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Research Article

Influence of l Global Physical Exercise on a Prototype on Low Back Pain (Patent Es2457990 B1)

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Abstract

An inventive philosophy based on logic and scientific evidence becomes a fait accompli called a thesis in scientific advancement at the service of the population.

This study aims to demonstrate the benefits that an instrument invented from a globalizing thought can bring about the existence of the human body as a sum of living tissues formed by basic materials. The human body is composed of molecules that from chemistry to organic chemistry generated biological tissues that have geometry, which in turn have their architecture, which obey the physical laws of charge, which compose among themselves a mechanical congruence at the service of kinetic functions, consuming processed energy from food in the digestive system made available to machinery controlled by a spectacular neural electronic system and endocrinological. A perfect symbiosis that requires care of the health sciences and kinetic activity for its perfect conservation. For this reason, the invented instrument object of the study has been based on facilitating a programmed, protocolized and caudalized physical activity that promotes the joint work of different apparatuses, systems and segments of the body in an integral conceptorat the service of the concrete objectives for health without losing the overall contribution of the body to the cause.

In this case, the instrument invented in its initial conception sought to harmonize the function of the load and mobility of the vertebral structures, which had suffered geometric deterioration of the segments that make up the spine, causing pain, but along the way we were surprised by other benefits that we have achieved from a global contribution of the body.

The instrument was able to improve lumbar ailments from global physical exercise with special attention to the importance of load lines [21] in favor of the conservation of the segments, their appropriate biomechanics, necessary contribution of the body's system to the service of the main objective that was low back pain, due to the structural damage suffered that could probably result in an inappropriate joint mechanics that with the passage of time would contribute to the degenerative process of the body structures that make up the different systems.

Keywords: Global; Physical Exercise; Prototype; Low Back Pain

Introduction

In the book of guidelines for action and monitoring of low back pain [1] Dr. Tornero defines low back pain as that which is located in the posterior region of the trunk between the last ribs and the iliac crests. The area of pain includes the lower limit of the buttocks and its degree of intensity varies depending on postures and physical activities. It is reported that between 70% and 85% of people suffer from low back pain at some point in their lives, this figure increases between 45 and 59 years. The annual prevalence is established between 22% and 65% [1].

Low back pain is classifiedn, according to its behavior and duration, into 4 categories

- Acute (less than 6 weeks).
- Subacute (between 6 to 12 weeks).
- Chronic (more than 12 weeks).
- Recurrent (repeated ailments with approximate intervals of three months).

Saving the recent epidemic of COVID 19, se points out that the pain of the spine is the most frequent condition of the human being. Accordingto EPISER *2000*, the prevalence of low back pain at the time of screening of an adult population over 20 years of age was

14.8%, and that of chronic low back pain was 77% in Spain. By sex, it is located at the prevalence of women over men, reaching its peak at age 60. Inflammatory low back pain occupies 0.8% of the population. The number of people who consult their doctors about their lumbar ailments is 1,200,000 in a period of 6 months. It is considered that low back pain causes a notable socioeconomic impact, it is estimated that 5% of patients with chronic low back pain generate an expense of 75% of the total cost of care for this symptomatology [1].

(Prevalence, incidence and economic impact)

Low back pain is a pathology that occurs in 80% of people at least once in their lives. Because of this high prevalence, we can describe it as a public health problem with major socioeconomic repercussions [1,20].

In the book "Guidelines for Action and Monitoring of Low Back Pain" [1], it is pointed out that in the United States (USA) more than 33 billion dollars are invested in direct expenses on low back pain, that is, in trying to relieve symptoms and surgical interventions. However, if we add the absenteeism caused by the lumgia, the expenditure can reach 100 billion dollars annually. According to an epidemiological study by Sauné and Cols [2], more than half of the patients with low back pain were on leave from work for at least one month, and observing the 75th percentile of the median, the figure reached 183 days. Therefore, this ailment reaches the first cause of work disability with economic repercussions of very high impact [3].

Low back pain is classified as a very frequent symptom and alarm gnoses or red flags are identified as informants and consultation guide for the diagnostic-therapeutic approach. In each case, the initial anamnesis that marks the route of a thorough physical examination and reports on the three conclusions of the *Quebec* group on diseases of the lumbar spine is of great importance

- Most do not have a verifiable structural anomaly.
- The duration of symptomatology is variable. 8% after 2 months are still in pain, which is a serious problem due to the number of people affected (waiting lists).
- The physical exam offers minimal benefit in determining the diagnosis.

The authors make a brief, but concise approach to various techniques and means such as massage therapy, thermotherapy, electrotherapy, ultrasound, sertherapy, manual therapies, mechanical means, orthopedic devices, highlighting the strong evidence in favor of therapeutic exercise, its association with other therapeutic and educational techniques. On the other hand, they indicate the individualized prescription based on specific circumstances of each patient based on the specific objectives. Obviously, pharmacological, surgical, physiotherapeutic treatments, etc. are of great importance. which must be carried out under strict ethical standards and codes of ethics [1].

