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CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 15, Issue, 09, pp.4935-4942, September, 2024

International Journal of Recent Scientific Research

ISSN: 0976-3031

RESEARCH ARTICLE

SNAPPING HIP SYNDROME: A COMPARATIVE STUDY OF THE EFFECTS OF PHYSIOTHERAPY INTERVENTIONS ON HIP STRENGTH AND RANGE OF MOTION

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DOI: http://dx.doi.org/10.24327/ijrsr.20241509.0930

ARTICLE INFO

Article History:

Received 28th July, 2024
Received in revised form 29th August, 2024
Accepted 16th September, 2024
Published online 28th September, 2024

Key words:

Snapping Hip Syndrome, Physiotherapy, hip strength, range of motion, strengthening exercises, stretching exercises.

ABSTRACT

Background and Purpose: Snapping Hip Syndrome (SHS), commonly known as "coxa saltans," is characterized by an audible or palpable snapping sensation during hip movement. SHS predominantly affects athletes and individuals engaged in repetitive hip motions, often leading to discomfort and reduced functional capacity. The condition is classified into internal, external, and intra-articular types, each with distinct causes. This study aims to compare the effects of two Physiotherapy interventions—strengthening-focused and stretching-focused—on hip strength and range of motion (ROM) in patients diagnosed with SHS.

Methodology: A total of 40 participants were randomly divided into two groups: Group A underwent a strengthening-focused intervention, while Group B followed a stretching-focused protocol. The interventions were administered over eight weeks, with sessions conducted three times a week. Hip strength was measured using a handheld dynamometer, and ROM was assessed using a goniometer. Statistical analysis involved paired and unpaired t-tests to evaluate pre- and post-intervention changes.

Results: Both groups demonstrated significant improvements in ROM across all exercises, with no statistically significant differences between the two groups in post-intervention ROM. However, Group A exhibited significantly greater improvements in hip strength, particularly in flexors, extensors, abductors, and adductors, compared to Group B.

Conclusion: Strength-based interventions are more effective in enhancing hip strength in SHS patients, while both strengthening and stretching exercises contribute equally to improvements in ROM. A combined therapeutic approach may offer the most comprehensive benefits, addressing both strength and flexibility deficits in SHS patients.

INTRODUCTION

Snapping Hip Syndrome (SHS), also known as "coxa saltans" or "dancer's hip," is a condition characterized by a snapping sensation or audible 'snapping' sound during hip movement. This phenomenon can occur when the hip is in motion, particularly during activities such as walking, running, or rising from a seated position. SHS is commonly observed in athletes, dancers, and individuals who engage in repetitive hip movements, but it can also affect the general population[1].

The hallmark of SHS is the distinctive 'snapping' sound or sensation that occurs when tendons or muscles slide over bony structures in the hip joint. Although the snapping itself is typically painless, it can be associated with discomfort, pain, or a feeling of instability, especially when the underlying cause is left untreated[2]. The snapping can be intermittent or

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consistent, depending on the severity of the condition and the activity level of the individual.

Snapping Hip Syndrome (SHS) can be classified into three main types: internal, external, and intra-articular, each associated with distinct anatomical structures and mechanisms. Internal SHS occurs when the iliopsoas tendon, or occasionally the rectus femoris tendon, snaps over the iliopectineal eminence, the anterior capsule of the hip joint, or the lesser trochanter. This type is characterized by a snapping sensation felt at the front of the hip, especially during hip flexion and extension movements such as lifting the leg or bringing the knee towards the chest. It is commonly seen in athletes and dancers due to the repetitive nature of their activities. External SHS involves the iliotibial band or the gluteus maximus tendon snapping over the greater trochanter of the femur. The snapping sensation in this type is typically felt on the outside of the hip and is most noticeable during hip abduction or rotation. This type is also prevalent among athletes, particularly runners and cyclists, and can be exacerbated by tightness in the iliotibial band. Intra-articular SHS differs from the other types as it involves loose bodies within the hip joint, labral tears, or other intra-articular pathologies. The snapping in this type is often accompanied by a catching or locking sensation, with pain usually deep within the hip joint[1]. Intra-articular SHS may be linked to more severe hip conditions and often requires imaging studies for accurate diagnosis[3]. Understanding these types is essential for tailoring appropriate Physiotherapy interventions, as the underlying causes and affected structures vary between them.

The prevalence of SHS in the general population is relatively low, but it is significantly higher in specific groups such as athletes and dancers. Studies have shown that the prevalence of SHS among athletes can range from 5% to 10% depending on the sport and the level of activity. For instance, a study conducted by Allen et al. found that SHS was present in approximately 7% of elite soccer players, with a higher incidence among those with increased hip flexion demands during play[4].

Dancers, particularly ballet dancers, are another group with a high prevalence of SHS. This is likely due to the repetitive and extreme ranges of motion required in their training. According to a study by Mayers et al., SHS was observed in 8.5% of professional ballet dancers, with a higher occurrence in those who had been dancing for over 10 years[5]. The study also noted that female dancers were more likely to develop SHS than their male counterparts, possibly due to anatomical differences and training patterns.

Demographic factors such as age and gender also play a role in the prevalence of SHS. Young adults, particularly those aged 12 to 27 years, are more commonly affected, with a peak incidence observed in the late teens to early twenties[6]. Gender differences have also been reported, with females more frequently affected than males, potentially due to greater joint laxity and anatomical variations in pelvic structure[7].

The biomechanics of the hip joint are essential for understanding how and why snapping occurs. During normal movement, the hip joint allows for smooth and controlled flexion, extension, abduction, adduction, and rotation. The forces generated by the muscles and tendons work together to stabilize the joint and enable efficient movement.

