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Effects of a Home Exercise Program on Chronic Low Back Pain in a Neurosurgery Clinic

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Abstract

Background: Chronic low back pain (CLBP) is a leading contributor to disability globally. The burden of disability associated with CLBP has steadily increased in all age groups since 1990. The number of people with back pain is expected to continue to grow due to the steadily growing population and the population living longer. Chronic low back pain is a treatable condition. The definition of CLBP is back pain lasting 12 weeks or longer, after the cause of acute low back pain (ALBP) has been treated. Chronic low back pain usually begins with an injury or accident which causes acute low back pain. Treatment of CLBP has long been debated by medical professionals.

Objective/Aims: The aim of this project was to evaluate the effectiveness of an eight-week home exercise program on pain and disability in patients with chronic low back pain.

Methods: An eight-week home exercise program was implemented at neurosurgery clinic. The target population was patients who suffered from low back pain with a duration of greater than three months. A total of 64 patients were recruited and agreed to participate in the study, and were split into two groups, intervention and comparison. The intervention group completed prescribed exercises five days a week for eight weeks while the comparison group continued care they were already receiving for back pain. Outcome measures were pain intensity using the Numeric Pain Rating Scale and disability using the Oswestry Disability Index. Comparisons were made between the comparison and intervention groups.

Results: A total of 56 patients participated in the study, 29 intervention group participants and 27 comparison group participants. Statistically significant improvements were seen in both pain intensity and disability scores after the eight-week home exercise program in the intervention group. Both pain and ODI scores worsened in the comparison group at the end of the eight-week period.

Conclusions: The significant improvement of NPRS and ODI scores indicate a home exercise program is an effective and feasible intervention for CLBP.

Keywords: Disability; Home exercise; Lumbar back pain

Background and Significance to Healthcare

Chronic Low Back Pain (CLBP) is a leading contributor to disability globally and is the leading cause of disability in over 160 countries [1]. The global burden of disability associated with CLBP has steadily increased in all age groups since 1990 [2]. In 2017, an estimated 577 million people worldwide suffered from back pain, which was an increase from 377.5 million people in 1990 [3]. The number of people with back pain is expected to continue to grow due to the steadily growing population and the population living longer [4].

Chronic low back pain is a public health concern due to the associated disability that results in productivity loss and missed days of work. Chronic pain, in general, is also associated with increased incidence of depression and anxiety and decreased overall quality of life. Chronic low back pain is often hard to treat and is usually associated with frequent, acute exacerbations.

According to the WHO, the lifetime prevalence of low back pain was estimated at 60% to 70% in 2020 [1]. A study completed by Meucci et al. [4] found that the prevalence of chronic low back pain among individuals between the ages of 24 and 39 years was 4.2% and 19.6% in those between the ages of 20 and 59 years. Overall, low back pain has been shown to increase as age increases, especially from the third decade and beyond [4]. Chronic low back pain occurs more frequently in women with a six-month prevalence rate of 55.6% compared to 38.5% in men [5].

Generalized low back pain affects those of all socioeconomic backgrounds, but vulnerable, low- income populations are affected more than those with higher incomes. The percentage of adults with back pain decreases as annual income increases. In 2019, 44.8% of adults with an annual income less than 100% of the federal poverty level had either acute or chronic low back pain, while only 37.6% of adults with income of 200% or more of the federal poverty level suffered with low back pain. Non-Hispanic whites (42.7%) and non-Hispanic blacks (35.8%) have the highest prevalence of low back pain. Hispanics (31.2%) and non-Hispanic Asians (24.5%) have the lowest prevalence of low back pain [6].

According to the IOM [7], approximately 116 million adults in the United States suffer from chronic pain. The average cost associated with treatment of chronic pain and lost productivity is estimated to be $560-630 billion each year [7]. Chronic low back pain is the leading cause of missed workdays and the second leading cause of disability in the United States. Chronic low back pain accounts for approximately 149 million lost workdays per year [8].