Study

The inventive method object of this study is based on the induction of movements throughout the body, consisting of the integration of a series of movements in a concatenad a and protocolized way respecting the biomechanics and kinetics of muscle chains in relation to the therapeutic and/or preventive objectives previously marked.

This method created by Dr. Alireza Kazemi was the origin of the patent ES 2457990 B1 (13840853 CH, ES, FR, GB, LU, MC, AL) from empirical trials based on knowledge and clinical practice on subjects with vertebral pain who had positive responses in relation to the decrease-elimination of pain, reduction of disabilities caused by pain, manifestations of degree of satisfaction of users, improvement of quality of life, improvement of physical qualities and appropriate cost-effectiveness ratio.

The patent and its prototype are the final result of a project capable of creating an efficient instrument for the execution of a method for the treatment and care of the spine in a safer and more productive way. Once the prototype was created, a study was needed to demonstrate its efficiency.

Objective

The objective of this study is to investigate the action effects of the prototype created based on the description of the patented instrumental technique with number P201231500 (ES2457990B1).

Design study

The interventional observational study consisted of 30 exercise sessions with a described procedure and an intellectual exercise on the prototypes manufactured for this purpose (instrument-body interaction). The study lasted 10 weeks, 3 days per week equidistant from each other on alternate days (Monday, Wednesday and Friday or Tuesday, Thursday and Saturday).

Each exercise session had the measurement of flexibility pre and post exercise on the prototype manufactured based on patent P201231500 and publication number 2 457 990. The performance of the exercises comprised 4 sets with 12 repetitions in each session at 60% of 1RM which is within the range of Liddle., *et al*. 2004 [4] noted by the *American College of Sports Medicine (ACSM*) (2000) which recommends exercises with sets of 12 repetitions.

On the other hand, in sessions number 1, 15 and 30, the quality-of-life questionnaires or SF 36, Oswestry index, and Visual Analogue Scale (VAS) were completed. In addition, the measurement of height, weight, Body Mass Index and re-evaluation of pressures through the 1RM test were performed.

The instrument had an intelligent computer system developed by the research group of the university Cumplutense of Madrid enabled the study to the capable of recoording the data of te study varables in a systematic way ankakyzed by the system Itself.

Material and Method

Personal

Physiotherapists who had received the appropriate training, passing the examination of handling technical-scientific operations to ensure homogeneous actions in the execution of the tests both in positioning tasks in each subject in each case, such as the use of the system, the calibration of the instrument and the issuance of verbal commands both in the selection of terms and in the acoustic volume in their pronunciation.

Place of study

The research was carried out in the facilities of the "Instituto de Fisioterapia y Deporte, S.L." cOn the invaluable face-to-face and/or on-line contribution of all the health professionals who are co-authors of this article.

Prototypes

A prototype built according to the utilities described in patent number P201231500 published under number 2 457 990 was available.

Statistical package

For data analysis, the IBM SPSS Stadistics 22 statistical package was used, with a data dump recorded by the group of researchers in the Microsoft Office EXCELL 2007 program previously.

Sample size

28 subjects participated by random selection with a power of 80% to detect the effect of 0.5 (for a mean difference of 1,500, assuming a standard deviation of the differences of 3,000), using t-test paired with a 0.050 of two levels of unilateral significance.

Subject

40 volunteers were recruited, although 12 of them for reasons of time availability and family adversities could not take part in the observational study. The 28 participants met the inclusion and exclusion criteria. The informed consent of each volunteer was obtained prior to the start of the study.

Inclusion and inclusion criteria. Subacute and chronic low back pain

Inclusion

- Lumbar cord greater than 6 weeks and present at the beginning of the study.
- Aged 18-75 years.

Exclusion

- Traumatic. Vertebral fractures.
- Interventions of the Spine.
- Pain of neurological origin.
- Metabolic pathology bone, infectious, tumor of the spine.
- Systemic disease.
- Subjects with drugs. Anticoagulants.
- Pacemaker.
- Serious illnesses.
- Disorders of perception or central sensitization.
- Concomitant Psychiatric Pathology.
- No radiculopathies.

The study variables

Age

Age range between 18 and 75 years.

Gender

Male and female

Pain intensity

The visual native a-scale (VAS) was used. The subject moves a red marker that indicates the intensity of the pain, being on the left no pain ("NOT PAIN AT ALL") and on the right the maximum pain ("MAXIMAL PAIN"). The 10 centimetre long instrument was exposed to the subject in reverse, so the subject could not display the numerical values from 0 (absence of pain) to 100 (maximum pain). In this way, if the patient places the marker in the middle of the line, the number indicated on the back will be 50.

Participants indicated their pain scale through the VAS instrument that was recorded in the computer system through a touch screen incorporated into the prototype.

Quality of life. SF36

This variability was carried out through the SF36 questionnaire. The questionnaire consists of numerical values with 0 being the worst personal state and 100 the best.

