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Aggressive Exercise as Treatment for Chronic Low Back Pain

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Contents

Abstract

Exercise has long been a standard of treatment for back pain. Over the last 2 decades, the use of intense, non–pain-contingent exercises for treatment of chronic back pain has received increased advocacy. The main goals of these treatments are to improve functioning of painful lumbar soft tissue and to decrease the fears and concerns of patients about using their backs for daily activities. The methodology of an aggressive quota-based exercise approach to back pain is outlined in this article. This approach relies on objective quantification of physical capabilities, treatment directed at altering these parameters, and repeat quantification for determination of treatment efficacy and positive feedback. By eliminating impairments in back function, altering fears and beliefs about pain, and reducing disability, patients with chronic low back pain can achieve meaningful improvements in their quality of life.

Chronic back pain is a complicated medical predicament. Pain is a subjective phenomenon. The perception and subsequent reporting of pain is influenced by cognitive and social factors in addition to the peripheral pain stimulus. These factors may influence self-report of both pain and disability, and influence responsiveness to treatments.[1-4] Many individuals with chronic back pain have strong pain beliefs,[5,6] low self-efficacy, and are fearful that activities may increase pain or cause further injury.[7,8] These cognitive factors strongly influence the functional level of the individual with back pain. Additionally, many healthcare providers advise patients to avoid activities that stimulate back pain, and thereby reinforce activity restrictions.[9] Loss of physical capacities, or deconditioning, occurs as a consequence of persistent activity restrictions. These physical impairments result in disability, or decreased ability to engage in activities of daily living.

The multidimensional nature of chronic low back pain is best addressed with a comprehensive approach that recognises and treats deconditioning and detrimental cognitive behavioural elements. Pain-focused treatments neglect these factors and are insufficient to alter patients' complex predicaments.

As a therapeutic modality, exercise has a primary goal of improving functioning of targeted tissues, that is, tissue length, tissue resilience, muscle strength and endurance. From a cognitive standpoint, successful completion of exercise in the presence of chronic pain lessens patients' fears and concerns, improves self-efficacy and confidence for performing daily activities, thereby decreasing disability.[5,10]

Many healthcare providers are cautious about recommending exercises or any activities that may elicit back pain for fear that increased pain would indicate harm to degenerative spinal structures.[9,11] This reluctance is perhaps the most important factor limiting the prescription of aggressive exercise for treatment of chronic back pain. Although a growing body of literature supports the safety and efficacy of aggressive exercise,[12-21] providers' scepticism must be overcome to utilise this approach. It is important that all providers involved with the care of these patients, hold beliefs that normal back function can occur in the presence of chronic back pain, and that symptoms produced with exercise are generally benign. Without these common beliefs, an aggressive exercise approach is unlikely to succeed.

This approach is indicated for conditions such as lumbar disc degeneration, herniated nucleus pulposus, spinal stenosis, facet syndrome, Grade I-II spondylolisthesis, spondylolysis, myofascial pain and postoperative status (fusion, laminectomy). This approach is contraindicated in medical instability, lesions best treated with surgery, severe osteoporosis, fracture, tumour, cauda equina and conus medullaris syndromes, progressive neurological deficit, spinal instability, Grade III-IV spondylolisthesis, visceral/systemic pathology and spondyloarthropathy.

1. Quantification of Back Function

The goal of aggressive exercise is to improve back function. The cornerstone of this approach requires that back function be quantified so that progress towards this goal can be measured. In general, this includes measurements of trunk and lower extremity flexibility, trunk strength, lifting capacity and cardiovascular endurance. It is important to be aware that a patient's performance may be limited by pain, illness behaviours, and fears of re-injury or exacerbating their symptoms. In this sense, performance is a psychophysical phenomenon and not a purely physical event. Quantification initially serves to identify baseline impairments and guide clinicians in the selection of an appropriate level of exercise.

