

Incorporating physical exercise as part of lifestyle: The way to combat non-specific chronic low back pain

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ABSTRACT

Non-specific chronic low back pain is common and complex and has a large impact on individuals and society. Inculcating physical exercise to promote healthy lifestyle has played an important role in the prevention and management of chronic health conditions. The purpose of this article is to review the published literature on lifestyle factors mainly physical exercise to combat non-specific chronic low back pain.

PubMed database was reviewed from January 2000 to November 2018 and searched for 'exercise and non-specific chronic low back pain', 'lifestyle and non-specific chronic low back pain' and individual exercise interventions and non-specific chronic low back pain. Articles which fulfilled the criteria were included in the final review.

The available evidences from existing systematic reviews and articles suggested that physical exercise does improve pain severity and physical function in chronic non-specific low back pain. Regarding the type of exercises, strengthening or resistance exercises seem to be effective but no specific type of exercise is superior to others.

Incorporating physical exercise such as strengthening exercises as part of the lifestyle change could combat non-specific chronic low back pain.

Keywords:

Lifestyle, non-specific chronic low back pain, physical exercise

INTRODUCTION

Lifestyle is the way or manner of living. It includes everyday behaviours and covers all spheres of life like work, activities, pleasure and diet. According to WHO, 60% of factors related to individual's health and quality of life have correlation with lifestyle.¹ Unhealthy lifestyle can lead to disease and disability causing problems like metabolic diseases, joint and skeletal problems, cardiovascular disease, hypertension, obesity and chronic low back pain (CLBP).^{1,2}

Low back pain is pain or discomfort below the costal margin and above the inferior gluteal folds, with or without sciatica, and is defined as chronic when it persists for 12 weeks

or more. Non-specific chronic low back pain (NSCLBP) is defined as chronic low back pain with no recognizable pathoanatomical cause.³ Some of the risk factors for non-specific chronic low back pain quoted in the literature are bad posture, low level of physical exercise, positive family history, high level of income, obesity, low level of education, smoking and regular consumption of alcohol.^{4,5}

NSCLBP affects people of all ages, sex and status. It is a major health problem with rising prevalence.^{6,7} 60-80% of adults experience LBP at some point of their life.⁸ With the reported prevalence of 23% CLBP results in 11-12% of population to be disabled by LBP.⁹

