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Implementation of an adapted physical activities protocol on functional rehabilitation in chronic low back pain people

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Abstract

This study aimsto evaluate and validate a functional rehabilitation protocol in physical activity adapted for people with low back pain,

Method:elderly people men age between 41 and 53 years, were admitted to the protocol which lasted 15 weeks, and data collection were analysed, A follow-up is carried out, at each consultation, the interview and clinical examination will ensure the absence of warning signs, the following tests were carried out: Pain assessment; Evaluation of the functional impact of low back pain; Spine mobility assessment: Measurement of the mobility of the thoraco-lumbar spine in flexion and extension, evaluation of the tilting movement of the spine on the right side and the left side; Measure the endurance strength of the abdominal and lumbar spinal muscles. After collecting the results and having treated them statistically, we conclude: The protocol implemented that helped reduce pain and improved functional ability to perform activities in daily life. Has a positive effect on the improvement of certain variables: improved mobility of the dorso-lumbar spine in extension and tilting movement of the spine to the right and left. Improved the endurance of the abdominal and lumbar spinal muscles. On this basis, the study recommended: Developed a treatment path translated by the protocol validated in our study, by creating agreements of several care providers to implement the adapted physical activity protocol relating to people with common low back pain.

1. Introduction:

Recent studies indicate that the movement of modern man has diminished considerably from what it was before, due to change in healthy habits, in particular the practice of physical activities at leisure.

So sitting for long hours in front of the television, internet, video games and smartphones, have become direct reasons for reluctance to engage in physical activities, and this is what caused the emergence of many diseases related to lack of movement (Omri Dahoun et al, 2018, p 86). Low back pain is a pain or functional discomfort located between the twelfth rib and the gluteal fold, associated or not with irradiation in the lower limbs (Dr Yves Henchoz, 2011, p 612).

Low back pain is a very common condition, with about 80% of people suffering from it at some point in their lives (Hicks et al, 2002, p 207). Low back pain is a major public health issue due to its high prevalence (84% over a lifetime) and its evolution towards chronicity in 6 to 8% of cases. Low back pain is the cause of high consumption of care, high medical costs and frequent incapacity for work, sometimes prolonged (Petit Philippe, Audrey, 2018, p 346). In 2018, an international working group invited the World Health Organization to attract attention on the load that represents low back pain and the need to avoid excessive recourse to medical solutions. Indeed, according to the latest international clinical recommendations, many cases of low back pain require little or no formal treatment. When treatment is required, it is recommended to limit the intake of analgesics, the steroid injections and spinal surgery, and rather encourage physical and psychological therapy. Very often, health systems are not designed to apply this approach (Adrian C Traeger et al, 2019, p1).The health benefits of physical activity have been widely demonstrated by numerous studies for over twenty years (Weber et al, 2014, p S97). The question that arises today is that of the quantity and nature of the activities to be recommended according to the populations and their state of health? (Vuillemin, 2011, p 183).

After an exploratory study on the prevalence of low back pain patients, from 01-03-2017 to 25-02-2018 at the public hospital center of

mostaganem, we concluded that 10% of the majority of patients suffer from low back pain, therefore, low back pain is a public health problem, and also in the professional environment, in the multidisciplinary care of the low back pain patient in rehabilitation centers, we do not find the real integration of APA among current therapeutic modalities.

From our study, we have tried to identify the impact of various forms of exercises and physical activities, concerning the various populations suffering from low back pain (age category, women, Obese, soldats..), including the study of (Karlsson,et al,2018,p133) about to describe how patients with chronic pain experience physical activity and exercise (PA&E), the study of (Fouquet, Jacquot, & Nardoux, 2017, p29) titled physical therapy and nonspecific low back pain, and the study of (Valenza et al, 2017, p 753) to investigate the effects of a Pilates exercise program on disability, pain, lumbar mobility, flexibility and balance in patients with chronic non-specific low back pain. They resulted that, although these participants valued PA&E, they seldom achieved desirable levels, and performance of PA&E was undermined by difficulties and failure. The discrepancy between the intention to perform physical activity and the physical activity accomplished could be related to motivation, self-efficacy, and action control. The participants desired high-quality interaction with healthcare providers. The findings can be applied to chronic pain rehabilitation that uses PA&E as treatment, and they resulted in that today, a more scientific approach of the strengthening exercises is needed to clarify the place of the muscular strength function in the treatment of nonspecific low back pain, and that some limitations need to be reported. Although there was a substantial improvement in the measures of disability, pain, flexibility and balance, patient satisfaction was not measured. A follow-up is also needed in order to assess the possible long-term effects of the program; further studies should include a prospective design with a follow-up. In view of a preliminary study and judging by the importance of the subject and the sanitary dimensions, economic and social it involves, we proposed a solution based on scientific rules, for trying to bring valid help to this population and that which led the researchers asked the question: What is