Treatment of CLBP remains a topic of debate. As a result of the global opioid epidemic, the use of opioids is highly monitored and sometimes restricted. Between 1999 and 2019, close to 840,000 people died from drug overdoses [9]. More than 70% of drug overdoses in 2019 were related to opioids [9]. Providers are attempting to move away from prescribing opioids and focusing on other means of pain management. Other possible treatments include physical therapy, home exercise, acupuncture, interventional pain management techniques such as epidural steroid injections, non-opioid medications, surgery, and education [10].

Purpose

The purpose of this project was to implement a home exercise program to reduce pain and improve disability in patients with CLBP. This project aimed to evaluate the effectiveness of a home exercise program on overall pain and disability. Also, the project's intention was to initiate a sustainable protocol at a neurosurgery clinic. Using evidence-based education, encouragement, and demonstrations of exercises could potentially assist in increasing healthy behaviors, improve disability, reduce pain, and ultimately reduce health care costs.

Procedure Project Design

The project used a two-group, pretest-posttest design. This was a feasibility study to determine if implementing a home exercise program could be successful in patients with chronic low back pain. This project aimed at evaluating whether implementing a home exercise program would be beneficial in the treatment of CLBP.

Ethical Consideration

Approval from the Institutional Review Board of Southeastern Louisiana University was obtained to ensure protection of human subjects prior to project implementation. Informed consent was obtained from all participants prior to project implementation. All participants were over the age of 18 years and willingly participated in the study. Confidentiality was maintained by assigning a unique identifier, which consisted of the patient's first, middle, and last initials and date of birth. Only de-identified data was collected in the data collection tool. All information was secured on a flash drive kept in a locked drawer, and paper documentation was kept in a locked cabinet only accessible by the researcher. Written consent was obtained from each study participant after thorough project explanation. This consent included project goals, type of data collected, nature of commitment, participant selection, potential risks and benefits, confidentiality, procedures, and right to withdraw from the study. Risks associated with the study are the same risks associated with any other treatment of low back pain. There is a risk of the treatment causing an acute exacerbation of back pain when first initiated. There is a risk of participant anxiety related to completing the exercises at home. The risks will be reduced by the researcher providing detailed instructions on safe and effective ways to perform the exercises. A screening form was used to determined patients' ability to participate in the project.

Data Collection

Patients with CLBP were recruited in the clinic where the project was completed. All patients older than 18 years of age, with a history of back pain lasting greater than three months were asked to participate in the study. The participants were then assigned to the intervention group or the comparison group. Patients were approached by the DNP student to participate in the project. An informational flyer was handed to all patients on check in at their routine clinic appointment. The flyer consisted of information on the project, and eligibility criteria. The DNP student reviewed project details with all interested eligible patients. The participants assigned to the intervention group were given an information packet containing the prescribed home exercise program, consent, and Oswestry Disability Index questionnaire (ODI) with explanation. The comparison group participants were given the same information packet without the home exercise program included.

Pain was assessed by having participants use the Numeric Pain Rating Scale (NPRS) and disability was measured with the Oswestry Disability Index. The numeric pain rating scale is an eleven-point scale that is verbally administered to measure pain and discomfort. The scale ranges from zero, meaning no pain, to 10, meaning worst possible pain [11]. The patient simply subjectively identifies which number most closely represents their current pain scale.

The ODI is a self-administered questionnaire associated with degree of disability, ranging from minimal to bedbound [12]. There are 10 sections included in the ODI: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and traveling. Each section has six options for the patient to choose from depending on how limited they are due to pain and are scored from zero to five with a total possible score of 50. The score is then converted into a percentage of 100 and 0%-20% is considered minimal disability, 21%-40% is moderate disability, 41%-60% is severe disability. If the patient scores 61%-80% they are considered crippled, and scores of greater than 81% indicate that the patient is either bedbound due to pain or exaggerating their symptoms [13].