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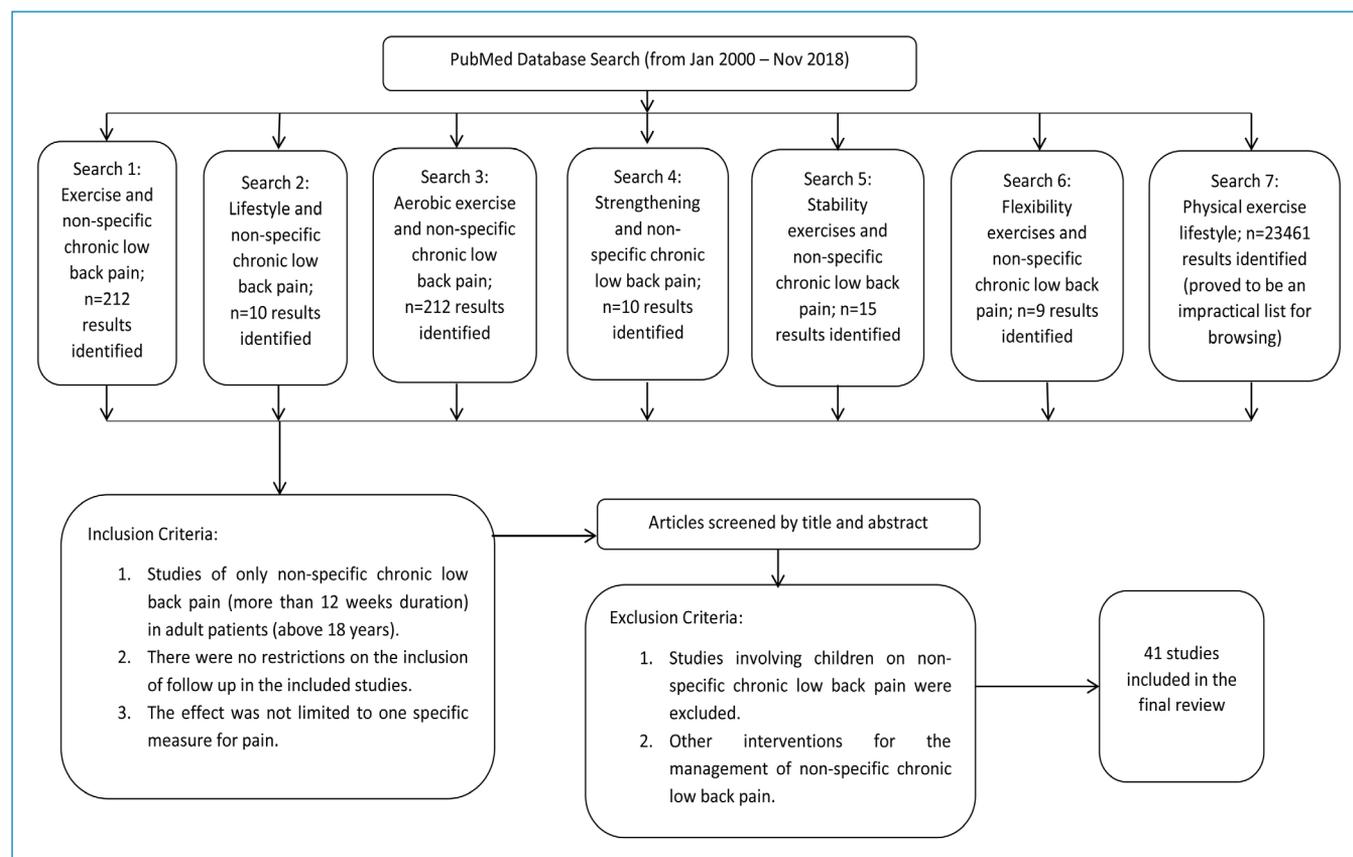
Physical exercise includes activity of some kind to develop or maintain physical fitness and overall health. Physically inactive or sedentary lifestyle leads to NSCLBP.² Furthermore, various guidelines on the management of NSCLBP include physical exercise, cognitive behaviour therapy and multidisciplinary treatment.^{10,11} Thus, by incorporating physical exercise as integral part of lifestyle, one may be able to overcome NSCLBP.

Today 'gyming' is a craze. The aim of this article is to provide evidence from published literature regarding the significance of physical exercise in lifestyle and role of various exercise interventions like aerobic, strengthening, stabilization, and flexibility training exercises to combat non-specific chronic low back pain.

METHODS

Articles cited in PubMed from January 2000 to November 2018 formed the basis of the search. A total of seven search terms were used. For the final review, 41 were included after excluding the others (Figure 1).

Figure 1: Flow chart of methodology



RESULTS

Impact of Non-Specific Chronic Low Back Pain (NSCLBP)

NSCLBP is a burden or problem to the patients because of lack of knowledge of their disease status, prognosis and how to deal with it, affecting their physical, mental and social health. It is a problem to health care professionals because many of the times as there is no definite cause, there is no definite treatment.¹² Patients expectation for their non-specific chronic low back pain influences general practitioners, way of managing such patients rather than the guidelines proposed.¹³ For the society non-specific chronic low back pain is a burden because it is one of the leading causes of work absenteeism, use of health care and sickness benefits and presenteeism,¹⁴ (lost productivity while still at job) causing indirect expenditures in addition to rampant direct costs.¹²

Exercise is medicine

Staying healthy is on everyone's priority list. The daily choices can decide on how healthy one is. Not everything is under one's control but habits like physical exercise can make a difference. Physical inactivity is sighted as the biggest public health problem of 21st century.¹⁵