the influence of the proposed protocol and implemented in Adapted physical activity for people with low back pain? The research objectives are to deploy engineering methods for the practice of physical activity and health, and to identify the role of APA among current therapeutic modalities, and the evaluation of the protocol implemented by physical activity adapted that helps people with lower back pain improve certain physical variables.

2. Method and Materials:

2.1. Participants

Among the people who treat at Mostaganem hospital, have been deliberately chosen by the specialist doctor, in order to control the search variables. The exploratory research sample: three people suffer from common low back pain, and main research sample (Experimental group): Nine people with common low back pain, their age varies between 41 and 53 years. Inclusion criteria of the research sample: adulthood person with common low back pain. Exclusion criteria for the research sample: People with chronic illnesses and their health do not allow physical activity, the presence of inflammation.

2.1. Design and Procedure

The first measurements of the exploratory study were taken on 12/05/2019, the final results at the end of the program on January 14, 2020 and will take the criteria of the initial assessment. At each consultation, the interrogation and clinical examination will ensure that there are no warning signs.

Interrogation:data collection (First and last name; age;profession;History of the disease;date of onset of low back pain; antecedents), the weight;type of low back pain; pain assessment EVA scale.

The measures:

- Measure functional disability Roland-Morris EIFEL scale.
- Thoraco-lumbar spine mobility assessment:Mobility of the thoraco-lumbar spine in flexion: finger-ground test; Mobility of the thoraco-lumbar spine in extension: Elsensohn test; Evaluation of the tilting movement of the spine: centimeter measurement.
- Endurance Strength Assessment: Shirado Test.

Table N°1 show polls of specialists on the proposed tests

the variable	The test	The points	Percentage
pain assessment	EVA scale	9	81.8%
Spinal mobility assessmentin flexion	finger-ground test	11	100%
Mobility of the thoraco-lumbar spine in extension	Elsensohn test	11	100%
Spinal mobility assessment	Evaluation of the tilting movement of the spine	11	100%
Muscular force	Measuring Endurance of the Abdominal and Lumbar Spinal Muscles	8	72.2 %
Functional capacity	Roland-Morris EIFEL scale	9	81.%

By analyzing the results of Table No. 1, the specialists agreed, at the rate of 72.2% to 100% on the tests destined to measure the dependent variable, the experts agreed on the fidelity and relevance of these tests.

Table 2 shows the comparison of the results of the exploratory study on the correlation between the tests.

Results of the exploratory study	The tests	Calculated Pearson correlation coefficient "R"	
		The pre-tests	Post-tests
Comparison of results: between the pain assessment results and all the tests.	Elsensohn test	0.997	0.90
	Finger-to-ground distance test	0.999	0.999
	Evaluation of the tilting movement of the spine on the right.	-0.992	-0.988
	Evaluation of the tilting movement of the spine on the left.	-1	-0.999
	EIFEL scale	0.997	0.994
	Shirado test	-0.73	-0.74

Through the analysis of the results of Table No. 3, and the results of Table No.4 We conclude that the tests arean honest tool to measure what it is defined to measure, which indicates loyalty and the relevance of these tests, and a high degree of honesty.