The concepts to assess are:

- Physical function.
- Physical role.
- Body pain.
- General perception of health.
- Vitality (Energy-fatigue).
- Social function.
- Emotional role.
- Mental health (in general).
- Transition in health (changes).

Once the patient has completed the paper questionnaire, the answers went through the platform available on the internet of the University of Granada (http://www.ugr.es/~abfr/sf36/), through which we obtained a final value of the questionnaire and a value for each item of the questionnaire.

Oswestry disability scale or disability index d

It is the gold standard to measure low back pain. To obtain the result of the questionnaire, the points of the answers obtained will be added and multiplied by two, thus obtaining the percentage of disability, being 0 null disability and 100 the maximum disability. This scale was used in Spanish thanks to the validation of Flórez in 1995 [5].

Tall

The height of patients has been measured with the SECA tallimeter, model 713, manufacturing number 907212.

Weight

Measured through the scale of the brand TANITA, Inner Scan model and manufacture number 870529. (BC 571 Max.150 Kg d = 0.1Kg% Body fat increments: 0.1%). Prior to each session, weight and size were evaluated without shoes and underwear.

Body Mass Index (BMI)

Through the data obtained previously, they were entered on the website www.calculoimc.com in which the numerical value of this item m is automatically calculated.

Flexibility

It was measured with the SANFLEX tailor tape, measuring the distance from the third finger of the right hand to the ground. The test was performedor placing the subject on a wooden box 18 centimeters high. The patient climbs on this platform and with his knees fully extended, he should try to touch the ground with both hands. The feet shall be spaced according to the distance between the hips without footwear. The assessment was performed before and after each session.

Strength

It is about assessing the strength of the cervical, thorcic spine, lumbar, upper limbs and lower limbs segments. In each session the maximum force (1RM) is assessed for the estimation of the force of each segment session after session The computer system of the prototype calibrated in millibars, being 1000 mBar 1.0197 kgf/cm^2 (kilograms-force per square centimeter).

Procedure and execution of physical exercise

The activation method deposited in the intellectual register that gave rise to the patented system "P201231500 and published under number 2 457 990 called the equipment for the treatment and care of the spine" consists of the sum of a series of simple exercises or, rather, in a series of movements that generates a global physical activity concatenated.

It is about this concatenation of the movements interacting with the prototype. The instrument and body guide each other in a safe and controlled manner.

The body-machine interaction requires a previous task that determines the ideal position and forces thanks to a foreseen professional examination, facts that help to adapt an appropriate volume and intensity of physical work.

The exercise begins with an ideal starting position for each case (normopposition, hyperkyphosis, hyperlordosis, rectifications of lordosis and/or kyphosis, vertebral rotations and s, symmetries or pelvic and scapular asymmetries, discopathies, previous surgeries or any other type of lesions detected in these Exploration is physical prior and according to the objectives to be achieved). In the event that the optimal position is uncomfortable or painful, the sessions are initiated in the painless position that most closely approximates the ideal position to go looking for the desired position progressively in successive sessions.

Once the subject is placed in the machine according to the needs of each case already predetermined by the professional, the prototype is calibrated.

Description of the instrument and the movements s: The subject is seated on a positioning seat in the three-dimensional coordinate system in the center of the prototype as if it were a car, his back rests on three cervical, thoracic and lumbar actuators, while his arms are attached to an actuator on each side and his feet on other or two actuators. The actuators act as resistance and/or assistance already calibrated to the mobility of the body that is running in drawing kyphosis of the spine with arms and legs in extension, followed by the lordosis of the spine with knee-elbow flexion and cervical extension in a closed system. The body is in a constant tracing of the letters "C" with anterior and posterior convexity passing through an "S" path in its change of directionality.

Phase I (Previous exertionor push)

With the legs and arms clinging to the levers on the actuator and is pushed forward, while the dorsal column pushes on the thoracic actuators backwards generating a large kyphosis from the arms to the legs.

- Elbow are extendes.
- The arms are moved forward with slight flexion of the shoulders.
- The knees are extended by pushing pedals anchoredors to the actuators of the lower limbs.
- The feet-ankles perform a discreet dorsiflexion.
- It tilts the pelvis erasing the lumbar lordosis and the cervical spine performs a discreet flexion and auto-elongation.

Phase II (Phase I return exercise)

The arms pull the handles of the actuators in the posterior direction while the elbows are flexed to ndo, the feet return while the knees execute the flexion and the head extends pushing towards the cervical actuator and the thoracic spain goes to the lordosis accompanied by a lumbar hyperlordosis with pelvic scale.

- Elbow flexion that ends up being slight extension of shoulders.
- Flexion of the knees with plantar flexion of the feet.
- The previous two facilitate hyperlordos is from the cervical spine to the sacral bone, while the cervical spine pushes the cervical actuator in extension.
- The spine is etense to generate lordosis in the whole of the spine.

