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Research Article

Effect Of Occupational Therapy Intervention Including Swiss Ball Activity Training Program On Functional Mobility Among Police Officers With Non-Specific Low Back Pain: A Randomized Controlled Trial

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ABSTRACT

Background: Low back pain may result from poor posture, which raises the mechanical stress in the lower back. The discomfort caused is more common in jobs that require a lot of physical labour. One of the main reasons for absenteeism from work and a significant contributor to occupational disability expenses is work-related low back pain (WRLBP). police work demands the highest levels of physical fitness, agility, and endurance, maintaining functional mobility is essential.

Study design: A Randomized Controlled Trial

Aim: To find out the Effect of Occupational Therapy intervention including Swiss ball activity training program on functional mobility among police officers with non-specific low back pain.

Objective: To explore the effect of Occupational Therapy intervention including Swiss ball training program on non-specific low back pain among police officers using Visual Analogue Scale and Oswestry Disability Index.

Participants: The participants were recruited based on exclusion and inclusion criteria. A total of 96 participants were included in the study.

Methods: - This is randomized controlled study; a total 96 participant recruited between 30-65 years of age. Participants were randomly assigned in one of 2 groups: control group with usual occupational therapy program and experimental group including occupational therapy program with Swiss ball exercise training program. Occupational therapy intervention was given 3 days per week for 12 weeks. The outcomes of the intervention were assessed using VAS and OLBDQ.

Result: The results indicate a significant improvement in both measures following the intervention. These findings suggest that the Swiss ball training program effectively reduced both pain score and disability score among police officers with low back pain.

Conclusion: In conclusion, this study demonstrates that occupational therapy intervention program including Swiss ball training program effectively reduces low back pain and improves functional mobility among police officers. Statistical analyses confirmed that the occupational therapy intervention including Swiss ball training program had a notable impact on pain reduction and functional mobility, with more pronounced effects in the experimental group. These results underscore the potential of integrating Swiss ball exercises into routine training for police officers and other heavy-duty professions as a viable strategy for managing low back pain.

Keywords: LBP, functional mobility, NSLBP, VAS, ODQ, Swiss ball.

INTRODUCTION:

Low back pain is a common condition that affects the muscles, nerves, and bones of the back between the lower fold of buttocks and lower edge of ribs. Pain may range from a slow, ongoing aching to an abrupt, intense sensation. [1] LBP is often categorized as either non-specific or specific. An underlying illness (like cancer), tissue injury (like a fracture), or referrals from other organs (like kidney or aortic aneurysm) can all account for specific LBP. On the other hand, non-specific pain indicates that another diagnosis, such as an underlying disease, pathology, or tissue damage, cannot reliably explain the perception of pain. [2]

Lower back pain (LBP) may occur without any underlined cause is more common in professionals who work long shifts in one posture, have bad posture, or use nonergonomic work practices. Long durations of sitting without changing posture can weaken the abdominal muscles, which can cause digestive and respiratory issues as well as a curved spine.[3] Significantly, these elements are inevitably included in the day-to-day work of police personnel. These workers usually take bad postures, such as standing for extended periods of time, heavy lifting (such as carrying weapons, tools, or body Armor and duty belt), and they deal with mentally taxing events and issues that interfere with their ability to get a good night's sleep, like long work shifts.[4] Because police officers are exposed to physical, biological, chemical, and psychological risks, they are more likely to experience occupational trauma. Police officers who have experienced prolonged work trauma develop mental illnesses, which is a public health concern. A crucial aspect of police officer's physical duties is carrying loads. Police officers' body armour and duty belts may therefore have an impact on their capacity to carry out duties associated with their jobs. Although body armour and duty belts have been linked to an increased incidence of pain and limitations in movement and work performance, it is unknown how much the weight that police officers carry influences discomfort.[5]

One suggested method for identifying those who are at risk for developing Low Back Pain early on is to watch how they react to prolonged standing exposures. Long-term, low-load, static postures, including standing while working or performing daily tasks, have been linked to a higher risk of developing lower back pain. Jobs that require standing still for extended periods of time are associated with the development of low back discomfort.[6]