Table 3 shows the coefficient of stability between the tests of the exploratory study.

the tests between the results of the pre-test and Post-tests	The coefficient of stability :Pearson correlation coefficient calculated "R":	Coefficient of stability Calculation: Cronbach's alpha index "α"
EVA scale	0.99946643	0.99973
Elsensohn test	0.99961336	0.9998
Finger-to-ground distance test	0.99876554	0.99938
Evaluation of the tilting movement of the spine on the right.	0.99999462	0.99999
Evaluation of the tilting movement of the spine on the left.	0.99979082	0.99989
EIFEL scale	1	1
Shirado test	0.93495672	0.9669

This indicates that the measurements are very stable, therefore, these results reflect the faithfulness of the tests usedin our studyand will allow us to carry them out safely in the perspective of obtaining valid results.

We organized a pre-work meeting during detailed explanations of all tests, we did the tests with the help of the medical staff, as well as the typical presentation of the tests under the same spatial conditions, in this way, and we have achieved the objectivity of the tests by the following points:

- ✓ Prepare the information and measurements form for each person and record the measurements with the help of the medical team.
- ✓ Using a set of approved tests, in a simple and clear way, and we provide a sample presentation for each test.
- ✓ The good preparation of the means and test in the field.
- ✓ Adjustments were made based on observations and preliminary study results, until we check the conditions for objectivity.

Functional rehabilitation programme

Content of the protocol: Once the protocol is complete, it was presented to specialists and unanimously approved after making the proposed modifications. People had to complete a total of 45 sessions; each ergocycle session varies from 45 to 60 minutes per work unit. The content was organized into three parts: preparatory (Warm-up: global exercises, stretching, specific exercises),main, and final (Recovery, advice for those with low back pain: Learn the correct gestures and postures). The number of

sessions per week is 3. For each session we will choose 3 to 4 different exercises depending on the objective, protocol exercises have been applied, according to the circular drive method in two phases:

First phase:in three week's adaptation work
First stage:Overall flexibility exercise and spinal flexibility.
Second step:Targeted muscle flexibility exercise, the dorsal chain and the abdominals.
Third step: proprioception work, back awareness exercise.
Second phase: in three months functional rehabilitation work in APA,
First stage: Targeted muscle building exercise, abdominals.
Second step: Targeted muscle building exercise, Thoracic and lumbar chain.
Third step: Specific exercise for low back pain.

The scientific foundations of the protocol

We used specialized scientific references, and the opinion of 11 experts specializing, through a questionnaire, the results are presented in the following table:

Table 6 shows the percentages of expert opinions on the content of the protocol

Proposal on the components of the program	expert opinion	The points	Percentages
The total duration of the program is 6 months / 3 months / 1 year	Varies between 3 to 6 months	11	100 %
The number of rehabilitation units at week 3-2-4-5	3 sessions per week	8	72.7 %
Determine the time of a session: 30-40-60 min	Varies between 40 to 60 min per session	11	100 %
The type of exercises	Stretching exercise	11	100 %
	Global flexibility exercise	9	81.8 %
	Spinal flexibility exercise	11	100 %
	Muscle building exercise	10	90.9 %
	Therapeutic exercise	7	63.6 %

Interpretation of the results on the content of the proposed protocol : By analyzing the results of Table No. 6 the experts agreed, from 63.6% to 100%, on the content of the program, Therefore, based on the opinions and scientific experience of professors, in terms of physiological and

psychological specialization, and field experience, especially for physiotherapists, we determine the general framework of the program from the duration of the program, of the time unit, the number of units per week, and the type of exercises included in the program, and this makes the protocol more efficient.

2.2. Statistical Analysis

We used the following statistical methods:Cronbach's alpha index "α", Calculated Pearson correlation coefficient "R", Percentage, T of student, Arithmetic means X, The variance, Standard deviation S.

3. Results

Table 7 shows comparison of the pre-test and post-test results of the experimental group of the EVA scale

EVA scale	the arithmetic mean X	the standard deviation S	Calculated T	The t table	The significance threshold	Statistical significance
pre-test	76.22	11.99	10.95	1.859	0.05	significant
post-test	46.88	15.81				

We noticethrough the statistical results listed in the table above, than the arithmetic mean value of the pre-test on the sample, of the pain assessment test was 76.22,and the standard deviation value 11.99, while the value of the arithmetic mean in the post-test of the same test 46.88and the standard deviation was 15.81, and the Student's T value was 10.95, which is greater than the tabular T 1.859 at the degree of freedom 8, and significance level 0.05. So there are differencesstatistically significant between the average of the two tests and in favor of the post-test.