On the other hand, there are numerous benefits of physical exercise ranging from prevention and management of chronic diseases including chronic low back pain, cardiovascular fitness, promoting longevity to mood elevation, feeling of well-being, mental health and quality of life.¹⁶ Keeping in view the numerous benefits of physical exercise, US Department of Health and Human Services, has released guidelines on physical activity for individuals in 2008.¹⁷ The basic premise of the global initiative, Exercise Is Medicine (EIM), dates back to Claudius Galen's time (129 - 210AD).^{18,19}

NSCLBP and exercise

NSCLBP accounts for 85% of all back-pain cases.²⁰ Physical exercise is planned and structured muscular activity involving repetitive movements and not just any body movement requiring energy expenditure as in physical activity.²¹ Exercise therapy has been studied for its role in prevention as well as treatment of low back- pain.

Prevention

Three reviews on prevention are noteworthy. Thirteen articles reporting on nine studies and nine interventions were included in the first review. There was moderate quality evidence that post-treatment exercise programmes can prevent recurrence of back pain but conflicting evidence was found for treatment exercise.²² The second was a systematic review and meta-analysis of 23 published reports and provided moderate quality evidence that exercise together with education can prevent an episode of low back pain.²³ Another review concluded effectiveness of exercise in primary as well as secondary prevention of NSCLBP.²⁴

Management

Regarding the evidence on management, the Cochrane systematic review (39 trials) showed conflicting evidence regarding the effectiveness of exercise therapy as compared to inactive treatment. But exercise could help to return earlier to normal activities and work.²⁵ Five years later a meta-analysis (61 randomized control trials) further showed slight effectiveness of exercise therapy in decreasing pain and improving function particularly in health care populations.²⁶ After another five years, a systematic review showed similar results of improvement in post treatment pain intensity,

disability and long-term function but quality of evidence remained low.²⁷ Furthermore, two literature reviews concluded that exercise therapy is probably the most widely used conservative treatment for NSCLBP throughout the world²⁸ and it diminishes pain and disability.²⁴

Summary

Thus, its beneficial to include physical exercise in lifestyle to prevent non-specific chronic low back pain and for patients with NSCLBP it can be used for increased return to normal activities and prevent disability.

TYPES OF EXERCISE AND NSCLBP

Aerobic Exercise and NSCLBP

A lifestyle of decreased aerobic activity, lesser value of maximum oxygen consumption (VO_{2max}) and low level of physical fitness is associated with a higher probability of getting non-specific chronic low back pain.²⁹

Aerobic activity is beneficial in treating CLBP as it accelerates the process of healing by enhancing the blood supply, reducing stiffness,³⁰ alteration of pain perception and control in the central nervous system,³¹ after a period of 30 minutes potentiates the release of endorphins which bind to the opiate receptors present in the brain and spinal cord,³⁰ decreased dependency on drugs for pain relief and increased fitness levels and easy conduct of day to day activities.³²

Functional limitation,³³ disability³⁴ seen in NSCLBP (as per the fear avoidance model)³⁵ can be improved by aerobic exercises by improving functional capacity³⁶ by reducing fear and hesitation associated with movement.

The study on association between free - living physical activity and psychological distress concluded that patients with CLBP and higher mental stress spent lesser time in physical activity, thus highlighting the significance of aerobic exercise in management of these patients.³⁷

A meta-analysis on patients with non-specific chronic low back pain comparing the effects of progressive aerobic training (PAT) and progressive resistance training (PRT) comparing pain, disability and the quality of life (QoL) found that aerobic exercise decreased the intensity of pain.³⁸

