

Correlation of Core Muscle Endurance, Physical Activity and Non-Specific Low Back Pain in Male Police Personnel

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ABSTRACT

BACKGROUND: Non-specific low back pain (NSLBP) is a common musculoskeletal disorder among police personnel, largely due to prolonged standing, repetitive tasks, and high physical demands of their occupation. Core muscular endurance is essential for maintaining spinal stability and proper posture, while regular physical activity enhances overall musculoskeletal health and functional performance. Reduced core endurance and insufficient physical activity can contribute to fatigue, poor biomechanics, and increased risk of low back pain. Therefore, understanding the relationship between these factors is important for developing effective prevention and rehabilitation strategies.

OBJECTIVE: The objective of the study is to determine the relationship of core muscular endurance, physical activity, and non-specific low back pain in male police personnel.

METHODOLOGY: This cross-sectional study was conducted among 66 male police personnel aged between 25–50 years. Physical activity levels were assessed using the International Physical Activity Questionnaire (IPAQ), and core muscular endurance was evaluated using the plank test. Nonspecific low back pain intensity was measured using the Numerical Pain Rating Scale (NPRS). Pearson's correlation coefficient was used to analyse the relationship between core muscular endurance, physical activity, and non-specific low back pain.

RESULT: A total of 66 subjects were included in this study based on inclusion and exclusion criteria. The findings demonstrated a very strong negative correlation between physical activity level and low back pain intensity ($r = -0.971$, $p < 0.001$), indicating that higher levels of physical activity were associated with lower pain intensity. Similarly, a very strong negative correlation was observed between core muscular endurance and low back pain intensity ($r = -0.967$, $p < 0.001$), suggesting that greater core endurance was associated with reduced pain intensity. Overall, the findings demonstrate that higher levels of physical activity and greater core muscular endurance are strongly associated with lower low back pain intensity.

CONCLUSION: The study concluded that physical activity level and core endurance are significantly related to pain intensity in policemen with non-specific low back pain (NSLBP). Lower physical activity and poor core endurance were associated with higher pain levels. Regular exercise and core

strengthening may help reduce pain, improve spinal stability, and enhance physical function in policemen.

KEYWORDS: Core muscular endurance, Male Police personnel, Non-specific low back pain (NSLBP), Occupational health, Pain Intensity, Physical activity.

INTRODUCTION

Non-specific low back pain (NSLBP) can be considered as one of the most common musculoskeletal disorders that affects in the working populations all over the world, it could also be the root cause of pain, disability as well as reduced work performance irrespective of their job type. Even though there isn't a proper way of defining NSLBP it is said to be pain occurring in the low back region without any specific underlying pathology that includes fracture, nerve root involvement or any infection. NSLBP is more prevalent in occupations that include prolonged standing, heavy lifting, awkward postures, repetitive movements that results in overstraining. Police personnels in general are considered highly vulnerable in developing back pain due to their demanding nature of their profession that includes vigorous activities like running, sudden physical exertion, prolonged patrolling, heavy, long hours of sitting in patrol vehicles. This occupation related tension often results in excessive strain or load over lumbar spine and surrounding musculature, increasing risk of musculoskeletal problems and chronic low back pain¹.

Core muscular endurance can be considered as a key in maintaining spinal stability, posture and efficient movement during functional activities. The core muscles, including the abdominal, back, pelvic and hip muscles contribute in the stability of spine and in providing equal distribution of forces throughout movements. Hence the decrease in endurance of these muscles lead to spinal instability, muscular fatigue, poor posture, increased mechanical stress on spinal structures, thereby leading to development of low back pain. individuals who have a poor core endurance may not be able to maintain correct posture during prolonged or vigorous activities, making them more susceptible to injury and pain. Therefore, core muscular endurance plays an important role in preventing musculoskeletal disorders particularly in jobs that are physically demanding such as policing.²

The second important factor influencing the musculoskeletal health and physical fitness is physical activity. Multiple Studies have concluded that physical activity has improved muscle strength and endurance, body composition, flexibility, cardiovascular fitness, all of which contribute in reducing risk of low back pain and spinal support. In contrast sedentary lifestyle and inadequate physical activity which is becoming popular nowadays also result in obesity, reduce endurance, occupational stress, muscular weakness, poor physical conditioning also could lead to disorders like NSLBP. Police personnel are one among the top list of those who often experience irregular work schedules, occupational stress that put them in a tight schedule where they get very limited time for regular exercise, thereby resulting in decreased participation in physical activities and negatively affect their overall fitness and endurance level³.