Setting

The project was conducted at a neurosurgery clinic in the southern United States. The clinic provided management of chronic low back pain. Patients assigned to and seen by the researcher were included in the sample population for the project.

Participants

Patient participation was voluntary. A convenience sample of patients receiving care for chronic low back pain was enrolled in the study. These patients were then split into two groups, one being the intervention group who completed the home exercises and the second being the comparison group who continued treatment with usual care. Participants who were currently being treated with pain management including continual opioid therapy or regular treatment with epidural steroid injections or pain directed injections were placed in the comparison group. There was no crossover between groups.

Intervention

The intervention consisted of an exercise program utilizing a variety of stretching and strengthening exercises that the patient will perform in their home. The exercises chosen focused on core stabilization. Core stabilization exercises are highly successful in terms of decreasing pain and improving disability and quality of life. All exercises were demonstrated to the participant at the office visit. The exercise program was designed to take no more than one hour to complete entire routine of exercises and walking. Three sets of each exercise were to be completed once daily at least five days per week. The participants were also to walk thirty minutes daily. The comparison group was treated by their treating physician with usual care such as medications, spine injections, intramuscular injections, therapy, etc.

Exercises were designed for patients with back pain and thus limit risk of acute exacerbations of pain. The researcher then obtained the patient's baseline numeric pain score and completed the ODI questionnaire with each participant. This determined the level of disability prior to implementation of the exercise program. This session lasted approximately 45 minutes. Each participant of the intervention group was also given a log to keep track of daily exercise.

The next part of the protocol involved telephone calls completed with members of the intervention group after implementation of the project, at the two-, four-, and six-week intervals. These calls were scripted and covered the participants progress in terms of reduction of pain and improvement of disability. Questions related to the study were answered during the telephone conversation and participants were encouraged to continue with the program and keep follow-up appointments. Participants were asked to detail the exercises they were able to complete and which they had difficulty completing. The exact exercises could then be personalized for the participants if they were unable to complete the originally prescribed exercises. If any of the exercises caused an exacerbation of back pain, these were modified to ensure patient safety.

Participants kept a log or diary of the exercises completed, when they were completed, and any issues they had while completing the exercises. The logs will be discussed during each of the phone calls. The information obtained during the calls was collected for discussion and motivational purposes, not as collected data. The comparison group did not receive the follow-up phone calls.

The last part of the protocol occurred during the participants' final follow-up phone call eight weeks after beginning the exercise program. These calls were scripted with a separate script for each group. This call included a discussion regarding progress with pain reduction and disability improvement. The ODI questionnaire was completed, and numeric pain score obtained to again compare the pre- and post-intervention results. The participants of the intervention group were also provided with encouragement to continue the home exercise program. This session lasted approximately 30 to 45 minutes. The final follow-up phone call was also completed with the comparison group eight weeks after their recruitment, where the ODI and pain scores were again obtained.

Data Analysis

All computation of data was completed using Statistical Analysis System (SAS) software version 9.4. The means of pre-test and post-test pain and ODI scores were compared using the independent samples *t*-test. The *t*-statistic was computed by dividing the difference between means by an estimate of standard error of the difference between two sample means. Parametric assumptions of normal sample distribution, data measured at interval level, similar group variances, and no overlapping of participants in each group were met. For categorical data, the chi-square test of independence was performed. The Shapiro-Wilk test was performed to determine if the variables were normally distributed within the population. If the *p*-value is greater than α (0.05) then the factor is distributed normally. No further testing was completed regarding independence of data as no patient was in both groups. Similarity of variance was examined by comparing the pooled *t*-test to the unequal variance *t*-test. Since the results were virtually identical, only the pooled *t*-test results were reported. The *t*-test was considered statistically significant if the *p*-value is less than 0.05 [14].