1.1 Flexibility

Deficits in flexibility in patients with chronic back pain have been demonstrated in multiple studies.[22-27] The motions assessed include total lumbosacral flexion, extension, side bending and straight leg raising. Total lumbosacral sagittal motion assesses both lumbar and pelvic components, and straight leg raising reflects hamstring flexibility. Multiple techniques have been described in the literature to assess lumbar spine motion, such as the Schober (tape measure) test and its modifications, flexicurves, goniometers, finger-to-floor test, inclinometers, spinoscopy and radiographic methods.[24,27-33] In the authors' practice, the single inclinometer technique is used, as it is simple, reliable and easy to interpret.[34] Normal values for trunk motion have been established: total flexion 100 to 120°, extension 25 to 45°, side bending 25 to 45°, and straight leg raising 75 to 85°.[23,24,26,35]

1.2 Trunk Strength

Studies have shown that patients with chronic low back pain have deficits in trunk strength.[36-44] The loss of extensor strength is much greater than that of flexor strength.[36,38,40,41] The normal extensor to flexor strength ratio is 1.2 to 1.5, and in patients with chronic back pain it has been documented to be less than 1.0.[36,41] Although there are several methods available for documenting trunk strength (isometric, isokinetic and isoinertional), we prefer the isoinertional method, as it is more functional. This type of resistance is provided by free weights and most machines, and applies a constant load throughout the range of motion. At our institutions, Cybex Back Extension Machines (Lumex Corp, Ronkonkoma, NY) provide quantitative information regarding isoinertional capacity and allow for easy transference of exercise to a health club. Baseline assessment entails measuring the maximum amount of weight that a patient can correctly lift for four repetitions. The ideal is for patients to perform repetitions at 100% of ideal bodyweight (IBW).[45]

1.3 Lifting Capacity

Lifting capacity is included in the assessment of back function as it is a common activity of daily living and involves integration of lumbar function with other functional units. Deficits of isoinertional lifting capacity of 40 to 60% of normal have been associated with chronic low back pain.[46,47] We utilise a standardised isoinertional lifting protocol, in which a patient lifts a plastic crate from floor to waist and waist to shoulder level with increasingly heavier loads.[48] Patients' goals are to achieve normal lifting capacity: 50% IBW from floor to waist (lumbar lift) and 40% IBW from waist to shoulder (cervical lift) for men, and 35% IBW floor to waist and 25% waist to shoulder for women.[48]

1.4 Cardiovascular Endurance

The consequences of deconditioning on the cardiovascular system are well recognised.[49-53] Less is known of the effects of deconditioning in patients with chronic back pain, but its existence has been documented.[54,55] Cardiovascular conditioning can improve patients' tolerance for physical activities and may have beneficial effects on mood, sleep and muscle relaxation.[55-59] We assess cardiovascular fitness with lower extremity ergometers (Cybex Fitron: Cybex Fitron, Ronkonkoma, NY, USA), which provide quantitative information in units of kg • m/min. The target heart rate is 75 to 85% of age-determined heart rate, or as determined by the referring physician for patients with cardiac disease. Testing is done using a 9-minute protocol. Patients are started on predetermined workloads which are sequentially increased every 3 minutes, using heart rate and psychophysical tolerance as endpoints. Although norms are not available for this equipment, total work of less than 7000 kg • m/min for men and 6000 kg • m/min for women on lower extremity testing is considered suboptimal.[45]

2. Patient Education and Behavioural Management

Illness behaviours and counterproductive attitudes and beliefs are components of chronic low back pain.[5-8,60-62] It is critical that they be addressed to improve the patient's predicament. Illness behaviours may be inadvertently rewarded with attention and concern from family and friends, healthcare providers, or financially compensated with disability payments. During treatment, clinicians educate patients regarding their spine anatomy, pathology and physiology, and the deleterious effects of deconditioning. They are informed about the beneficial effects of exercise on their condition and made aware that an initial increase in their pain is expected. They are also informed that exercise is generally safe, and that they are expected to continue to exercise in spite of an increase in symptoms. This information provides a rationale for exercise, establishes realistic treatment expectations and focuses the patients' efforts on impairments and disability as opposed to pain reduction.

Exercise recommendations are based on past performance levels and the patient's goals, and are not contingent on daily pain complaints. This 'quota-based' exercise programme is very successful for inducing physiological changes in back function. As exercise is based on measured performance, patients are continuously given numerical feedback regarding their increasing physical capacities. This provides tangible evidence that challenges their beliefs regarding pain and function.[10]

Dramatic expressions of pain are acknowledged and evaluated, but the responses to these expressions are limited. Patients are advised to perform at their best possible level during these exacerbations, and attempts are made to keep the patient focused on treatment goals. Resumption of meaningful life activities is continuously encouraged by members of the team.

Although not essential, we have found that treating some patients in a group setting can be advantageous. Group sessions allow modelling, where patients experiencing success support those new or struggling during the rehabilitation process.