These acts are answered by the resistance of the actuators installed or in the prototype that were calibrated according to the previous assessments and the objectives set. The movements are accompanied by correct breathing according to the principles of Philippe Campignion in 1999 [6].

Through the proposal of exercises for scoliosis indicated by A. Lapierre in 1996 [7] the influence of some parts of the body on the others or the publication of Jorge Rodrigo Vásquez-Ríos and Tania Inés Nava-Bringas 2014 [8] is accredited. We can see these actions concatenated in our methodological proposal from the joint activation of movements and interaction of the body with the external forces in a constant back and forth as if it were Newton's second law. These actions and reactions train the various physical qualities such as muscle strength, coordination, synergism, speed, endurance, elasticity and flexibility of the body as a whole. A. Lapierre [7] and Jennifer Pohlmen [9] indicate in their publications exercises that are reproduced in a kinetic chain concatenated continuously. Action -reaction, agonist-antagonist, back and forth, etc.

The possibility of calibration of the force-resistance, speed of execution, distance and ideal positioning offers absolute control over the way of acting in pursuit of the objectives safely for each case. Force calibration has evolved in recent decades in relation to the useful Delorme, TL procedures; Watson. TO 1951 [10].

On the other hand, the prototype is equipped with an integrated intelligent computer system developed by the research group of the University Cumplutense of Madrid that automatically registers the data of the force executed and integrates the values of any variable as a global registration system for the statistical use and processing of Big data useful in algorithms. This data is analyzed by the intelligent computer system automatically to provide future recommendations [23-25].

Results

Statistical package

The data collected in this study have been stored in a Microsoft Office EXCELL 2007 database and subsequently analyzed through the statistical analysis program IBM SPSS STADISTICS 22. In addition, to make it easier for patients to complete the forms, there is a paper copy of their answers, with the date and signature of each day of evaluation. The post hoc was evaluated through the Boferroni, Tukey and DMS test.

All measurements were made in three phases, at the beginning of the study (0), at the fifteenth session (session 15) and at the last session of the study (session 30)

Subject

Participated 28 subjects (15 men and 13 women) whocompleted the planned study in 30 sessions. It is asignor the number 1 for the male sex and the number 2 for the female sex in the statistical treatise.

Age

The mean age for men was 39.33 years with SD (± 13.32) and for women it was 59.15 years SD (± 8.59).

Visual analogue scale (VAS)

In the three measurements through the pain scale with values ranging from 0 to 100 points, we can see in tables 1 that, without differences between genders at the time of measurement, there was a significant reduction in pain (P < 0.01) of the participants in relation to the activity developed in this study.

VAS	Son-in-law	Media	Standard deviation	N
VAS 1	1	41	18,91	15
	2	42	12,36	13
	Total	41,75	15,92	28
VAS 2	1	13,13	14,15	15
	2	24,54	11,98	13
	Total	18,43	14,18	28
VAS 3	1	8,07	12,69	15
	2	12,77	12,93	13
	Total	10,25	12,79	28

Table 1: Descriptive statistics VAS.

Quality of life (SF36)

In the three measurements through the SF36 survey on quality of life, we can observe in tables 2 that, without differences between genders, there was a significant increase in satisfaction (P < 0.01) between the moments of measurement of the participants in relation to the activity carried out in this study.

	Son-in-law	Media	Standard deviation	N
SF36_1	1	67,09	15,21	15
	2	63,75	17,41	13
	Total	65,54	16,05	28
SF36_2	1	74,53	14,53	15
	2	71,94	9,71	13
	Total	73,33	12,38	28
SF36_3	1	79,03	16,29	15
	2	77,78	8,40	13
	Total	78,45	13,02	28

Table 2: (Descriptive statistics SF36).

Physical function

In the three measures on quality of life, in its item related to physical function through the SF36 survey, we can see in tables 3, between the moments of measurement and without differences between genders, there was a significant increase in physical function (P < 0.01) of the participants in relation to the activity developed in this study.

	Son-in-law	Media	Standard deviation	N
Func.phy1	1	87,33	7,99	15
	2	71,15	19,81	13
	Total	79,82	16,58	28
Func.phy 2	1	92,33	7,99	15
	2	77,68	11,83	13
	Total	85,53	12,27	28
Func.phy 3	1	93	9,024	15
	2	82,31	14,95	13
	Total	88,04	13,08	28

Table 3: (Descriptive Statistics Physical Function).

There were significant differences (P < 0.01) of initial records between men and women; and that were maintained during the study, with the highest records for men with the highest level of physical function.

Physical role

In the three measurements on the quality of life in its item related to the physical role through the SF36 survey, we can observe in tables 4 that, between the moments of measurement and without differences between the genders, there was a significant increase in the physical role (P < 0.01) of the participants in relation to the activity developed in This study.

