# The effectiveness of Cognitive Behavioral Therapy (CBT) with general exercises versus general exercises alone in the management of chronic low back pain

**Muhammad Khan*, Saeed Akhter, Rabail Rani Soomro and Syed Shahzad Ali**
Department of Physiotherapy, Institute of Physical Medicine & Rehabilitation, Dow University of Health Sciences, Karachi, Pakistan

**Abstract**: To evaluate the effectiveness of Cognitive Behavioural Therapy (CBT) along with General exercises and General exercises alone in chronic low back pain. Total 54 patients with chronic low back pain who fulfilled inclusion criteria were recruited from Physiotherapy, Department of Alain Poly Clinic Karachi and Institute of Physical Medicine & Rehabilitation Dow University of Health Sciences Karachi. Selected patients were equally divided and randomly assigned into two groups with simple randomisation method. The Cognitive Behavioural Therapy (CBT) and General exercises group received Operant model of CBT and General Exercises whereas General exercises group received General exercises only. Both groups received a home exercise program as well. Patients in both groups received 3 treatment sessions per week for 12 consecutive weeks. Clinical assessment was performed using Visual Analogue Scale (VAS) and Ronald Morris Disability Questionnaire at baseline and after 12 weeks. Both study groups showed statistically significant improvements in both outcomes measures p =0.000. However, mean improvements in post intervention VAS score and Ronald Morris score was better in CBT and exercises group as compared to General exercise group. In conclusion, both interventions are effective in treating chronic low back pain however; CBT & General exercises are clinically more effective than General exercises alone.

**Keywords**: Cognitive Behavioural Therapy, exercises, low back pain, psychological interventions.

## INTRODUCTION

Low-back pain is a major musculoskeletal complain which not only put economical burden but also cause disability in large populations around the world. Chronic low-back pain (CLBP) is a major cause of medical expenses, work absenteeism, and disability (Koes 2006). Many interventions has been applied in the management of Chronic Low Back Pain (CLBP) includes medication, manipulation, exercise, heat and cold, electrophysical agents and Cognitive behavioural therapy (CBT). Cognitive behavioral therapy (CBT) for pain management is based upon a cognitive behavioral model of pain. This model highlights that pain is a complex experience which is not only caused by its underlying pathophysiology, but also by an individuals' cognitions, and behaviour (Keefe *al et*, 1986). The cognitive-behavioural model suggested that functional limitations result from maladaptive beliefs and avoidance behaviours that are maintained by learning processes (Vlaeyen *et al*, 1995). Tissue injury or pathology is a common cause of pain; other psychosocial factors cannot be ignored in understanding pain and disability. Pain is both sensory and emotional experience and tissue damage is not a necessity to initiate pain (Vlayen *et al*, 1999).

According to CBT theory, inappropriate cognitions and poor pain coping behaviours may interact with biological factors and social, environmental consequences. This interaction may produce unwanted outcomes, which includes higher pain intensity, pain-related disability, and utilization of health care resources (Goossens *et al*, 1998). Vlaeyen & Crombez (1999) proposed a bio psychosocial model called Fear avoidance model. The model proposed two types of opposing behaviours called confrontation and avoidance. As indicated by the name confrontation is an adaptive behaviour response to resolve the problem. The avoidance is a catastrophic cognition leading to chronicity, disuse, de-conditioning and depression (Wand & O'Connell, 2008). It is not clear what causes catastrophic beliefs however altered proprioception has been documented by some authors (Keefe *et al* 2005). Operant CBT model consist of behavioural graded activity training (Sanders, 1996). Back strengthening exercises, aerobic training and cognitive behavioural treatment (CBT) are beneficial modes of treatment when applied in combination. But the effectiveness of strengthening and aerobic training versus other active treatments produced inconclusive evidence. (vanTudler, 2000). However, individually designed stretching and strengthening programs, improves pain and function (Hayden *et al*, 2005). Johnsen *et al*. (2007) randomised controlled trial did not show any significant effects of additional CBT as compared to GP usual care. In another high quality Randomized controlled trial Hay *et al*. (2005) compared the role of usual physiotherapy with a brief pain-management programme based on CBT approach and did not show any significant difference between both groups. In addition Smeets *et al*. (2006) did not report any

**Corresponding author:* e-mail: mohdkhan50@yahoo.com

significant difference between CBT, active physiotherapy, combination of CBT and active physiotherapy or waiting list in chronic non-specific low back pain. These studies used various models of CBT intervention without much explanation of the CBT activities while some used fear of avoidance model. Therefore the aim of this study was to compare the effectiveness of CBT consisted of operant behavioural graded activity training (Sanders, 1996) with general exercises versus general exercise alone in the management of chronic low back pain.