During treatment, patients are strongly encouraged to discontinue opioid agonists (narcotics), muscle relaxants and sedatives. Patients with significant depression or anxiety are given additional support and may be referred to psychologists or psychiatrists.

Weekly meetings of the treatment team are held to discuss patients' current level of function, treatment goals, medical and behavioural issues. It is crucial for the team of providers to be unified and provide a consistent message that normal back function may be safely re-established in spite of pain.

3. Exercise Regimens

Provided that there are no contraindications to aggressive exercise, patients are assigned to an exercise level based on measured impairments. During the initial therapy evaluation, instructions are provided regarding a home stretching programme specific for measured impairments in flexibility. Stretching at the physiological limits of flexibility is performed at least twice per day. Following assessment of strength, treatment goals are established according to a patient's age, gender and IBW. Patients are carefully instructed on the correct set-up and use of all exercise equipment. The next 1 to 2 weeks is dedicated towards acquiring proper exercise technique and diminishing fear of physical exertion. A list of exercises and targeted back muscles is provided in table A1 and figure A1.

The second phase of treatment generally lasts between 2 and 4 weeks, during which rapid progression towards treatment goals is expected. Patients generally meet with their therapist 2 to 3 times per week with sessions lasting between 1 and 2.5 hours. Patients who are highly motivated and experienced with exercise require only 1 weekly therapy session and exercise independently several more times per week. Exercise sessions involve supervised stretching, aerobic conditioning, general strengthening, specific back strengthening, and lifting. Repeat quantification is performed every 2 weeks to monitor progress, provide feedback and document treatment outcomes. Patients are encouraged to achieve their pre-established goals by increasing their repetitions and/or weights with each session. Exercise must provide sufficient physiologic overload to produce improvements in physical abilities. In the presence of chronic pain, this intensity of exercise will often stimulate abnormally sensitive nociceptors associated with the chronic pain symptoms and exacerbate pain complaints. These exacerbations are usually tolerable, brief and do not represent tissue damage. As training progresses, tissue function improves and the sensitivity of abnormal nociceptors tends to decrease. Therapy continues in spite of ongoing pain complaints, and wellness behaviours are reinforced.

At discharge from therapy, patients are transitioned to a home-based or health club maintenance regimen. A recent study[63] demonstrated high compliance with exercise recommendations at follow-up. For those with work disability, recommendations for return to work are based upon performance in therapy.

4. Studies Utilising Aggressive Exercise Regimens

Data from prospective and retrospective studies utilising aggressive exercise as treatment for patients with chronic low back pain reveal that within a period of 6 to 8 weeks, it is possible to improve trunk flexibility by 20%, trunk strength and lifting capacities by 50%, and endurance by 20 to 60%.[15,16,20,37,46,64,65] Pain-related disability as determined by the Oswestry scale[66] was reduced by 50%, on average, and pain severity by 30%.[67] Treatment outcomes, once quantified, are amenable to analysis using statistical databases. By tracking treatment outcomes, information can be derived to modify treatment regimens, with the goal of improving patient care.

5. Conclusion

Chronic back pain is often a complex condition, influenced by pathology, pain intensity, impairments in back function, and societal and behavioural reinforcements, with significant resulting disability. To date, there is no scientific evidence that activity and exercises are harmful, or that pain-inducing activity must be avoided by this patient population. Indeed, empirical evidence to the contrary suggests that activity and exercise that challenge physical impairments actually result in an improvement in chronic back pain. The exercise philosophy and regimen outlined in this article exemplifies one such approach that combines aggressive exercise with focused application of cognitive behavioural techniques.

Clearly, future research is needed in this area. We need a better understanding of how exercise alters psychological fears and beliefs regarding pain and function. Dose-response relationships regarding the intensity of exercise and outcomes require further clarification. Predictors of outcome should be further explored, with the hope that this will lead to modification of therapy and improved outcomes for those most resistant to our care.

Acknowledgements

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Appendix

Exercises for the treatment of low back pain.