	January	Media	Standard deviation	N
	1	56,67	44,79	15
Role. Phy 1	2	63,46	41,60	13
	Total	59,82	42,68	28
	1	85,00	35,10	15
Role. Phy 2	2	84,62	33,13	13
	Total	84,82	33,57	28
	1	86,67	31,15	15
Rol. Phy 3	2	86,54	33,25	13
	Total	86,61	31,54	28

Table 4: Descriptive Statistics Physical Role.

Satisfaction with the decrease in pain

In the three measures of quality of life in its item related to satisfaction due to the reduction of pain through the SF36 survey, wecan observe in tables 5 that, between the moments of measurement

	Son-in-law	Media	Standard deviation	N
Decr.Pain1	1	56,33	14,91	15
	2	60,58	15,42	13
	Total	58,30	15,02	28
Decr.Pain2	1	75,17	21,22	15
	2	71,35	15,43	13
	Total	73,39	18,52	28
Decr.Pain3	1	81	19,75	15
	2	77,31	12,39	13
	Total	79,29	16,55	28

Table 5: Descriptive statistics for satisfaction with decreased.

and without differences between genders, there was a significant increase in satisfaction due to the decrease in pain (P < 0.01) of the participants in connection with the activity developed in this study.

Health (Perception of the improvement of the avalanches)

In the three measures of quality of life in its item related to satisfaction with improved health through the SF36 survey, we can observe in tables 6 that, between the moments of measurement and without differences between genders, there was a significant increase in satisfaction due to the improvement in health (P < 0.01) of the participants in relation to the activity carried out in this study.

	Son-in-law	Media	Standard deviation	N
Health 1	1	56,67	17,60	15
	2	58,46	18,75	13
	Total	57,50	17,82	28
Health 2	1	60,67	19,54	15
	2	61,54	15,46	13
	Total	61,07	17,45	28
Health 3	1	64,67	18,66	15
	2	6I7,31	14,52	13
	Total	65,89	16,61	28

Table 6: (Descriptive statistics perception of health improvement).

Vitality (energy-fatigue).

In the three measures of quality of life in its item related to vitality through the SF36 survey, we can observe in tables 7 that, between the moments of measurement and without differences between genders, there was a significant increase in vitality (P < 0.01) of the participants in relation to the activity developed in this study.

	Son-in-law	Media	Standard deviation	N
Vitality 1	1	64,33	22,43	15
	2	56,54	12,31	13
	Total	60,71	18,54	28
Vitality 2	1	63	13,73	15
	2	60	11,37	13
	Total	61,61	12,55	28
Vitality 3	1	69,67	23,79	15
	2	65,38	14,50	13
	Total	67,68	19,79	28

Table 7: Descriptive statistics Vitality.

Social function

In the three measures of quality of life in its item related to social function through the SF36 survey, we can observe in tables 8 that, between the moments of measurement and without differences between genders, there was a significant increase in the social function in life (P < 0.01) of the participants in relation to the activity developed in this study.

	Son-in-law	Media	Standard deviation	N
Soc. Func 1	1	77,67	18,60	15
	2	62,38	24,63	13
	Total	70,57	22,57	28
Soc. Func 2	1	79,33	25,61	15
	2	76,73	16,09	13
	Total	78,13	21,37	28
Soc. Func 3	1	84,50	16,07	15
	2	76,92	13,85	13
	Total	80,98	15,30	28

Table 8: Descriptive statistics Social function.

Emotional role

In the three measures of quality of life in its item related to the emotional role through the SF36 survey, we can observe in tables 9 that, between the moments of measurement and without differences between genders, there was a significant increase in the emotional role in life (P < 0.01) of the participants in relation to the activity developed in this study.

Mental health (in general)

In the three measures of quality of life in its item related to mental health through the SF36 survey, we can observe in tables 10 that, between the moments of measurement and without differences between genders, there was a significant improvement in

	Son-in-law	Media	Standard deviation	N
Emoc. Rol 1	1	79,99	37,37	15
	2	61,54	46,84	13
	Total	71,43	42,28	28
Emoc. Role 2	1	84,44	35,34	15
	2	87,18	28,99	13
	Total	85,71	31,98	28
Emoc. Role. 3	1	86,67	31,15	15
	2	86,54	33,25	13
	Total	86,61	31,54	28

Table 9: Descriptive Statistics Emotional Role.

	Son-in-law	Media	Standard deviation	N
Ment. Heal 1	1	72,53	17,69	15
	2	68,31	18,14	13
	Total	70,57	17,70	28
Ment. Heal 2	1	72,53	13,68	15
	2	72,62	13,05	13
	Total	72,57	13,14	28
Ment. Heal 3	1	75,40	19,57	15
	2	75,08	12,87	13
	Total	75,25	16,50	28

Table 10: Descriptive Mental Health Statistics.

mental health (P < 0.01) of the participants in relation to the activity developed in this study.

Transition in health (change)

In the three measures of quality of life in its item related to the change in health status through the SF36 survey, we can observe in tables 11 that, between the moments of measurement and without differences between the genders, there was a significant improvement in the change in health (P < 0.0001) of the participants in relation to the activity developed in this study.