## METHODS

This randomised controlled trial was conducted at Alain Poly Clinic Karachi &Institute of Physical Medicine & Rehabilitation Dow University of Health Sciences Karachi between January, 2012 and April, 2012. Patients who were diagnosed with chronic non-specific low back pain were selected. Both males and females' patients' age 25-45 years who had MRI of the lumbar spine to exclude any underlying pathology, back pain for more than 3 months till 2 yearsand had no associated medical conditions were included. Exclusion criteria was back pain for less than 3 months Patients, history of back surgery, inflammatory arthritis, tumours, spinal or hip fractures, pregnancy, lumbar radiculopathy and severe cardiopulmonary disease affecting exercise tolerance. The calculated sample size was 54 subjects, 27 each group which was calculatedwith independent population group formula repeated measure analysis of variance with power of test 99% and confidence interval 99%.

After taken written consent computer based simple randomisation technique was used to assign subjects into 2 groups. Group 'A' received CBT aimed to guide patients to achieve their daily life goals. CBT consisted of operant behavioural graded activity and problem solving training. In graded activity the physical therapist focused on gradual increase or pacing of activities which were important and relevant for individual patients with instruction to modify dysfunctional beliefs and general exercises consisting of rolling, bridging, knee to chest, hamstring stretching (each exercise 20 repetitions) and cycling plus treadmill each exercise for 10 minutes with resistance and speed adjusted to patient individual needs. Group 'B' only received general exercise protocol same as group A. All the exercises in both groups were carried out under the supervision of physical therapist and the patients were instructed to carry out same exercises at home 2 times per day and at least 5 times a week. The duration of the intervention was for 12 weeks, 3 sessions a week for each group. Patients were blind to the study where as treating therapists received brief training for application of CBT. Pre and post intervention data was collected by using Visual Analogue Scale (VAS) and Ronald Morris Disability Questionnaire (RDQ). The VAS is a 0 to 10 point subjective scale and the patient have to score from 0 as no pain and 10 is the worse pain patient can get. The RDQ is a health status measure designed to be completed by patients to assess physical disability due tolow back pain. It consist of 24 sentences which describes patient status and patient have to tic a sentence best suits their condition and add up all tics for some of disability score.

SPSS version 16 was used for data analysis. T-test was used to reveal the effects of treatments within the groups. Wilcoxon signed rank test was used to compare group A and group B for their pre and post treatment effects with level of significance P-value less than 0.05 considered significant.

## RESULTS

This study included 54 patients 27 patients in CBT and general exercise group A and 27 patients in general exercises group B. There was no drop out in both groups. Age of the participants ranges between 29 and 50 years with mean age 39.61±5.3 years. Gender distribution were (n=25) 46% males and (n=29) 54% were females. Statistically there was no significant difference between two groups with P-value =0.000 for both groups. However, clinically CBT & General exercise group A showed better results as compared to general exercise group B. In group A, mean VAS score reduced to 2.66± 1.39 post interventions which was 6.51±1.34 on base line. Ronald Morris score also reduced to 5.33±2.67 post interventions, which was 13.77±2.53 on base line. In General exercise group mean VAS score reduced to 5.25 ±1.19 post interventions, which was 7.03±1.25 on base line. Ronald Morris score also reduced to 9.88 ±1.84 post interventions which was 12.92±2.09 on base line.

## DISCUSSION

The results of the trial showed that participants in both CBT with general exercises and general exercises both groups made significant improvements in pain scale and RDQ (P-value=0.000). However CBT group showed better results in mean pre and post intervention score on both measures VAS and Ronald Morris Disability Questionnaire as compared to general exercises group. The results of Johnsen*et al*. (2007) study support the notion that CBT and active exercise have produced additional benefit but overall there was no significant difference between the two groups in pain and disability measures. All subjects in this study were given educational pack contained advise on pain and activity, pacing, goal setting, posture and when to see their GP. The intervention group received an additional 6 weeks intervention based on CBT. In addition, subjects in the Johnsen *et al*. (2007) study were followed for a longer period of time (12 months) and more frequently, which may have influenced the outcomes.