Table 1: Aerobic Exercise and non-specific chronic low back pain

	Title (Ref.No)	Study Type	Aim of Study	Results	Conclusion
1	Aerobic exercise training in addition to conventional physiotherapy for chronic low back pain: A randomized controlled trial. ⁴⁰	Randomized controlled trial.	To examine the effect of adding aerobic exercise to conventional physiotherapy treatment for patients with chronic low back pain (CLBP) in reducing pain and disability.	Both groups demonstrated a significant reduction in pain and an improvement in disability at 8 weeks and 12 months; however, no differences were observed between groups. There was no significant difference in CLBP relapse at 12 months between the 2 groups	The addition of aerobic training to conventional physiotherapy treatment did not enhance either short- or long-term improvement of pain and disability in patients with chronic CLBP.
2	Aerobic vs. resistance exercise for chronic non-specific low back pain: A systematic review and meta-analysis. ³⁸	A systematic review and meta-analysis.	To compare progressive aerobic training (PAT) to progressive resistance training (PRT) for pain, disability and quality of life (QoL) in people with chronic non-specific low back pain (NSCLBP).	Six studies were included, comprising 333 participants. Exercise significantly reduced pain intensity (SMD =-0.42 [-0.80, -0.03]; p< 0.03) although neither mode proved superior.	PAT and PRT decreased pain intensity in individuals with CNSCLBP although neither mode was superior. High-quality RCTs comparing PAT, PRT, and PAT + PRT, are required.

Various studies compared the effect of intensity and duration of aerobic activity on CLBP. A 6-week programme involving moderate aerobic exercise (i.e. treadmill walk at 50% of heart rate reserve) and a strengthening programme of the same duration were compared. The aerobic exercise group was found to have a 20% reduction in CLBP as compared to 15% reduction in the other group.³⁹

An 8-week intervention programme incorporating aerobic exercise of moderate intensity with the conventional physiotherapy was also compared to the conventional physiotherapy in a study. The exercise group experienced a significant reduction in pain by 47%, whereas the group receiving conventional physiotherapy only had a 42% reduction in their symptoms. In addition, the exercise group also developed a higher level of aerobic physical fitness.⁴⁰

A high intensity exercise programme of 12 weeks duration also showed similar results of better outcome in exercise group than the control group, indicating that exercise programmes incorporating different intensities of aerobic exercise can give similar results

for these patients.³² See Table 1 for a summary of the effects of aerobic exercise on NSCLBP.

Summary

Aerobic exercise has been found to be a cost effective and efficacious treatment modality for the treatment of non-specific chronic low back pain. It also has additional benefits of improving the well-being and physical fitness of these patients, which improves their functional ability and quality of life.

Stabilization exercises and NSCLBP

Core stabilization exercises have been found to be better when compared to various other exercise programmes for the treatment of non-specific chronic low back pain. The important reason for this effect is the use of drawing-in maneuver in this type of exercise, which activates transversus abdominis and multifidus muscle groups as well, as compared to the other exercises which mainly concentrate on the surrounding muscle strength. This manoeuvre thus, enhances the holding capacity and co-ordination of various muscle groups involved.