	Son-in-law	Media	Standard deviation	N
Trans. Heal 1	1	51,67	27,49	15
	2	53,85	24,68	13
	Total	52,68	25,77	28
Trans. Heal 2	1	58,33	24,40	15
	2	55,77	10,96	13
	Total	57,14	19,07	28
Trans. Heal 3	1	68,33	19,97	15
	2	69,23	18,13	13
	Total	68,75	18,79	28

Table 11: Descriptive statistics Health transfer.

Oswestry Disability Scale or Disability Index

In the three measurements related to the disability index through the Oswestry survey, we can observe in tables 12 that, between the moments of measurement and without differences between the genders, there was a significant decrease in the disability (P < 0.01) of the participants in relation to the activity developed in this study.

	Son-in-law	Media	Standard deviation	N
OSW1	1	13,87	10,21	15
	2	22,62	13,82	13
	Total	17,93	12,60	28
OSW2	1	9,07	7,92	15
	2	16,00	10,55	13
	Total	12,29	9,73	28
OSW3	1	8,27	8,94	15
	2	12,31	10,98	13
	Total	10,14	9,97	28

Table 12: Oswestry descriptive statistics.

Body mass index (MIC)

In the three measurements related to the body mass index that shows the relationship between height and body weight, we can see in tables 13 that, between the moments of measurement there were no significant differences between the genders or the BMI (P < 0.05) of the participants in relation to the activity developed in this study.

Flexibility A (pre-session measurement)

In the three measurements related to flexibility at the beginning of the sessions (0, 15, 30), measuring the distance from the tip of the third finger of the right hand to the ground during trunk flexion, the subject being above a step as described in the section on method, We can observe in tables 14 that, between the moments of

	Son-in-law	Media	Standard deviation	N
BMI 1	1	25,53	2,55	15
	2	28,78	7,39	13
	Total	27,04	5,51	28
BMI 2	1	25,50	2,85	15
	2	28,46	7,23	13
	Total	26,87	5,45	28
BMI 3	1	25,69	3,16	15
	2	28,54	7,36	13
	Total	27,01	5,59	28

Table 13: (BMI descriptive statistics).

measurement and without differences between the genders, there was a significant decrease in the distance from the finger to the ground (P < 0.01) of the participants in relation to the activity developed in this study, which shows the gain in flexibility.

	Son-in-law	Media	Standard deviation	N
F0A	1	26,30	17,62	15
	2	23,31	9,23	13
	Total	24,91	14,18	28
F15A	1	18,96	15,77	15
	2	17,69	7,35	13
	Total	18,38	12,39	28
F30A	1	16,90	14,68	15
	2	15,81	6,89	13
	Total	16,40	11,54	28

Table 14: (Descriptive statistics Flexibility A).

Flexibility B (post-session measurement)

In the three measurements related to flexibility at the end of the sessions (0, 15, 30), measuring the distance from the tip of the third finger of the right hand to the ground during trunk flexion, the subject being on top of a step as described in the section on mathematicsand method, We can observe in tables 15 that, between the moments of measurement and without differences between the genders, there was a significant decrease in the distance from the finger to the ground (P < 0.01) of the participants in relation to the activity developed by this study, which shows the gain in flexibility.

	Son-in-law	Media	Standard deviation	N
F0B	1	24,20	16,91	15
	2	20,46	8,14	13
	Total	22,46	13,46	28
F15B	1	17,03	15,65	15
	2	15,00	7,60	13
	Total	16,09	12,40	28
F30B	1	14,83	13,80	15
	2	13,69	7,71	13
	Total	14,30	11,20	28

Table 15: Descriptive statistics Flexibility B.

Cervical strength

In the three measurements related to the muscular strength of the cervical spine, as we can see in tables, between the moments of measurement there were no significant differences between the genders, but there were significant differences (P > 0.5) in the gain of cervical strength dragged by the increase in The recorded strength of women reaching men between the firstand second measurements. But according to the data recorded in the tables indicated above, there was bias in this variable due to automated recording failures by the cervical actuator (it could never register values higher than 200 millibars). For the above, we have excluded this variable, but for scientific rigor we report on the data orbtaken.

Thoracic strength

In the three measurements of dorsal strength, we can observe in tables 16 that, between the moments of measurement, there was a significant increase in the dorsal strength (P < 0.01) of the participants in relation to the activity developed in this study and there was also a significant difference between the genders (P < 0.01), with greater strength of men than women.

	Son-in-law	Media	Standard deviation	N
Th.1	1	1386,67	405,09	15
	2	1038,46	239,93	13
	Total	1225,00	376,76	28
Th.2	1	1866,67	315,47	15
	2	1461,54	275,49	13
	Total	1678,57	357,31	28
Th. 3	1	2353,33	289,99	15
	2	1846,15	419,55	13
	Total	2117,86	433,81	28

Table 16: Descriptive statistics Dorsal pressure.