**Table 1**: evaluation of vas and ronald morris scores CBT & general exercise group and general exercise group.

| Intervention group | Parameters | Mean ±SD | | P-value |
|---|---|---|---|---|
| | | Baseline | 12 Weeks | |
| CBT & General Exercise Group | Visual Analogue Scale (VAS) | 6.51 ±1.34 | 2.66±1.39 | 0.000 |
| | Ronald Morris Disability Questionnaire | 13.77±2.53 | 5.33±2.67 | |
| General Exercise Group | Visual Analogue Scale (VAS) | 7.03 ±1.25 | 5.25±1.19 | 0.000 |
| | Ronald Morris Disability Questionnaire | 12.92±2.09 | 9.88±1.84 | |

P-values were obtained employing Wilcoxon signed rank test. (*P-value ≤ 0.05 isconsidered as significant.

The first limitation of the study was that it was not a double-blinded trial and the Physical Therapists were given only brief training for application of CBT and the sample size was also low. Secondly no psychological measure was used to measure participant's stress and depression level to establish whether higher scores would be a cause of poor outcome despite CBT intervention. The results of present study suggest that reduction of pain in VAS is associated with positive change in function in CLBP patients in both treatment groups. These findings are in agreement with Moffet *et al.* (2006) study reported that active exercises consisting of McKenzie techniques and CBT treatments are clinically effective in the management of CLBP. However, McKenzie showed slightly better results in as compared to CBT intervention. This study used multiple outcome measures measuring pain, disability, anxiety and depression, which increase the validity of the results while present study did not measure anxiety and depression. Secondly Moffet *et al.* (2006) study included high disability score patients while in present study baseline disability score was low hence still produced better results. This could be explained by the fact that both general exercises and McKenzie protocol decrease fear-of-movement and fear-avoidance-beliefs by encouraging active participation of the patient. Furthermore the general exercise group had higher compliance as compared to CBT group, which could have impact on the results.

There is evidence that de-conditioning play a role in chronic pain disability (Hazard *et al*, 1989). It is possible that participants who received general exercise with CBT may have improved their endurance, leading to better functional outcome in disability score. In the present study measurement of aerobic fitness was not considered despite aerobic exercise like cycling and treadmill was a part of general exercise. It would be interesting to establish whether changes in aerobic fitness are associated with better function outcome among persons with chronic low back pain.

There are several issues that need to be addressed in the study of CBT interventions. First, in clinical settings, interventions are individually tailored according to assessment finding of a patient, thus making it is difficult to make treatment protocols for clinical trials. Most importantly performing psychological assessment and treatment by application of CBT is a skill required special training. This makes it difficult to replicate studies on CBT due to variations in the skills of clinicians applying treatment. The present study and Johnsen *et al*. (2007) study attempted to address this issue and provided brief training to the clinicians applying CBT intervention. In Johnsen *et al.* (2007) study the treating physiotherapists received a brief 2 days CBT training however, Jellema *et al*. (2005) have reported that brief training is ineffective for carrying out psychological assessment in low back pain patients. The author concluded that it is important to recognise fear of pain or movement during initial assessment and treatment and the clinician must receive appropriate training before applying CBT in clinical practice.

Cognitive-behaviour therapy produced positive changes in disability and pain intensity. This can be explained by the fact that CBT is based on changing patient's perception, enhance empowerment and teach coping strategies. CBT focus on motor processing and helps patients to distract their memory from pain experience by using pacing based activities and return to previous normal activity level (Strong *et al,* 2002). Poor coping strategies, self-efficacy and fear-avoidance has been highlighted as a strong predictor of disability in low back pain (Mannion *et al*, 2001). Psychological stress disrupts Central Nervous System performance and alters motor control this can cause avoidance and inhibit motor control to process appropriate coping strategies (Moseley and Hodges 2004). In contrast adapting positive behaviours such as activities, pacing and distraction improve motor processing and produce descending inhibitory effect to control pain (Zusman, 2002).

## CONCLUSION

This study found that both CBT with General exercises and General exercises alone significantly reduced pain intensity and disability in patients with chronic low back pain. Furthermore, subjects treated with CBT & Exercises showed an additional clinical benefit as compared to General Exercises only. Hence, CBT & Exercises could be a better option in clinical practice.