Table 8 shows comparison of the pre-test and post-test results of the experimental group Finger-to-ground distance test

Test de la distance doigts-sol	the arithmetic mean X	the standard deviation S	Calculated T	The t table	The significance threshold	Statistical significance
pre-test	0.2048	0.01	1.2	1.859	0.05	non-significant
post-test	0.2228	0.069				

We noticed that the arithmetic mean value of pre-test on the sample, of the finger-to-ground distance test was 0.2048, and the standard deviation value of 0.01, while the value of the arithmetic means in the post-test of the same test 0.2228and the standard deviation was 0.069, and the Student's T value was 1.2, which is less than the tabular T 1.859 at the degree of freedom 8, and significance level 0.05. Indicating that there are no differences statistically significant between the mean scores of the pre-test and the post-test of the mobility of the thoraco-lumbar spine of the experimental group.

Table N ° 9 shows comparison of the pre-test and post-test results of the Elsensohn Test experimental group

Test Elsensohn	the arithmetic mean X	the standard deviation S	Calculated T	The t table	The significance threshold	Statistical significance
pre-test	0.207	0.012	2.984	1.859	0.05	significant
post-test	0.21	0.013				

We noticed that the arithmetic mean value of pre-test on the sample, of the tilting movement of the spine to the right of 0.207, and the standard deviation value of 0.012, while the value of the arithmetic mean in the post-test of the same test 0.21 and the standard deviation of 0.013, and the Student's T value was 2.984, which is greater than the tabular T 1.859 at degree of freedom 8, and significance level 0.05. Indicating the existence of statistically significant differences between the mean of the two tests and in favor of the post-test.

Table N ° 10 shows the comparison of the pre-test and post-test results of the experimental group for Evaluation of the tilting movement of the spine on the right side.

Evaluation du mouvementd'inclinaison du rachis le à droite.	the arithmetic mean X	the standard deviation S	Calculated T	The t table	The significance threshold	Statistical significance
pre-test	0.4546	0.0693				
post-test	0.4488	0.0695	4.274	1.859	0.05	significant

We noticed that the arithmetic mean value of the pre-test on the sample, of the tilting movement of the spine to the right was 0.45, and the standard deviation value 0.0693, while the value of the arithmetic mean in the post-test of the same test 0.44 and the standard deviation 0.0695, and the value of Student's T 4.274, which is greater than the tabular T 1.859 at the degree of freedom 8, and significance level 0.05. Indicating the existence of statistically significant differences between the mean of the two tests and in favor of the post-test.

Table 11 shows the comparison of the results of the pre-tests and post-tests of the experimental group for Evaluation of the tilting movement of the spine on the left side.

Evaluation.	the arithmetic mean X	the standard deviation S	Calculated T	The t table	The significance threshold	Statistical significance
pre-test	0.4476	0,0643				
post-test	0.4451	0.0646	5.75	1.859	0.05	significant

We noticed that the arithmetic mean value of the pre-test on the sample, of the tilting movement of the spine to the left was 0.44, and the standard deviation value of 0.0643, while the value of the arithmetic mean in the post-test of the same test 0.44 and the standard deviation 0.0646, and the Student's T value 5.75, which is greater than the tabular T 1.859 at the degree of freedom 8, and significance level 0.05. Indicating the existence of statistically significant differences between the mean of the two tests and in favor of the post-test.