Lower back strength

In the three measurements of lumbar strength, we can see in tables 17 that, between the moments of measurement, there was a significant increase in lumbar strength (P < 0.01) of the participants in relation to the activity developed in this study and there was also a significant difference between the genders (P < 0.01), with greater strength of men than women.

Upper limb strength

In the three measurements of the strength of the upper limbs, it can be observed in the tables 18 that, between the moments of measurement, there was a significant increase in the strength of the upper limbs (P < 0.01) of the participants in relation to the ac-

	Son-in-law	Media	Standard deviation	N
LUM.1	1	1086,67	294,88	15
	2	838,46	225,60	13
	Total	971,43	289,13	28
LUM.2	1	1700,00	292,77	15
	2	1323,08	277,35	13
	Total	1525,00	339,53	28
LUM. 3	1	2180,00	285,86	15
	2	1730,77	368,29	13
	Total	1971,43	393,33	28

Table 17: Descriptive statistics Lumbar Pressure.

tivity developed in this study and there was also a significant difference between the genders (P < 0.01), with greater strength of men than women.

	Son-in-law	Media	Standard deviation	N
UP. Limb 1	1	386,67	164,17	15
	2	230,77	48,04	13
	Total	314,29	145,84	28
Up. Limb. 2	1	660,00	176,47	15
	2	330,77	131,56	13
	Total	507,14	227,59	28
Up. Limb. 3	1	820,00	161,25	15
	2	430,77	232,32	13
	Total	639,29	276,67	28

Table 18: (Descriptive statistics Higher Ms. Pressure).

Lower limbs strength

In the three measurements of the strength of the lower limbs, we can observe in tables 19 that, between the moments of measurement, there was a significant increase in the strength of the lower limbs (P < 0.01) of the participants in relation to the activity developed in this study and there was also a significant difference between the genders (P < 0.01), with greater strength of men than women.

Discussion

M. Küster [11] advises against rest and recommends physical activity to prevent future lumbar ailments in adolescents. The invention and its proposal through the prototype used in this study proposes the realization of a physical activity that involves the whole body in a systematized, directed and controlled way. Comparingour study with others, we found many differences, the most important thing is its integrative capacity, since the physical activity carried out through the prototype presented in this study is

	Son-in-law	Media	Standard deviation	N
Low. Limb. 1	1	2486,67	440,56	15
	2	2223,08	289,12	13
	Total	2364,29	394,61	28
Low. Limb. 2	1	2973,33	79,88	15
	2	2553,85	455,73	13
	Total	2778,57	375,51	28
Low. Limb. 3	1	3000,00	0	15
	2	2838,46	340,44	13
	Total	2925,00	241,33	28

Table 19: Descriptive Statistics Ms. Lower.

global, integrates all segments of the locomotor system, different neuromuscular systems intervene And therefore, it recruits motor unitstos of muscles in all parts of the body.

Multiple studies have confirmed the relationship between the intrinsic lumbar muscles and the rest of the body. For example, in a study by Hides, JA., Stanton, R., Mendis MD., *et al.* 2014 [12], the direct relationship between the size of L5 multifids and lesions in the lower limbs was demonstrated. This relationship is also proven by anatomical studies explaining the correlation of the upper and lower body through the thoracolumbar fascia Willard, FH., Vleeming, A., Schuenke MD., *et al.* 2012 [13] and M. D. Schuenke, A. Vleeming, T. Van Hoof, F. H. Willar [14]. Therefore, we believe in the need to improve all the qualities of the musculoskeletal system, coordination, strength, elasticity and intra- and intermuscular synergies throughout the body through a global exercise that allows the activation of all these qualities at the same time.

On the other hand, the improvement experienced in areas such as mental health, vitality and its social dimensions generate an increase in adherence to physical activity (therapeutic exercises), since a great improvement is experienced in areas not directly related to low back pain, but that influence the way of coping with the pathology. In addition, a favorable biopsychosocial environment improves pain perception and decreases kinesiophobia Williams, A., Wiggers, J., O'Brien, KM., *et al*. 2016 [15].

Ye, C., Ren, J., Zhang, J., *et al*, 2015 have studied the difference between lumbar spine exercises in isolation and general physical activity and conclude that global physical activity has better long-term effects [16].

