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**EFFECT OF MCGILL EXERCISE ON LUMBOPELVIC STABILITY  
AND PAIN IN ADULT FOOTBALL PLAYERS WITH GROIN PAIN: AN  
EXPERIMENTAL STUDY**

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**ABSTRACT**

**Background & Purpose:** Adductor-related groin pain is a common issue among football players, impacting performance and recovery. This study aims to compare the efficacy of McGill's "Big Three" exercises (curl-up, side bridge, bird-dog) with conventional physiotherapy exercises (isometric adduction, folding knife sit-up) in enhancing lumbopelvic stability and reducing pain in adult male football players with adductor-related groin pain.

**Methodology:** Thirty-two male football players, aged 18–25 years, were randomly assigned to an experimental group performing McGill's exercises or a control group performing conventional physiotherapy exercises. Both groups trained 3 days per week for 6 weeks. Lumbopelvic stability was assessed using a Pressure Biofeedback Unit, and pain intensity was measured with the Numeric Pain Rating Scale (NPRS).

**Results:** The McGill group showed significant improvements in lumbopelvic stability (pre:  $36.00 \pm 1.41$  mmHg; post:  $49.63 \pm 1.96$  mmHg;  $p < 0.001$ ) and pain reduction (pre:  $5.00 \pm 0.73$ ; post:  $1.00 \pm 0.73$ ;  $p < 0.001$ ). The control group also improved in stability (pre:  $35.81 \pm$

1.22 mmHg; post:  $40.63 \pm 1.19$  mmHg;  $p < 0.001$ ) and pain (pre:  $4.81 \pm 0.65$ ; post:  $2.81 \pm 0.83$ ;  $p < 0.001$ ). However, the McGill group exhibited significantly greater improvements in both outcomes compared to the control group.

**Conclusion:** McGill's "Big Three" exercises are more effective than conventional physiotherapy exercises in improving lumbopelvic stability and reducing adductor-related groin pain in male football players. These findings support the use of McGill's exercises as a preferred rehabilitation strategy for this population.

**Keywords:** Groin Pain, McGill Exercises, Lumbopelvic Stability, Numeric Pain Rating Scale, Football Players, Core Stability

## INTRODUCTION

Groin pain is a prevalent condition among football players, primarily due to the sport's high-intensity demands, including repetitive sprinting, sudden directional changes, kicking, and overuse of the adductor muscles [1, 2]. These movements stress on the adductor muscles and surrounding structures, leading to adductor-related groin pain, which is particularly common in male football players due to the biomechanical and physical requirements of the sport [3, 4]. If not treated appropriately, adductor-related groin pain can affect athletic performance and may progress to chronic musculoskeletal dysfunction [3].

Lumbopelvic stability is the ability of the core muscles to maintain optimal alignment and control of spine and pelvis during dynamic movements. It is crucial for efficient force transmission and injury prevention in football [5]. The core muscles, including the transversus abdominis, multifidus, and pelvic floor muscles, play a significant role in stabilizing the

lumbopelvic region, which is essential for reducing strain on the adductor muscles during football-specific activities [6]. Lumbopelvic instability have been associated with an increased risk of groin injuries, as poor core control can lead to compensatory overuse of the adductors, exacerbating pain and dysfunction [5, 7].

Core stability exercises are important for rehabilitation and injury prevention programs for athletes with groin pain [1, 7]. Among these, McGill's "Big Three" exercises—curl-up, side bridge, and bird-dog—are specifically designed to enhance core endurance while minimizing spinal loading [8, 9]. These exercises target deep stabilizing muscles, such as the transversus abdominis and multifidus, which are important for lumbopelvic stability. These exercises improve postural control and reduce pain in athletes with chronic musculoskeletal conditions [10, 6]. For instance, Ammar (2012) demonstrated that McGill exercises were superior to

conventional exercises in improving core stability and reducing pain in individuals with chronic low back pain, suggesting their potential applicability to other musculoskeletal conditions like groin pain. Similarly, Hessam *et al.* (2023) found that McGill's core stability training improved movement patterns and performance in male basketball players, highlighting the exercises' efficacy in enhancing functional outcomes in athletes.