Demographics

A total of 64 patients were recruited and all agreed to take part in the study. These participants were then split into intervention and comparison groups. A total of eight participants withdrew from the project during implementation leaving a total of 56 participants for data analysis.

Demographics included age gender, race, and ethnicity. Variables were summarized using descriptive statistics to generate mean, standard deviation, minimum, and maximum.

Demographics were similar between the two groups. The mean age of the intervention group was 65 years and 69 years in the comparison group. There were 12 males (41%) and 17 (59%) females in the intervention group and 9 males (33%) and 18 females (67%) in the comparison group. Of the 29 participants in the intervention group, 28 were not Hispanic or Latino and all 27 participants in the comparison group were not Hispanic or Latino.

Results

Using an alpha level of .05, an independent samples *t*-test was performed to first determine if there was difference in the mean pain and ODI scores prior to project implementation between the intervention and comparison group. There was not a statistically significant difference between comparison group and intervention group mean pain scores prior to implementation *(p*=0.43). There was also not a statistically significant difference between mean ODI scores prior to implementation (*p*=0.44). The mean numeric pain rating score pre-intervention was 6.0 (SD = 2.22), whereas the mean pain score post-intervention was 2.83 (SD=2.30) in the intervention group. The mean pain score prior to the start of the study in the comparison group was 5.48 (SD=2.67) and the mean post-study pain score was 6.11 (SD=2.67). There was a decrease of -3.17 between pre- and post-intervention mean pain scores in the intervention group and an increase of 0.63 in pre- and post-intervention mean pain scores in the comparison group. Results indicated that, on average, mean pain scores after implementation of a home exercise program in the intervention group were much lower (*M* = 2.83, *SD* = 2.30) when compared to the comparison group (*M* = 6.11, *SD* = 2.67) The changes in pain were -3.17 in the intervention group versus an increase of 0.63 in the comparison group. This difference in mean changes was statistically significant (*t*(54)= -7.83, *p*<0.0001). (Table 1).

The same testing was completed to compare the means for pre- and post-intervention ODI scores. Pre-intervention the intervention group had a mean ODI score of 51.24 (*SD*=13.56) while the comparison group had a mean of 54.37 (*SD*=16.64). After completing the eight-week home exercise program the intervention group's ODI scores mean decreased to 29.17 (*SD*=16.04). The comparison group continued current treatment they were receiving and had a post-intervention ODI mean of 58.74 (*SD*=16.87). The testing showed that the intervention group's mean ODI scores were drastically lower (M=29.17, *SD*=16.04) after completing home exercises than the comparison group (M=58.74, *SD*=16.87) with current treatment (*t*(54)=-7.83, *p*=<.0001). The negative *t* statistic indicates there were larger decreases in mean ODI scores for the intervention group than the comparison group. Therefore, the null hypothesis was rejected for both pain and disability (Table 1).

Variable	Pre-Intervention Mean ±SD	Post-Intervention Mean ± SD	Change: Post-Pre Mean ± SD	*p*-value* to compare changes (intervention vs comparison)
NPRS Scores:				
Intervention (n=29)	6.0 ± 2.22	2.83 ± 2.30	-3.17 ± 2.63	<0.0001
Comparison (n=27)	5.48 ± 2.67	6.11 ± 2.67	0.63 ± 1.92	
ODI Scores				
Intervention (n=29)	51.24 ± 13.56	29.17 ± 16.04	-22.07 ± 15.41	<0.0001
Comparison (n=27)	54.37 ± 16.67	58.74 ± 16.87	4.37 ± 8.67	

Table 1: Independent Samples t-Test Results for Pain and ODI Scores.