Table 2: Stabilization exercises intervention for NSCLBP

	Title	Study Type	Aim of Study	Results	Conclusion
1	Effects of Stabilization Exercise Using a Ball on Multifidus Cross-Sectional Area in Patients with Chronic Low Back Pain. ⁴⁶	Randomized clinical trial	To study the effects of lumbar stabilization exercises on cross-section area (CSA) of the MF, pain, weight bearing and functional disorders in chronic low back pain patients.	The experimental group was found to show better results in terms of cross-sectional area of multifidus, as well as better pain control, weight bearing and functional ability	The patients treated with core stabilization had better results in regard to CSA of MF as well as functional ability, intensity of pain
2	Effect of spinal stabilization exercise on dynamic postural control and visual dependency in subjects with chronic non-specific low back pain. ⁴³	Randomised controlled trial	To evaluate the effect of core stabilization exercise on dynamic postural control and visual dependency in chronic low back pain patients	Stability indices showed improvement with both interventions, but stabilization exercise group showed better outcomes in overall and anteroposterior stability indices	The patients treated with core stabilization had better results in regard to functional ability, stability and intensity of pain
3	Comparative effectiveness of lumbar stabilization, dynamic strengthening, and Pilates on chronic low back pain: randomized clinical trial. ⁴¹	Randomised controlled trial	To compare the effects of dynamic strengthening, lumbar stabilization and Pilates exercises on CLBP	Dynamic strengthening exercises showed favourable outcomes, but there was not a significant decrease in pain and disability scores as compared to the other two forms of exercise.	All three are beneficial in pain reduction of chronic non-specific LBP, increasing range of motion and core strength. Dynamic strengthening is less effective than stabilization techniques.
4	Effectiveness of core stabilization exercises and routine exercise therapy in management of pain in chronic non-specific low back pain: A randomized controlled clinical trial. ⁴²	Randomised controlled trial	To compare core stabilization exercises with routine exercise therapy for treatment of patients with CLBP	Clinically, core stabilization exercises provided better pain relief; whereas both were statistically, both were effective	Stabilization exercise regimen proves to be more effective in pain reduction
5	The effect of stabilization exercise on pain-related disability, sleep disturbance, and psychological status of patients with non-specific chronic low back pain. ⁴⁴	Interventional study	To determine the role of stabilization exercises in reducing disability, sleep disturbance and their effect on psychological status	There was a statistically significant enhancement in the mental status of the treated subjects	Core stabilization exercises have a favourable effect on the sleep pattern, mental status and physical disability of the patients who are exposed to this exercise therapy.
6	Effects of McGill stabilization exercises and conventional physiotherapy on pain, functional disability and active back range of motion in patients with chronic non-specific low back pain. ⁴³	Randomized clinical trial	To compare the McGill exercises and the conventional physiotherapy as treatment modalities for non-specific chronic low back pain.	The outcome parameters of pain, disability and range of motion were more favourable in patients treated with the core stabilization exercise regime, however this difference was not statistically significant	Both the therapies provide similar benefits in pain management, functioning and mobility; however, core stabilization is clinically more effective.

In the corresponding study conducted in order to compare the efficacy of lumbar stabilization, dynamic strengthening and Pilates, it was found that all three were beneficial. But, lumbar stabilization had comparatively higher efficacy than the other two.⁴¹

In 2017, a randomized controlled trial comparing core stabilisation exercises with the routine exercise therapy in treatment of NSCLBP concluded that although both are useful in treatment, stabilization regime is superior to the routine physical therapy in terms of reduction in pain.⁴²

A study has been conducted to evaluate the effect of core stabilization exercise on dynamic postural control and visual dependency highlighted the effect of these exercises on postural control capabilities of these patients. The treated patients showed better outcomes in regard to functional ability, stability and intensity of pain.⁴³

The individuals suffering from chronic low back pain are known to have sleep disorders and compromised psychological status. Core stabilization exercises have a favourable effect on the sleep pattern and mental status of the. These exercises act by modifying the central control of motor system and recruiting the core musculature. As a result, the patients experience better mood, better sleep and better functional ability.⁴⁴

Various studies on specific types and tools of core stabilization exercises have also been carried out. A similar study compared the McGill exercises and the conventional physiotherapy as treatment modalities for NSCLBP. The outcome parameters of pain, disability and range of motion were more favourable in patients treated with the latter exercise regime.⁴⁵

Another study was based on core stabilization exercises using an exercise ball, which has been used for muscle strengthening and balance control. The experimental group was found to show better results in terms of cross-sectional area of multifidus, as well as better pain control, weight bearing and functional ability.⁴⁶ See Table 2 for a summary of the effects of stabilization exercises on NSCLBP

Summary

Core stabilization exercises have a favourable effect on both the physical and psychological aspects of NSCLBP. Various studies have provided evidence of their role as an effective treatment regime in terms of pain relief and mental and physical wellbeing.

Strengthening exercises and NSCLBP

Strengthening exercises are efficient and safe treatment for patients with non-specific chronic low back pain. The main aim of any exercise programme is to enhance four components: strength, flexibility, balance and endurance. Resistance or Strength training improves all of these by using progressive overload,⁴⁷⁻⁴⁹ which is the core principle of exercise training.