Previous studies have shown significant relationship between physical fitness and musculoskeletal health among tactile populations. A study conducted by Ismail Nabeel et al, reported that police officers who had high level of physical activity along with better physical fitness had lower prevalence of musculoskeletal injuries and backpain⁴. Similarly, there were also studies conducted among firefighters highlighting the importance of core muscular endurance and physical fitness in reducing occupation

related back pain and in improving overall functional performance⁵. Since both police personnel and firefighters share similar occupational demands, these findings can also be applied to police population. Despite increasing awareness regarding occupational low back pain, limited studies have specifically investigated in the combined relationship between core muscular endurance, physical activity, and non-specific low back pain among male police personnel due to various reasons. So, understanding this relationship is important for developing preventive physiotherapy interventions and fitness programs which aims at reducing low back pain, improving spinal stability, encouraging to engage in vigorous or regular activities and enhancing occupational performance. Therefore, the present study aims to determine the relationship of core muscular endurance, physical activity, and non-specific low back pain in male police personnel.

MATERIALS AND METHODS

The study used a correlational study design. Participants were selected using inclusion and exclusion criteria and were informed about the study, and written consent was obtained from each of them. Participants included 66 men aged between 25–50 years, who met the inclusion and exclusion criteria. The inclusion criteria included police personnel with non-specific low back pain lasting for more than one month, who are actively working in the police department and willing to participate in the study, they must also be able to perform physical activity and core endurance assessments. The exclusion criteria included individuals with history of spinal surgery, spinal deformity, neurological disorders, or any specific spinal pathology such disc prolapse, subjects undergoing physiotherapy or medical treatment for low back pain were also excluded from the study.

PROCEDURE

After enrollment of participants in the study, a brief introduction about the study procedure was explained and informed consent was obtained. Subjects were assessed their physical activity using the International Physical Activity Questionnaire (IPAQ), low back pain intensity was measured using the Numerical Pain Rating Scale (NPRS), and core muscular endurance was assessed using plank. The analysis of these measures was conducted using Pearson's correlation and Spearman's rank correlation with a p value less than 0.05 considered statistically significant to examine relationship of core muscular endurance, physical activity, and non-specific low back pain.

OUTCOME MEASURES

The outcome measures included the Numerical Pain Rating Scale (NPRS), International Physical Activity Questionnaire (IPAQ), and Plank Test. The NPRS is a valid and reliable 11point scale (0 = no pain, 10 = worst imaginable pain) used to assess pain intensity and monitor changes in low back pain⁶. The IPAQ is a standardized self-reported questionnaire that evaluates physical activity performed over the previous seven days, with activity levels expressed in MET-minutes/week and categorized as low, moderate (≥ 600 MET-min/week), or high (≥ 3000 MET-min/week)⁷. The Plank Test assesses core muscular endurance and spinal stability by measuring the duration (in seconds) for which an individual can maintain a correct forearm plank position, with longer holding times indicating better core endurance⁸. Together, these validated and reliable outcome measures were used to assess pain intensity, physical activity level, and core muscle endurance in policemen with low back pain.

RESULTS

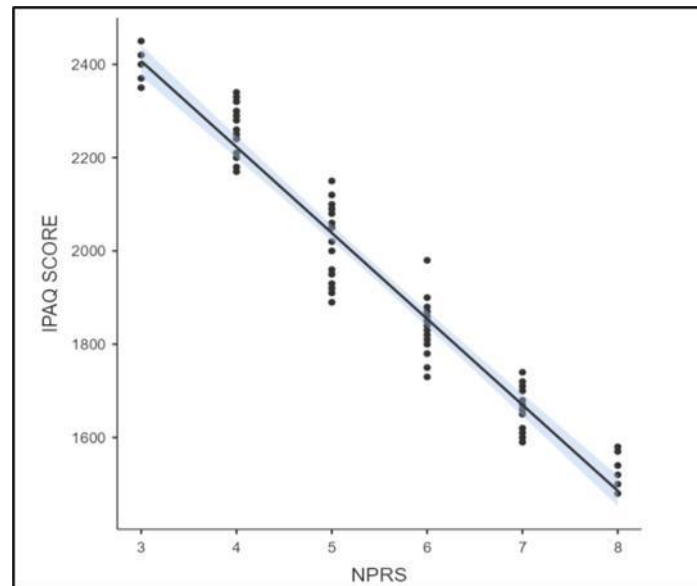


Figure 1.1 Correlation between IPAQ score and NPRS score

This scatter plot illustrates a very strong negative correlation between the IPAQ score and the Numerical Pain Rating Scale (NPRS), with the relationship being statistically significant ($r = -0.971$, $p < 0.001$). Participants with higher physical activity levels generally reported lower low back pain intensity. The close clustering of the data points around the regression line indicates minimal variability and a strong linear inverse relationship. Furthermore, the narrow confidence interval reflects the precision and consistency of the observed association.