LBP can be categorized as either non-specific or specific. Non-specific refers to a condition in which another diagnosis, such as an underlying disease, pathology, or tissue damage, cannot reliably explain the perception of pain. In around 90% of instances, it is non-specific. Low levels of physical activity, smoking, obesity, and high levels of physical stress at work are risk factors for non-specific LBP. An underlying illness (like cancer), tissue injury (like a fracture), or referrals from other organs (like kidney or aortic aneurysm) can all account for specific LBP.[7]

Due to shifting job requirements and working conditions, the majority of police officers are spending more time sitting down. The chair affects the user's posture with respect to their gadgets. One risk factor for low back discomfort that is often highlighted is prolonged static sitting. Any position that results in continuous static muscular effort causes fatigue. Therefore, the design of seats is crucial to the research of human sitting. A seat that is overly deep will cut off circulation to the legs and feet by pressing the front edge into the space directly behind the knees. Strong strains are placed on the thigh when the seat depth and thigh length are not aligned. As a result, the gap between the back of the knee and thigh should be somewhat greater than the seat's depth. [8]

Extended periods of standing and frequent bending can lead to low back strain, which can impair police officer's functional mobility and have an adverse effect on their daily activities, quality of life, and everyday life. Therefore, this study aims to evaluate the nonspecific LBP among the police officers and provide them the appropriate training program with the help of Swiss ball to enhance their Functional Mobility.

METHODOLOGY:

A total of 96 participants included in the study through randomization according to the random sampling divided into 2 groups experimental group and control group. In experimental group occupational therapy intervention including Swiss ball training was given to the participants for duration of 12 weeks, 3 sessions per week (Table 1). In control group conventional O.T program was given to the participants for duration of 12 weeks, 3 sessions per week (Table 2). Participants were recruited from Vijay Nagar police station and Jaarcha police station, Gautam buddha Nagar as per inclusion criteria, age above 30 years, both male and female, officers with minimum duty time of 12 hours and active-duty police officers were included and according to exclusion criteria Pregnant female officers, officers with significant skeletal or postural anomalies extremely visible neuromuscular disease or spinal injury are excluded. Participants were given an informed consent form outlining the goals and methods of the study prior to its commencement.

Table 1: - Experimental group

S.NO	NAME OF ACTIVITY	PROCEDURE	PURPOSE	DURATION
1.	Upper body roll out	Prone, lower leg and feet are only in contact with the ball, hands underneath shoulders	Core muscle strengthening	2 to 3 sets
2.	Inclined press up	Hands beneath shoulder, keep arms fully extended, trunk positioned as far back as possible	Core and abdominal muscle strengthening	2 to 3 sets
3.	Contralateral single-leg hold	Right leg was positioned flat on the surface, left leg was manually assisted to approx. 90 Degree of hip & knee flexion	Abdominal muscle strengthening	2 to 3 sets
4.	Quadruped exercise	Knees & hands on the floor, on verbal command subject extended the contralateral hip until both UL & LL segments were parallel to trunk	Back muscle strengthening	2 to 3 sets

Table 2:- Conventional group

S.NO.	EXERCISE	PURPOSE	DURATION	METHOD
1.	Heel Raise	Low Back Muscle Strengthening	10 Repetition	Stand with weight even on both feet slowly raise heels up and down.
2.	Straight Leg Raise	Low Back Muscle Strengthening	10 Repetition	Lie on your back with 1 leg straight and one knee bent. Tighten abdominal muscles to stabilize low back. Slowly lift leg straight up about 6 to 12 inches and hold.
3.	Bridging	Low Back Muscle Strengthening	10 Repetition	Tighten the muscle in your stomach. Raise your hips off floor until they line up with your knees and shoulder. Return to starting position and repeat.
4.	Wall Squats	Low Back Muscle Strengthening	10 Repetition	Stand with back leaning against the wall. Walk feet inches in front of body. Keep abdominal muscles tight while slowly bending both knees 45°. Hold for 5 second. Slowly return to upright Position.

Outcome measures:

1. Oswestry Disability Index:

The most widely used and validated outcome measure for assessing low back pain is the Oswestry Disability Index (ODI). Numerous languages, including German, Arabic, Chinese, Korean, Danish, Greek, and others, have already had translations and validations of the ODI.[9]

2. Visual Analog Scale:

Most people agree that the VAS is a credible and trustworthy instrument for measuring chronic pain.2–5. To the best of our knowledge, its reliability has not been evaluated in the context of acute pain measurement, despite the fact that it seems to be equally valid in this context.[10]

DATA ANALYSIS: After completion of all (pre-treatment and post treatment) evaluation, results were collected and data were put in the excel and analysed by using IBM SPSS. The scoring of pre-treatment and post-treatment data of outcome measures VAS and OLBDQ were analysed using IBM SPSS for statistical significance result. The Pre-test and Post-test for scoring of experimental and control group were analysed through parametric test, T-test was used to analyse the pain and functional mobility scores for analysis of outcome measure.