Under Strength training, all three elements of exercise training, namely the frequency, intensity and duration are increases gradually, thereby increasing the work performed, till the maximum potential is attained. This concept of progressive exercise overload increases the functional capacity, whereas increasing intensity provides the maximum benefits in terms of capability to perform various tasks.¹⁶

Progressively increasing the resistance offered to the muscle groups causes an increase in the lean muscle mass and diminishes the deposited fat, thereby increasing the effective work capacity.¹⁶

Strengthening of the extensor muscles of lumbar region is an effective therapeutic tool for chronic low back pain as it also provides measurable outcomes.^{50,51} It is possible to record the baseline measurements at the beginning of the therapy and then compare at the with resultant parameters, thereby allowing patients to experience evident improvement in their work capacity and function. A similar strengthening program has been conducted in the Oschner Health System, which demonstrated significant improvement in the measured muscle strength, range of motion and patient- observed function and also decrease in disability scores. Hence, adding measure able performance outcomes to the strengthening therapy generates a better clinical picture.¹⁶

A study was conducted in 2015 to evaluate the effect of hip strengthening exercises as compared to lumbopelvic exercises used in the treatment of non-specific low back pain on eighty participants over a 6-week interval. The results showed that there was no statistically significant difference in the pain or disability scores between the two study groups, showing that both exercise programmes were similar in their efficacy.⁵²

In a randomised control study conducted to compare the effects of dynamic strengthening, lumbar stabilization

Table 3: Strengthening exercises intervention for NSCLBP

	Title (Ref.No)	Study Type	Aim of Study	Results	Conclusion
1	A high-intensity lumbar extensor strengthening program is little better than a low-intensity program or a waiting list control group for chronic low back pain: a randomised clinical trial. ⁵³	Randomised clinical trial	To compare the effects of high intensity lumbar extensor strengthening exercises to low intensity strengthening exercises or no strengthening.	Although there was some benefit in the high intensity group, it was not statistically significant.	Although high intensity strengthening exercise program is beneficial in treatment of CLBP, it does not give statistically significant outcomes.
2	Exercise in the Management of Chronic Back Pain. ¹⁶	Systematic review	To emphasize the importance of measurement as the key to better communication among the providers treating spinal pain.	Lumbar extensor strengthening significantly reduces pain and generates quantifiable clinical outcomes for chronic back pain patients.	Adding measureable performance outcomes to the strengthening therapy generates a better clinical picture
3	The effect of the addition of hip strengthening exercises to a lumbopelvic exercise programme for the treatment of non-specific low back pain: A randomized controlled trial. ⁵²	Randomised control trial	To evaluate the effect of hip strengthening exercises as compared to lumbopelvic exercises used in the treatment of non-specific low back pain on eighty participants over a 6-week interval.	There was no statistically significant difference in the pain or disability scores between the two study groups	Both exercise programmes were similar in their efficacy
4	Comparative effectiveness of lumbar stabilization, dynamic strengthening, and Pilates on chronic low back pain: randomized clinical trial. ⁴¹	Randomised control trial	To compare the effects of dynamic strengthening, lumbar stabilization and Pilates exercises on CLBP	Dynamic strengthening exercises showed favourable outcomes, but there was not a significant decrease in pain and disability scores as compared to the other two forms of exercise.	All three are beneficial in pain reduction of chronic non-specific LBP, increasing range of motion and core strength. Dynamic strengthening is less effective than stabilization techniques.

and Pilates exercises on CLBP, it was concluded that dynamic strengthening exercises showed favourable outcomes, but there was no significant decrease in pain and disability scores as compared to the other two forms of exercise. Dynamic strengthening exercises may in turn cause a relative increase in the low back pain symptoms due to the increased work load put on the spinal column.⁴¹

A study of 8 weeks duration compared the effects of high- intensity lumbar extensor strengthening exercises to low- intensity strengthening exercises or no strengthening. Although there was some benefit in the high- intensity group, it was not statistically

significant.⁵³ See Table 3 for a summary of the effects of strengthening exercise on NSCLBP.

Summary

Strengthening exercise programme is an easily quantifiable, efficient and safe therapeutic tool for treating non-specific chronic low back pain. It decreases the incidence of vertebral fractures⁵⁴ and recidivism rates,⁵⁵ and also treats the associated depression⁵⁶ and fear of movement or kinesiophobia.⁵⁶ However, some recent studies comparing its efficacy with other exercise programmes have found equivocal results.