Discussion

A home exercise program was implemented to determine if home exercise would be beneficial in reducing pain and disability in patients with chronic low back pain. Data indicated the participants who completed the home exercises and received the two-week phone calls and motivational interviewing had significant improvements of both pain and disability at the end of the eight-week implementation period. Participants in the comparison group who did not complete the exercises or receive phone calls had an increase in pain and disability after the eight-week implementation period. A smaller than optimal sample population was available for recruitment and intervention due to the limited time for recruitment. Overall, sustainability of the project will be dependent on broadening the scope of the project by expanding to more providers and completing follow-up studies with a larger sample size. The project feasibility study was proven successful. As a result of significant findings, the home exercise program could be expanded to include multiple providers and specialties. This protocol could easily be implemented by other clinics and specialties. With continued support from providers within the clinic, the home exercise program could become a permanent treatment protocol, which would ensure the project's sustainability.

Recommendations

One suggestion for improvement of the project would be to promote the project implementation on a grander scale. Including patients from all providers in the clinic would drastically improve the study validity by adding a larger population to obtain the sample from. All providers incorporating the home exercise program into their treatment regimen would authenticate the significance of results. Completing the study on a larger scale and achieving the same or better results, would further lend to the sustainability of a home exercise program. The exercises were chosen after completing an extensive literature review to find the safest and most effective exercises and a handout of the exercises and instructions was made and can be distributed to other providers and patients. Having this already completed saves the providers time in educating patients about the exercises.

This project could easily be translated into other disciplines such as orthopedics and pain management. Also, including a multidisciplinary approach in the project would greatly improve the project. The addition of physical and/or occupational therapists could greatly improve the education of patients regarding performing the exercises at home. The study findings support the practice change to include a home exercise program for patients with CLBP being feasible. This further supports the need for an official policy change.

Conflict of Interest

The authors declare that there are no financial or commercial relationships that could constitute as potential conflicts of interest in the conduct of the research.

References

1. World Health Organization (2021) Musculoskeletal Conditions.
2. International Association for the Study of Pain (2021) The global burden of low back pain. International Association for the Study of Pain.
3. Wu A, March L, Zheng X, et al. (2020) Global low back pain prevalence and years lived with disability from 1990 to 2017: estimates from the Global Burden of Disease Study 2017. Annals of translational medicine 8: 299.
4. Meucci RD, Fassa AG, Faria NMX (2015) Prevalence of chronic low back pain: systematic review. Revista de Saúde Pública 49: 1-10.
5. Wáng YX, Wáng JQ, Káplár Z (2016) Increased low back pain prevalence in females than in males after menopause age: evidence based on synthetic literature review. Quantitative imaging in medicine and surgery 6: 199-206.
6. Lucas JW, Connor EM, Bose J (2021) Back, lower limb, and upper limb pain among U.S. adults, 2019. National Center for Health Statistics.
7. Institute of Medicine (US) Committee on Advancing Pain Research, Care, and Education (2011) Relieving pain in America: A blueprint for transforming prevention, care, education, and research. Washington (DC): National Academies Press.
8. Freburger JK, Holmes GM, Agans RP, et al. (2009) The rising prevalence of chronic low back pain. Archives of internal medicine 169: 251-258.
9. Centers for Disease Control and Prevention (2021) The Drug overdose Epidemic: Behind the Numbers.
10. Practice guidelines for chronic pain management: an updated report by the American Society of Anesthesiologists Task Force on Chronic Pain Management and the American Society of Regional Anesthesia and Pain Medicine (2010) Anesthesiology 112: 810-833.
11. Alghadir AH, Answer S, Iqbal A, et al. (2018) Test-retest reliability, validity, and minimum detectable change of visual analog, numerical rating, and verbal rating scales for measurement of osteoarthritic knee pain. Journal of Pain Research 11: 851-856.
12. Vianin M (2008) Psychometric properties and clinical usefulness of the Oswestry Disability Index. Journal of Chiropractic Medcine 7: 161-163.
13. Fairbank JC, Pynsent PB (2000) The Oswestry Disability Index. Spine 25: 2940-52.
14. Kim MJ, Mallory C (2017) Statistics for evidence-based practice in nursing (2nd edition) Jones & Bartlett Learning.