RESULT:

TABLE 3.0 Descriptive Stats of Pre-Post VAS and OLBDQ in Experimental Group

		Mean	Std. Deviation	Std. Error Mean
Experimental Group	Pre VAS	5.58	1.567	.248
	Post VAS	3.05	.876	.138
	Pre OLBDQ	24.35	5.428	.858
	Post OLBDQ	16.60	5.068	.801

Table 4: Descriptive Stats of Pre-Post VAS and OLBDQ in controlled Group

Stats		Mean	Std. Deviation	Std. Error Mean
Controlled Group	Pre VAS	4.74	1.149	.177
	Post VAS	4.36	1.265	.195
	Pre OLBDQ	20.67	5.991	.924
	Post OLBDQ	19.38	5.934	.916

Group Statistics

	type	N	Mean	Std. Deviation	P value
diff. VAS	case	40	2.53	.905	>0.001
	control	42	.38	.539	
diff. OLBDQ	case	40	7.75	2.295	>0.001
	control	42	1.29	1.088	
VAS PRE	case	40	5.58	1.567	0.007
	control	42	4.74	1.149	
VAS POST	case	40	3.05	.876	>0.001
	control	42	4.36	1.265	
OLBDQ PRE	case	40	24.35	5.428	0.005
	control	42	20.67	5.991	
OLBDQ POST	case	40	16.60	5.068	0.025
	control	42	19.38	5.934	

DISCUSSION:

The present study aimed to assess the effectiveness of occupational therapy intervention using Swiss ball training program in reducing low back pain among police officers, with outcomes measured using pre and post the Visual Analogue Scale (VAS) and the Oswestry Low Back Disability Questionnaire (OLBDQ). Determining the best treatment options for this population is especially important because the pain in lower back among this population is very high. [11] The difference in VAS scores ranges from 0 to 4, with an average improvement of 1.43 and a standard deviation of 1.306, demonstrating varied individual responses to the intervention. The difference in OLBDQ scores spans 0 to 12, with an average improvement of 4.44 and a standard deviation of 3.702, reflecting diverse progress levels among participants.

In comparison to the above-mentioned analysis Joo Yoon, in their study have suggested Lumbar stabilization exercises using a ball are thought to be an effective interventional therapy for the alleviation of chronic low back pain and to increase bone mineral density of patients. The functional mobility of police officers with NSLBP was not altered by this study.[12]

Another study by Yamamoto in their study on chronic LBP concluded that trunk muscle strengthening exercises are useful for increasing muscle strength and improving symptoms in such patients. Swiss balls have limited usability for low back therapeutic intervention.[13]

One more study by Sotos at. al. in their study on LBP among high-risk professional suggested that fitness regimen could help high-risk professions' endurance and core strength. There is no Swiss ball training program offered to strengthen the core or trunk muscles in patients with low back pain.[14]

On other hand, Karmegam Karuppiah in their study on high-powered traffic police motorcycle riders have concluded that lumbar support with integrated massager system, an ergonomic intervention innovation, effectively preserves and enhances the spinal posture's natural curve.[15]

CONCLUSION:

In conclusion, this study demonstrates that a Swiss ball training program effectively reduces low back pain and improves functional mobility among police officers.
Significant reductions in pain intensity and disability were observed, as evidenced by
substantial improvements in VAS and OLBDQ scores, with large and clinically meaningful effect sizes. Statistical analyses confirmed that the Swiss ball training program had a notable impact on pain reduction and functional mobility, with more pronounced effects in the experimental group.

LIMITATION OF THE STUDY:

- Only NSLBP patients were studied in this study.

FUTURE RECOMMENDATION:

- Future research should assess how the Swiss ball training program affects NSLBP patients with and without lumbar instability.
- Higher pain levels and older age groups should be the subjects of future research.
- Larger sample sizes should be used in future research on this population to account for the diversity in training responsiveness.

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