Conventional physiotherapy exercises, such as isometric adduction and folding knife sit-ups, are commonly used to address groin pain by strengthening the adductor muscles and improving local muscular endurance [3, 11]. However, these exercises primarily focus on isolated muscle groups and may not adequately address the dynamic lumbopelvic control required for football-specific movements [5]. Prior research suggests that multi-planar core stability exercises, like McGill's "Big Three," may offer more benefits by reducing compensatory strain on the adductors [6, 7]. Despite the growing evidence supporting core stability interventions, there is limited research directly comparing McGill's "Big Three" exercises to conventional physiotherapy exercises in football players with adductor-related groin pain. This study aims to address this gap by evaluating the efficacy of McGill's exercises in improving lumbopelvic stability and reducing pain

compared to conventional physiotherapy exercises in this population.

## MATERIALS AND METHODS

### Study Design

This experimental study is a randomized controlled trial with simple random sampling to allocate participants to either an experimental group (McGill's exercises) or a control group (conventional exercises). The intervention was conducted over 6 weeks, with sessions held three times per week at a football academy in Ahmedabad city.

### Participants

Thirty-two male football players aged 18–25 years, with at least two years of football experience and training a minimum of three times per week, were recruited. Inclusion criteria included adductor-related groin pain in the dominant leg persisting for at least four weeks, with a pain intensity score of less than 6 on the Numeric Pain Rating Scale (NPRS) during the squeeze test and tenderness upon palpation of the adductor tendon [4,5]. Exclusion criteria included a history of hip or pelvic surgery, lower limb surgeries or conditions, spine-related conditions or surgeries, or participation in other rehabilitation programs. Participants were randomized into two groups (n=16 per group).

### Intervention

**Experimental Group (Group A):** Participants performed McGill's "Big

Three” exercises- curl-up, side bridge, and bird-dog. These exercises were performed three times per week for 6 weeks, as described by McGill (2003). Exercises were performed in sets of 10 repetitions. (n=16 per group)

**Control Group (Group B):** Participants performed a conventional physiotherapy protocol- isometric adduction against a football placed between the feet in a supine position, isometric adduction against a football between the knees in a hook-lying position, and folding knife sit-ups with a football between the knees [5, 11]. These exercises were also conducted three times per week for 6 weeks. Exercises were performed in sets of 10 repetitions. (n=16 per group)

### Outcome Measures

**Lumbopelvic Stability:** Measured using a Pressure Biofeedback Unit (in mmHg) to assess lumbopelvic stability [6]. The PBU provides an objective measure of lumbopelvic control, with higher pressure readings indicating improved stability [8].

**Pain Intensity:** Measured using the Numeric Pain Rating Scale (NPRS), a validated scale [3]. The NPRS was administered during the squeeze test to ensure consistency in pain provocation [4].

### Procedure

Participants were randomized into experimental (n=16) and control (n=16) groups following baseline assessments of

lumbopelvic stability and pain intensity. Post-intervention assessments were conducted after 6 weeks. All statistical analyses were performed using IBM SPSS Statistics version 25. Paired t-tests compared pre- and post-intervention values within groups, and independent t-tests compared differences between groups.

### STATISTICAL ANALYSIS

Data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics (mean  $\pm$  standard deviation) were calculated for all outcome measures. Paired t-tests were used to compare pre- and post-intervention values within each group to assess within-group changes. Independent t-tests were used to compare post-intervention differences between the McGill and control groups to determine between-group differences. The level of significance was set at  $p < 0.05$  (95% confidence level), with a p-value of  $p < 0.001$  indicating significant differences.