Table 4: Flexibility exercise intervention for NSCLBP

	Title(Ref.No)	Study Type	Aim of Study	Results	Conclusion
1	Adaptive physical activity and back pain: a non-randomised community-based intervention trial. ⁵⁷	Open-label intervention study	To evaluate the effect of community-based physical activity on back pain.	The study group following the APA program showed significant improvement in back pain and also their health status	Community-based APA program is effective in treating back pain as well as general health of these patients
2	An occupational, internet-based intervention to prevent chronicity in subacute lower back pain: a randomised controlled trial. ⁵⁸	Randomized controlled trial	To investigate the effect of occupational postural and exercise programme on the risk of chronicity of pain and to determine if modifying these risk factors would change specific outcomes.	Statistically significant results were recorded in patients of intervention group. A correlation between functional disability and risk of chronicity of pain.	A real-time internet based occupational intervention programme can be beneficial in preventing the chronicity of back pain among office workers

Flexibility training and non-specific chronic low back pain

The literature search for the above title identified two potentially eligible studies.

In 2011, an open-label intervention study was conducted to evaluate the effect of community-based physical activity on back pain. The study was carried out for duration of 12 months on non-specific chronic low back pain patients.

The patients performed the Adapted Physical Activity (APA) program three times in a week in the form of flexibility and strength training exercises and also other exercises that improved body posture. The study concluded that community-based APA program is effective in treating back pain as well as general health of these patients.⁵⁷

Another study investigated the effect of occupational postural and exercise programme on the risk of chronicity of pain and to determine if modifying these risk factors would change specific outcomes. The study incorporated exercises combining flexibility, strengthening, mobility, core stabilization and stretching. It was concluded that a real-time internet based occupational intervention programme can be beneficial in preventing the chronicity of back pain among office workers.⁵⁸ See Table 4 gives the summary of the effects of flexibility exercises on NSCLBP.

Summary

Although flexibility training exercises are considered beneficial in treatment of chronic low back pain as an

integral part of various exercise programmes, it has not been compared satisfactorily with other forms of exercises.

LIMITATION

Limitation of the studies were inconsistent quality of the studies with variable duration of exercises and heterogenous outcome measures.

CONCLUSION

Non-specific chronic low back pain is nowadays a well-recognised entity which affects the physical and mental health of the patients as it restricts their functional ability. The aim of treatment of chronic low back pain is help the patients to return to normal activities of day to day life like sitting, rising, walking, twisting, bending, climbing and lifting. This can be achieved by improving their strength, endurance, balance and flexibility.

Various forms of exercise have been used to achieve the desired outcomes, like aerobic exercise, strength training, core stabilization exercises and flexibility training exercises. Among these, strength training exercises have favourable effects on all four parameters of strength, endurance, balance and flexibility.

A number of studies have been conducted to compare one form of exercise with the other in regard to pain relief and upliftment of physical and mental wellbeing. Although clinical differences exist, the studies conducted have failed to reveal an exercise that statistically proven to be superior to others.

We conclude that further clinical trials are required in order to establish any one form of exercise as the most effective in treatment of non-specific chronic low back pain.

CONFLICTS OF INTEREST

None

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Prediction of cardiovascular risk factors from retinal fundus photographs via AI algorithm

Scientists from Google and its health-tech subsidiary Verily have discovered a new way to assess a person's risk of heart disease using machine learning. By analyzing scans of the back of a patient's eye, the company's software is able to accurately deduce data, including an individual's age, blood pressure, and whether or not they smoke. This can then be used to predict their risk of suffering a major cardiac event — such as a heart attack — with roughly the same accuracy as current leading methods. The algorithm potentially makes it quicker and easier for doctors to analyze a patient's cardiovascular risk, as it doesn't require a blood test. But, the method will need to be tested more thoroughly before it can be used in a clinical setting. A paper describing the work is published.

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