Table 12 shows the comparison of the pre-test and post-test results of the EIFEL scale experimental group

Échelle EIFEL	the arithmetic mean X	the standard deviation S	Calculated T	The t table	The significance threshold	Statistical significance
pre-test	14,88	2,7588	8.12	1.859	0.05	significant
post-test	11,11	3,7896				

We noticed that the arithmetic mean value of pre-test on the sample, of the EIFEL Scale Test was 14.88, and the standard deviation value of 2.75, while the value of the arithmetic mean in the post-test of the same test 11.11 and the standard deviation was 3.78, and the Student's T value was 8.12, which is greater than the tabular T 1.859 at the degree of freedom 8, and significance level 0.05. Indicating the existence of statistically significant differences between the mean of the two tests and in favor of the post-test

Table N ° 13 shows the comparison of the results of the pre-tests and post-tests of the experimental group of Test Shirado.

Shirado test	the arithmetic mean X	the standard deviation S	Calculated T	The t table	The significance threshold	Statistical significance
pre-test	90	27,73	3,793	1,859	0.05	significant
post-test	99,4	33,59				

We notice that the arithmetic mean value of pre-test on the sample, of the Shirado Test was 90, and the standard deviation value of 27.73, while the value of the arithmetic mean in the post-test of the same test 99.4and the standard deviation was 33.59, and the Student's T value was 3.79, which is greater than the tabular T 1.859 at the degree of freedom 8, and significance level 0.05. Indicating the existence of statistically significant differences between the mean of the two tests and in favor of the post-test.

4. Discussion:

The pain variable:We clearly illustrated a decrease in pain in the results of the Lumbar Pain variable test,the improvement is due to the positivity of the

program implemented in APA, because we have produced a protocol model planned on scientific bases while creating an atmosphere based on mutual respect and trust, and this is due to integration of gestures and adequate postures in the recovery parts, contributeto reduce the degree of pain and thus avoid the factors of daily life that increase the symptoms. (Sylvie Rozenberg, 2012, p A27) indicates that the management of common low back pain mainly based on analgesic treatment, education and physical exercises.These results are consistent with the study of (Caby et al. 2014, p133) subjects with very painful chronic low back pain respond favorably to the dynamic and intensive program, which would give subjects the possibility of better managing their pain whatever its level,and the study of (Chang, Wen-Dien, et al, 2015, p 619) all of the basic strength training strategies examined in this study help relieve chronic low back pain, and the study of (Karlsson et al, 2018, p 133) the results can be applied to the rehabilitation of chronic pain, physical activity and exercise as a treatment.Indeed (Nino, 2013, p 8-9) states that while exercise is a safe molecule for health chronically ill if it is well supervised, it requires strict security arrangementsand a good level qualification. For a decade, we discover its virtues for healthinsofar as it is not intended to enter into a competitive sporting logicbut of added health value.

The results showed that a obvious improvement in the mobility of the thoracolumbar spine in flexion., This is due, according to the opinion of researchers, that the 3-week adaptation phase was not sufficient to cause a statistically significant change, (Petit, 2005, p 77) explains that exercise can improve a sore back. In fact, walk, run, swim and pedal while respecting the physical condition of the moment. When we have back pain, he does not hesitate to contain specific back exercises; you have to improve your overall physical condition. The protocol designed to have a positive effect on improving the mobility of the dorso-lumbar spine in extension, and the mobility of the tilting movement of the spine on the right side and the left side,this is due to the efficiency of the program, following the inclusion of an adaptation phase as a preparatory phase to stretch certain muscles, in order to regain flexibility and fight against stiffness, and through exercises

of overall flexibility and spinal flexibility, and muscle flexibility exercises target the back chain and abdominals. These results are consistent with the study of (Gliss Muhammad et al, 2019, p314) who concluded that the application of the proposed rehabilitation programhad a positive and effective effect compared to the application of the traditional rehabilitation program,At the level of the motor amplitude of the spine by improving (amplitudemovements in the front, motor amplitude movements backwards, amplitude movements from the lumbar axis to the right, and to the left, (Ciangura&Oppert, 2009, p28) indicates that the practice of a physical activityhelps reduce the proportion of lean mass lost during weight loss, thus preserve the energy expenditure of rest and the functional capacities of an obese subject, and(Valenza et al, 2017, p753) who concluded that An 8-week Pilates exercise program is effective in improving disability, pain, flexibility and balance in patients with chronic non-specific low back pain.