### RESULTS

The study evaluated the impact of McGill exercises versus conventional physiotherapy on lumbopelvic stability and pain intensity in adult male football players with adductor-related groin pain. **Table 1** presents the lumbopelvic stability scores. The McGill group (n=16) exhibited a pre-intervention mean of  $36.00 \pm 1.41$  mmHg, improving significantly to  $49.63 \pm 1.96$  mmHg post-intervention (mean difference: 13.63

mmHg;  $p < 0.001$ ). The control group (n=16) showed a pre-intervention mean of  $35.81 \pm 1.22$  mmHg, increasing to  $40.63 \pm 1.19$  mmHg (mean difference: 4.82 mmHg;  $p < 0.001$ ). The McGill group's improvement was significantly greater than the control group's ( $p < 0.001$ ), indicating superior enhancement in lumbopelvic stability. **Table 2** summarizes pain intensity outcomes. The McGill group's pain scores decreased from  $5.00 \pm 0.73$  to  $1.00 \pm 0.73$

(mean difference: 4.0;  $p < 0.001$ ), while the control group's scores reduced from  $4.81 \pm 0.65$  to  $2.81 \pm 0.83$  (mean difference: 2.0;  $p < 0.001$ ). The McGill group demonstrated a significantly greater pain reduction compared to the control group ( $p < 0.001$ ). These results suggest that McGill exercises are more effective in reducing groin pain and improving lumbopelvic stability in this population.

Table 1: Mean Age Table

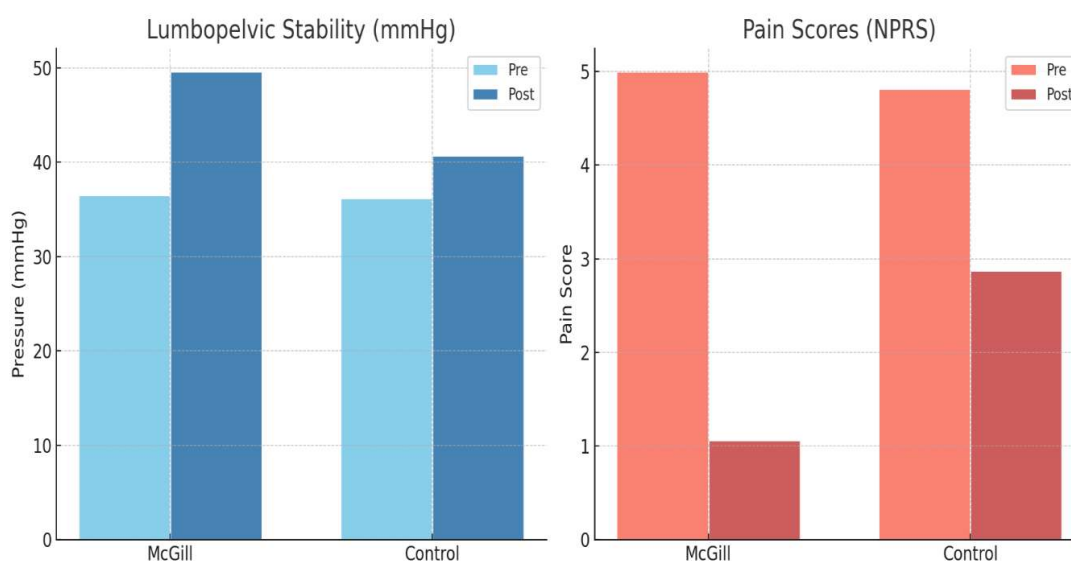
Group	Number of Participants (n)	Mean Age $\pm$ SD (years)
McGill Group	16	21.5 $\pm$ 2.3
Control Group	16	21.5 $\pm$ 2.3

Table 2: Mean and SD of Lumbopelvic Stability Scores (mmHg)

Group	Pre-Intervention Mean $\pm$ SD	Post-Intervention Mean $\pm$ SD	P value
McGill Group	36.00 $\pm$ 1.41	49.63 $\pm$ 1.96	$p < 0.001$
Control Group	35.81 $\pm$ 1.22	40.63 $\pm$ 1.19	$p < 0.001$