Table A1. A summary of the exercises/machines and the specific muscle groups they target in the treatment of patients with low back pain

Exercise	Muscles
Cybex back extension	Multifidi, longissimus, iliocostalis
Roman chair hyperextension	Multifidi, longissimus, iliocostalis, gluteus maximus, hamstrings
Lumbar crate lifting	Multifidi, longissimus, iliocostalis, gluteus maximus, hamstrings, rhomboids, trapezius
Lat pull-down	Latissimus dorsi, rhomboids, teres major/minor
Cybex rotary torso	Internal/external obliques, adductors, erector spinae
Multihip machine	Hip flexors, hip extensors, hip abductors, hip adductors, glutei, erector spinae

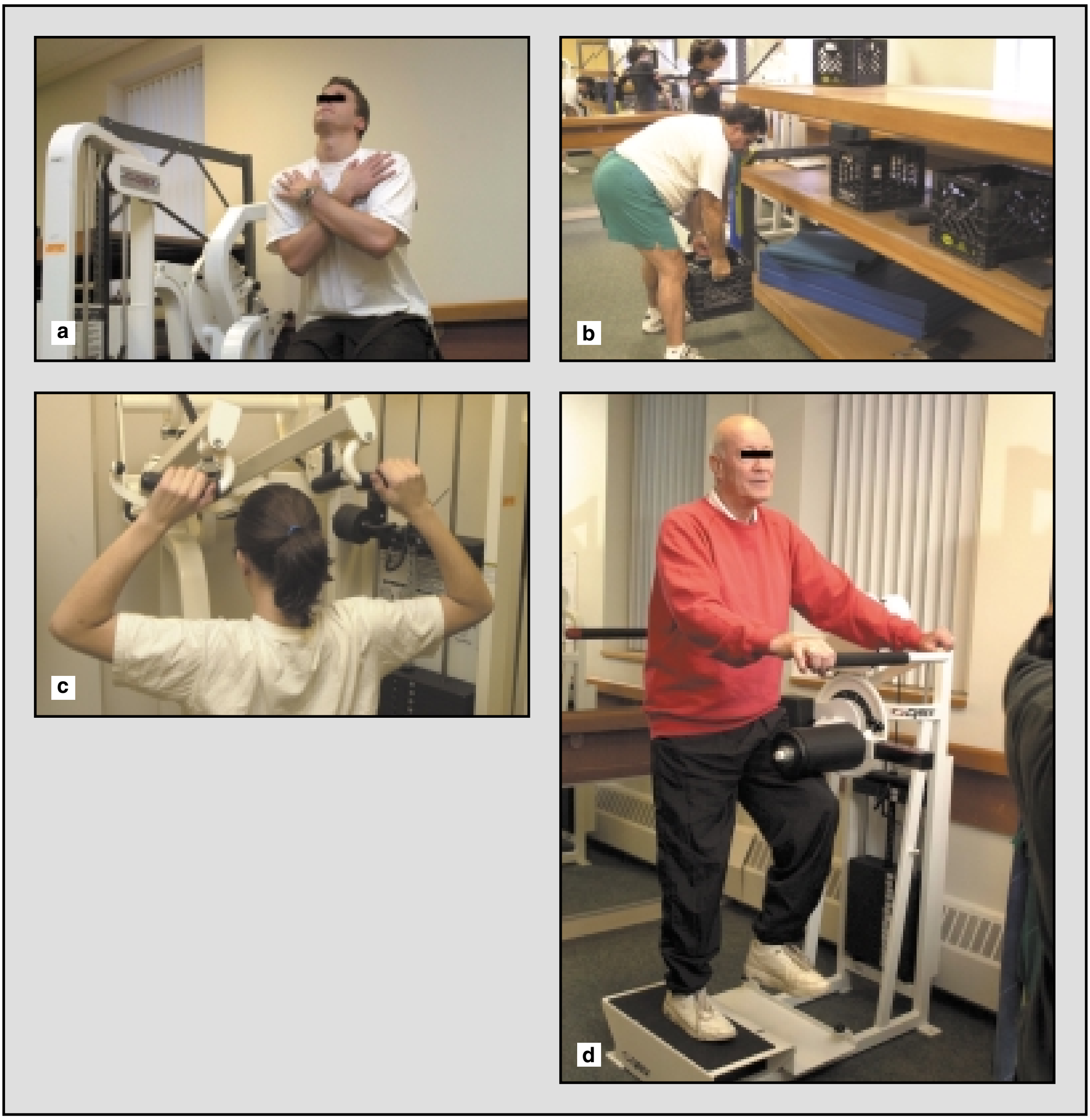

Fig. A1. Examples of some exercises for the treatment of low back pain: (**a**) Cybex back extension; (**b**) lumbar crate lifting; (**c**) lat pulldown; and (**d**) Cybex multihip.

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