The methodological proposal of action and the use of the inventive instrument presented in this study for a global physical activity could have sufficient scientific support based on

- The existence of similar instruments as is the case of MedX described by Steele J, 2016 [17], David Concept described by Garima Anandani, 2015 [18], Pilates machines described or by Anna Selby-Alan Herman, 2005 [19].
- The physical activity proposed by the author of the invention through his prototype (instrument) is equipped with a sophisticated software capable of integrating the indications of health sciences and physical activity professionals, prior to a clinical examination and/or the physical condition of the user; It activates its pre-programmed actuators in each case for specific objectives, interacting with the subject reproducing movements contemporaneous with specific physical demands of all parts and segments of the body, with absolute respect for the biomechanics of each segment. It takes into consideration the different structures, geometries, angles and positions of various body segments involved in movements [21].
- The invented instrument complies with sufficient guarantees of safety, being of high precision to the application of Newton's laws, lever arms, forces (millibars or force torques), which makes it suitable for preventive, therapeutic and sports tasks in various sectors of the population, both from an anthropometric vision and the age range for its ability to adapt and calibrate its parameters. Therefore, we can consider that the instrument has sufficient guarantee of safety in the control of possible human errors.
- Effectiveness is guaranteed by having an intelligent system as an element of control and calculation, capable of recording the data, analyzing them and making recommendations, and even working with algorithms in the future.
- The study of the variables in this trial brought together positive results with a mean significance P< 0.001 in the following variables:
    - Pain
    - Satisfaction with its 9 subdivisions.
    - Disability.
    - Flexibility.
    - Thoracic strength, lumbar, upper limbs, lower limbs.

In summary, we can deduce that it is possible to improve most of the physical qualities through exercises that integrate all the segments of the musculoskeletal system and generate a better quality of life for users [22-25].

On the other hand, having active users promotes positive effects on the section of coste-effectiveness of preventive-therapeutic tasks in the complicated timing of daily life and cost savings in the current lifestyle, since the duration of the sessions is not very long (15 minutes) and the subject remains active, a fact that does not generate a time problem for either the operator or the user, and can also have a positive impact on waiting lists in public health. In this way we can positively influence the high socioeconomic cost to society of back pain (as explained in the introductory section of this article).

Conclusion

The method and instrument are capable of

- Decrease the intensity of low back pain.
- Decrease disability.
- Increase global flexibility and elasticity.
- Increase thoracic strength.
- Increase lumbar strength.
- Increase the strength of the upper limbs.
- Increase the strength of the lower limbs.
- Increase the degree of satisfaction:
    - For being able to perform all kinds of physical activities due to the improvement of their state of health.
    - For no problems with work or other daily activities as a result of improving your physical health.
    - For not having pain or limitations ofbido to pain.
    - For feeling more vitality and energy.
    - Being able to perform normal social activities without interference due to physical or emotional problems.
    - For feeling emotionally good and coping better with work or other daily activities.
    - For feeling calm and happy.
    - Considering that his state of health has improved.

Based on the results obtained we can say that it is reasonable to consider the proposed method and instrument, significantly efficient to reduce lumbar ailments, reduce the degree of disability and adapt the coste-effectiveness in this concept.

Possible indications, applications and precautions Directions

- Flexibility deficit.
- Mobility deficit.
- Muscle strength deficit.
- Cerical, thoracic, lumbar, sciatic pain.
- Alterations of the axes and planes of the spine (hiperkyphosis-hypokyphosis, hyperlordosis-hypo lordosis and scoliosis) in the three periods of life (children, adults and the elderly).
- Thoracic gorge syndrome.
- Activation of vital systems such as respiratory and cardiovascular systems.
- Physical activity against sedentary lifestyle in school, professional and senior age.
- Alternative to neurodin, being self-activating.
- Synergistic activation in neurological conditions.

- Improves coordination of strength and overall movement.
- Physical activity in systemic diseases.
- Physical activation as an instrument of functional recovery (spine, h-ombros, elbows, knees, ankles) andinduction to post-injury rehabilitation.
  - Prevention through global physical exercise.

Applications

- It is an a-preventive therapeutic option in all those cases in which it is advisable to take care of the user's physical condition in relation to strength, elasticity, flexibility, resistance, speed of execution of movement and coordination.
- It is an a-preventive therapeutic option in back ailments.
- It is an a-preventive therapeutic option in ligamentous, muscular and joint injuries in the functional recovery phase.
- It is an a-preventive therapeutic option in cases where immobilization may be counterproductive, since its use could alleviate the adverse effects of immobility.
- It is an a-preventive therapeutic option in cases of neuromotor training.

Precautions

- In all cases where physical exercise is a medical-health contraindication.
- In raising and lowering the individual from the instrument and his evacuation.
- Special attention to the instruction manual of the instrument, both in the actuation procedure and in those of the system.
- Always use the instrument in optimal conditions in relation to the revision of the perfect condition of the different components of the instrument.

Limitations

This study has several limitations

- The sample size was 28 subjects over the initial random selection of 40 subjects. The 12 cases lost in the sample were due to family and work issues.
- We could not guarantee that there would be no dialogue between participants and/or with the professionals running the tests to avoid external influence on the responses.
- The instrument could not be hidden from the eye of the participants.
- There were failures of the cervical segment pressure system and the results of the cervical strength variable could not be assessed.

Conflict of Interest

The authors and professionals who have participated in this study declare that they are not conditioned by any condition and circumstances that could induce bias of the data in this study. To be free of conflict of interest and the only thing that moves them is the research task and the interest in science, and thus be able to provide society with possible benefits in all dimensions and especially in areas of health, quality of life, economic, psychological and well-being.

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