Table 3: Mean and SD of Pain Scores (NPRS)

Group	Pre-Intervention Mean $\pm$ SD	Post-Intervention Mean $\pm$ SD	P value
McGill Group	5.00 $\pm$ 0.73	1.00 $\pm$ 0.73	$p < 0.001$
Control Group	4.81 $\pm$ 0.65	2.81 $\pm$ 0.83	$p < 0.001$



Graph 1: Pre and Post graph of Lumbopelvic stability and Pain score of Group A and Group B

## DISCUSSION

This study investigated the efficacy of McGill's "Big Three" exercises compared to conventional physiotherapy exercises in improving lumbopelvic stability and reducing adductor-related groin pain in adult male football players. The results demonstrate that the McGill group achieved a significantly greater improvement in lumbopelvic stability (mean difference: 13.63 mmHg;  $p < 0.001$ ) compared to the control group (4.82 mmHg;  $p < 0.001$ ). Similarly, the McGill group exhibited a more substantial reduction in pain intensity (mean difference: 4.0 NPRS points;  $p < 0.001$ ) than the control group (2.0 NPRS points;  $p < 0.001$ ).

The significant improvement in lumbopelvic stability in the McGill group aligns with prior research by Mills *et al.* (2005), who reported enhanced lumbopelvic control following a 10-week core stability training program in female athletes [6]. The McGill exercises target deep stabilizing muscles, such as the transversus abdominis and multifidus, which are critical for maintaining spinal and pelvic alignment during dynamic movements [10]. These muscles enhance neuromuscular control while minimizing spinal stress, as emphasized by McGill (2003) [9]. This mechanism likely explains the McGill group's superior outcomes, as improved lumbopelvic control reduces compensatory

strain on the adductor muscles, which are often overused in football due to repetitive sprinting and kicking [1, 2]. In contrast, the control group's conventional exercises, focusing on isometric adduction, primarily strengthen isolated muscle groups, which may be less effective in addressing dynamic core deficits [11]. This is supported by Karababa and Kilinc-Boz (2023), who noted that core training improves functional outcomes like balance and agility in young footballers, suggesting a broader impact of multi-planar exercises [11].

The substantial pain reduction in the McGill group (from 5.0 to 1.0 on the NPRS) compared to the control group (4.81 to 2.81) corroborates findings by Chaari *et al.* (2024), who demonstrated that a 12-week core stability program reduced pain and improved balance in soccer players with groin pain [7]. The McGill exercises likely alleviate adductor strain by enhancing lumbopelvic stability, which optimizes force transmission and reduces compensatory overuse of the adductors, as supported by Persson *et al.* (2017) [5]. This is particularly relevant in football, where adductor-related groin pain is prevalent due to the sport's biomechanical demands [3, 4]. The control group's lesser pain reduction suggests that while isometric adduction exercises strengthen local muscles, they do not address the broader lumbopelvic dysfunction contributing to groin pain [3].

The multi-planar nature of McGill exercises, as described by Hessam *et al.* (2023), likely enhances functional stability, making them more effective for pain management and rehabilitation in athletes [10].

The McGill exercises' multi-planar approach likely facilitates better force transmission across the kinetic chain, reducing compensatory strain on the adductors. This aligns with findings from Hölmich *et al.* (2010), who demonstrated that a structured exercise program targeting core and hip muscles significantly reduced groin pain incidence in football players [12]. These results suggest that incorporating McGill's exercises into rehabilitation protocols could offer long-term benefits for injury prevention and functional performance in this population.

Limitations include the 6-week duration, which may not reflect long-term outcomes, and the focus on male players from one city, limiting generalizability. Future research should explore longer interventions and diverse populations.

## CONCLUSION

McGill exercises significantly improve lumbopelvic stability and reduce groin pain in football players compared to conventional physiotherapy. The McGill group's greater improvements highlight the efficacy of these exercises in sports rehabilitation. Incorporating McGill's "Big Three" into training protocols may enhance

performance and prevent injuries in football players [12].

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