Functional incapacity:the protocol implemented in APA contributes to a degree of improvement on the variable of the ability to perform activities of daily living, this is due to the content of the program and the protocol flow, who to make changes in daily life, and this improvement is due to the back awareness exercises integrated into the proprioception work(Belkadi, 2019; yassinzenati, belkadi, &benbernou, 2021). These results are consistent with the study (Smith Benjamin et al, 2014, p18) there is strong evidence that any form of long-term active exercise reduces symptoms of pain and disability and forms an effective treatment. The thesis of (ImenBourigua, 2014, p 175) shows that solving the growing problem of chronic low back paindoes not consist only in the fight against physical deconditioning but, also, in the fight against motor deconditioning. It is possible that taking charge of this motor deconditioning will lead to better long-term results. Thus promoting the return of patients to active life. These results are consistent with the study of (Henchoz, Yves, Alexander Kai-Lik So, 2008, p 533) Results show that exercise is an effective means of primary and secondary prevention of low back pain. As a method of treatment, exercise reduces disability and pain and improve physical condition. According to (Fabre etChavignay 2010, p 628) APAs act at the functional level by reducing impairment and

disabilities and at the social level by reducing handicaps(Mohammed, Bachir, Eddine, & Adel, 2018). (Jill A Hayden et al, 2005, p 776) confirmed that muscle work objectively and subjectively improves functions.

Endurance of the abdominal and lumbar spinal muscles: the protocol implemented in APAcontributes to a degree of improvement in the results of the endurance test of the abdominal and lumbar spinal muscles, we attribute that the improvement is due to the positivity of the proposed programs, the main idea in the design of the functional rehabilitation program in APA is to fight against muscle loss caused by physical inactivity secondary to the pain that allows you to give back: Endurance strength and flexibility, it is also due because of the foundations of the protocol construction, the duration of the program (a period of three months) was enough to bring about a positive change, and the content of the exercises of the protocol, muscle building exercises for targeted muscles (abdominals, Thoracic and lumbar chain).(F. DouryPanchout et al, 2014, p 10) confirmed that it is therefore useful to apply the theory of deconditioning syndrome to musculoskeletal pain and offer patients chronicles of multidisciplinary rehabilitation programs to the effort, combining muscle building. These results are consistent with the study of(Bernard Fouquet et al, 2017, p29) confirmed that today, a scientific approach to muscle building exercisesis necessary to clarify the place of the correction of the function of muscle strength in the treatment of common low back pain(Becker et al., 2012). These results are consistent with the study of(Shin, M. K et al, 2018, p 59) Lumbar strengthening exercise led to less pain and an increase in the strength of the lumbar extensor(Adel et al., 2019; Beboucha, Belkadi, Benchehida, &Bengoua, 2021; Belkadi et al., 2015; Saddek et al., 2020).

5. Conclusion:

Following the rhythm of modern scientific trends, with an interest in adapted physical activity applicationsand these impacts on the health of individuals,judging by the importance of the subjectand the sanitary dimensions, psychological, economic and social it involves, we proposed a

solution, among the different solutions, so that it is based on scientific rules, inexpensive, easy to apply and without side effects.In addition to what was concluded from the effectiveness of the program implemented by adapted physical activity where we came to a set of conclusions, represented by:The implemented protocol that helped reduce pain (the degree of pain has decreased) and an improvement of the functional capacities to carry out the activities in daily life, so he made changes that would allow people with common low back pain to learn to manage this pain.Through it, we make the following suggestions: Developed a treatment path translated by the protocol validated in our study (good practice based on a method which gives good result in a certain environment), by creating agreements of several care providers forconcretize the protocol in APA relating to the person suffering from common low back pain. To emphasize the importance of the institute, and the training of students who can be an effective actor in society, we suggest the inclusion of applied trainingfor students of the institute from the second year, two years of applied training for graduate students and 4 years of applied training for master's students.The contribution of physical exercise was well demonstrated in the analysis of our study, we consider it necessary to privilege and facilitate the adhesion of specialists on APAin physical rehabilitation hospitals so as to integrate them to bring a plus and a good in the management of patientsand encourage continuity following our action.

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