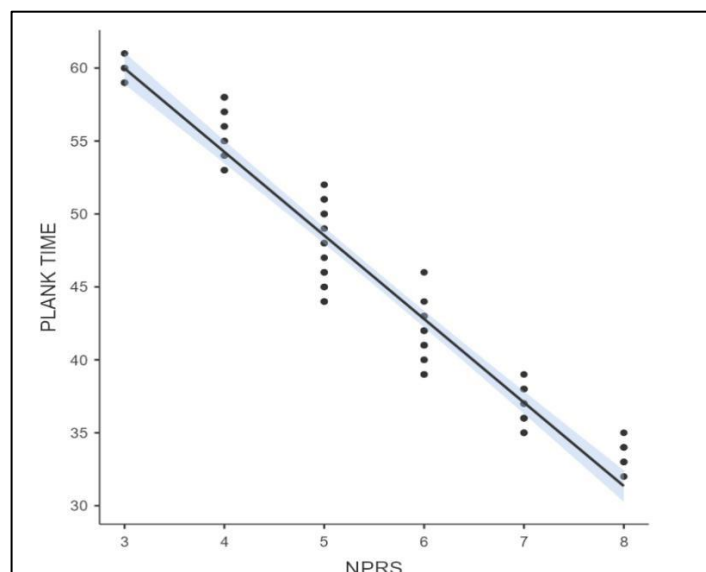


Figure 1.2 Correlation between Plank time and NPRS score

This scatter plot demonstrates a very strong and statistically significant inverse correlation between plank time and NPRS ($r = -0.967$, $p < 0.001$). Increased plank holding time, representing greater core muscular endurance, was associated with lower pain intensity among the participants. The regression

line accurately represents the distribution of the data, with only minor deviations from the fitted trend, indicating a consistent relationship between the variables. The narrow confidence interval further supports the stability and reliability of the estimated association.

DISCUSSION

The study aimed to determine the relationship of core endurance, physical activity level, and pain intensity among policemen with non-specific low back pain (NSLBP). The findings from the study demonstrated that policemen with lower physical activity levels as well as reduced core endurance experienced higher pain intensity. These results provide evidence that inadequate physical conditioning and poor muscular endurance may contribute to the development and persistence of NSLBP in police personnel. Police work often includes vigorous activities like prolonged standing, sitting, patrolling, load carrying, driving, and sudden physical exertion, all of which contribute to stress or overload on the lumbar spine. Performing physical activity and core endurance are essential for maintaining spinal stability, postural control, and efficient load distribution while performing occupational tasks. Reduced muscular endurance may affect trunk stability and neuromuscular control, leading to increased mechanical stress on spinal structures resulting in pain and functional limitations.

The findings of the present study are supported by several previous studies. Sanregret S et al. reported that reduced core endurance and physical fitness were associated with a greater risk of low back pain in firefighters⁵. Similarly, Gordon and Bloxham concluded that performing physical activity and exercise on a regular basis could reduce pain and improve overall functional ability in individuals with NSLBP⁹. Alzahrani et al. also found that police officers who had higher fitness levels and better trunk muscle endurance reported lower prevalence and severity of low back pain, which supports the findings of the current study¹⁰. Furthermore, Smith et al., conducted a study that emphasized on core stabilization exercises which effectively help reduce pain and disability while improving trunk muscle endurance¹¹. Likewise, Marins et al. reported that occupational fitness and conditioning programs should be structured to manage low back pain and to reduce the risk of musculoskeletal injury in tactical populations, including police officers¹². Silva et al. also identified low physical activity levels, prolonged static postures, and poor muscular conditioning are key factors often associated with low back pain among police personnel¹³.

Additionally, Hodges et al. found that reduced core endurance was related to impaired postural control and increased lumbar stress¹⁴, while Simonet et al. reported that altered lumbar movement patterns and reduced spinal stability also contribute to chronic low back pain¹⁵. Tavares et al. further highlighted the relationship between trunk muscle performance and chronic low back pain among military police officers, highlighting the importance of strengthening core and trunk muscles for improving occupational performance and reducing pain¹⁶. The findings of the present study indicate that policemen with better physical activity levels and greater core endurance are more capable of tolerating occupational demands with lower pain intensity. Improved core endurance helps in enhancing spinal support, balance, movement efficiency, and postural control, thereby minimizing excessive strain on the lumbar spine². Conversely, reduced physical activity and poor muscular endurance may lead to complications like early muscle fatigue, altered biomechanics, impaired posture, and increased strain on spinal tissues, resulting in greater pain intensity³.

In the present study, physical activity levels and core endurance were assessed using standardized outcome measures, while pain intensity was measured using the Numerical Pain Rating Scale (NPRS), a

reliable and widely used tool for assessing pain. The observed inverse relationship of physical activity and core endurance, with pain intensity suggests that improvements in physical fitness and trunk muscle endurance may contribute to better pain management and functional capacity among policemen with NSLBP. Overall, the findings of this study are consistent with existing literature and reinforce the importance of maintaining adequate physical activity and core muscular endurance for spinal health. The results support the implementation of regular fitness programs, core strengthening exercises, and occupational health interventions to prevent and manage NSLBP among police personnel, ultimately improving their functional performance, work efficiency, and quality of life.

CONCLUSION

The findings indicate that higher physical activity levels and better core muscular endurance are associated with lower pain intensity among policemen with NSLBP. This suggests that improving physical fitness and trunk muscle endurance may help reduce low back pain.

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