## REFERENCES

Goossens MEJ, Rutten-Van Molken MPM, Kole-Snijders AMJ, Vlaeyen JWS, Van Breukelen G and Leidl R

(1998). Health economic assessment of behavioural rehabilitation in chronic low back pain: A randomised clinical trial. *Health Econ,* **7**: 39-51.

Hayden JA, van Tulder MW and Tomlinson G (2005). Systematic review: strategies for using exercise therapy to improve outcomes in chronic low back pain. *Ann. Intern Med.,* **142**: 776-785.

HayE M, Mullis R, Lewis M, Vohora K, Main CJ and Watson P *et al.* (2005). Comparison of physical treatments versus a brief pain-management program for back pain in primary care: A randomised clinical trial in physiotherapy practice. *The lancet*, **365**(9476): 2024-2030.

Hazard RG, Fenwick JW, Kalish SM, Redmond J, Reeves V, Reid S, Frymoyer JW (1989). Functional restoration with behavioral support: A one-year prospective study of patients with chronic low back pain. *Spine,* **14**: 157-161.

Jellema P, van der Windt DA, van der Horst HE, Twisk JW, Stalman WA and Bouter LM (2005). Should treatment of (sub) acute low back pain be aimed at psychosocial prognostic factors? Cluster randomised clinical trial in general practice. *BMJ.,* **331**(7508): 84.

Johnson RE, Jones GT, Wiles NJ, Chaddock C and Potter RG Roberts C *et al.* (2007). Active exercise, education, and cognitive behavioral therapy for persistent disabling low back pain: A randomized controlled trial. *Spine,* **32**(15): 1578-1585.

Keefe FJ and Gil KM (1986) Behavioral concepts in the analysis of chronic pain syndromes. *J Consul Clin Psychol,* **54**: 776-783.

Keefe FJ, Nicholas M, Vlaeye J (2005). Psychological Assessment and Management of Pain. In Pain An Updated Review Edited by: Justins D. IASP Press.

Koes BW, van Tulder MW and Thomas S (2006). Diagnosis and treatment of low back pain. *BMJ,* **332**(7555): 1430-1434.

Mannion A.F, Junge A, Taimela S, Müntener M, Lorenzo K and Dvorak J (2001). Active therapy for chronic low back pain: Part 3. factors influencing self-rated disability and its change following therapy. *Spine,* **26**(8): 920-929.

Moffett JK, Jackson DA, Gardiner ED, Torgerson DJ, Coulton S, Eaton S, Mooney MP, Pickering C, Green AJ, Walker LG, May S, Young S. (2006). Randomized trial of two physiotherapy interventions for primary care neck and back pain patients: 'McKenzie' vs brief physiotherapy pain management. *Rheumatology*, **45**(12): 1514-1521.

Moseley GL, Nicholas MK and Hodges PW (2004). Does anti-cipation of back pain predispose to back trouble? *Brain,* **127**(10): 2339-2347.

Sanders SH (1996). Operant conditioning with chronic pain: Back to basics. In *Psychological approaches to pain management Apractitioner's handbook* Edited by: Gatchel RJ and Turk DC. New York, The Guilford press.

Smeets RJ, Vlaeyen JW, Hidding A, Kester AD, van der Heijden GJ, van Geel AC, Knottnerus JA. (2006). Active rehabilitation for chronic low back pain: Cognitive-behavioral, physical, or both? first direct post-treatment results from a randomized controlled trial. *BMC musculoskelet disord,* **20**(7): 5.

Strong J and Patric D (2002). *Pain: A textbook for Therapists*. Edinburgh, Churchill Livingstone.

vanTulder M, Malmivaara A, Esmail R and Koes B (2000). Exercise therapy for low back pain. A systematic review within the framework of the Cochrane collaboration back Review Group. *Spine,* **25**: 2784-2796.

Vlaeyen JWS and C rombez G (1999). Fear of movement/(re) injury, avoidance and pain disability in chronic low back pain patients. *Man ther,* **4**(4): 187-195.

Vlaeyen JWS, Kole-Snijders AM, Boeren RG and van Eek H (1995). Fear of movement/(re) injury in chronic low back pain and its relation to behavioral performance. *Pain,* **62**: 363-372.

Wand B and O'Connell NE (2008). Chronic non-specific low back pain sub-groups or a single mechanism? *BMC Musculoskel Disord*, **9**: 11.

Zusman M (2002). Forebrain-mediated sensitisation of central pain pathways: ‘non-specific' pain and a new image for MT. *Man ther,* **7**(2): 80-88.