Several factors contribute to abnormal movement patterns in Snapping Hip Syndrome (SHS), increasing the likelihood of snapping. Muscle imbalances between the hip flexors and extensors or between the abductors and adductors can disrupt normal movement patterns, raising the risk of snapping[8]. Additionally, tightness in the Iliotibial Band (ITB) or iliopsoas muscles can exacerbate the snapping phenomenon, while weakness in the surrounding muscles may compromise joint stability[9]. Structural abnormalities, such as femoral head deformities or acetabular labral tears, can create irregular surfaces within the hip joint, leading to abnormal movement patterns and contributing to the snapping sensation[10].

The clinical presentation of Snapping Hip Syndrome (SHS) typically includes several characteristic signs. An audible snap is a prominent feature, where a noticeable popping sound occurs with movement of the hip joint. This sound, often described as a "click" or "snap," can be heard by both the patient and the clinician. Additionally, a palpable snap may be detected by the examiner during a physical examination, where the snapping sensation can be felt directly[13]. Pain and discomfort are also common, with the pain usually localized to the hip region and potentially exacerbated by specific movements or activities. The discomfort is often described as sharp, aching, or throbbing, and can significantly impact the patient's daily activities and functional performance[11].

Diagnosing Snapping Hip Syndrome (SHS) requires a combination of clinical evaluation and imaging techniques to accurately differentiate it from other hip disorders with similar symptoms[12]. The diagnostic process begins with a comprehensive physical examination. This includes a detailed patient history, focusing on the onset, duration, and characteristics of symptoms, as well as any previous injuries or activities that may have contributed to the condition. The physical examination involves assessing the hip joint's range of motion, palpating specific anatomical structures, and evaluating the snapping sensation. Special tests, such as the Thomas test and the Ober test, are employed to identify SHS and assess the involvement of particular tendons or muscles.

Imaging techniques are crucial for confirming the diagnosis of Snapping Hip Syndrome (SHS) and evaluating the extent of the condition. Commonly utilized imaging modalities include ultrasound and magnetic resonance imaging (MRI). Ultrasound provides real-time visualization of the hip joint and surrounding soft tissues, making it particularly effective for identifying abnormalities in tendons and bursae and detecting the snapping phenomenon. MRI, on the other hand, offers detailed images of the internal structures of the hip joint, including tendons, muscles, and cartilage. It is valuable for ruling out other potential causes of hip pain and assessing underlying pathologies such as labral tears or cartilage damage[14].

Accurate diagnosis of Snapping Hip Syndrome (SHS) necessitates distinguishing it from other conditions with similar presentations. Key differential diagnoses include labral tears, which involve injury to the acetabular labrum and can result in hip pain and mechanical symptoms. Hip Impingement Syndrome, characterized by abnormal contact between the femoral head and the acetabulum, can lead to pain and reduced range of motion. Bursitis, involving inflammation of the bursa

around the hip joint, may produce pain and discomfort like SHS. Additionally, tendinitis or tendinosis, which refers to inflammation or degeneration of the tendons surrounding the hip joint, can present with symptoms comparable to SHS. Accurate diagnosis is crucial for formulating an effective treatment plan and enhancing patient outcomes.

The snapping phenomenon can lead to muscle weakness due to compensatory mechanisms. For instance, chronic irritation or repetitive snapping may result in overuse of certain muscle groups while underutilizing others, potentially leading to muscle imbalances. Weakness in the iliopsoas or gluteus medius, for example, can compromise hip stability and strength, impacting overall function and increasing the risk of further injury or dysfunction[15].

Additionally, repetitive snapping can lead to tendonitis or bursitis, contributing to muscle atrophy and decreased strength. The pain and discomfort associated with SHS may also result in reduced physical activity, further exacerbating muscle weakness and imbalance[16]. Therefore, addressing these muscular imbalances through targeted Physiotherapy interventions is crucial for restoring optimal hip strength.

SHS can also restrict hip range of motion (ROM), which directly impacts functional capabilities in daily activities and sports. The snapping sensation often results from the movement of tendons or muscles over bony structures or other soft tissues, which can lead to inflammation and scar tissue formation. This inflammation can cause joint stiffness and decreased ROM[17].

Restricted ROM can manifest as a decreased ability to perform activities requiring full hip flexion, extension, or rotation. For instance, individuals with SHS may experience difficulty in squatting, climbing stairs, or participating in sports that require dynamic hip movements[18]. The reduced range of motion not only affects athletic performance but also hinders daily functional tasks, thereby impacting the quality of life.

Furthermore, the mechanical alteration in the hip joint caused by SHS may lead to compensatory movement patterns, which can affect the efficiency of hip motion and contribute to further functional limitations[19]. Addressing these ROM restrictions through Physiotherapy can help improve flexibility, reduce discomfort, and enhance overall hip function.

Snapping Hip Syndrome (SHS) can be managed through a range of treatment modalities, broadly categorized into conservative and surgical approaches. The choice of treatment often depends on the severity of symptoms, the underlying cause of the snapping, and the patient's overall functional goals.

Conservative treatment is generally the first-line approach for managing Snapping Hip Syndrome (SHS), focusing on non-invasive methods to alleviate symptoms and enhance function. Key components of conservative treatment include rest and activity modification, which involves reducing or altering activities that exacerbate symptoms. Avoiding movements that trigger the snapping sensation can help diminish inflammation and discomfort[20]. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are often used to manage pain and inflammation associated with SHS[21]. Ice and heat therapy also play a role; ice can reduce acute inflammation, while heat therapy helps relax tight muscles and improve blood flow. Additionally, targeted stretching and strengthening exercises are crucial, focusing on the iliotibial band, hip flexors, and gluteal muscles to alleviate symptoms and improve overall hip function [22].

Surgical intervention is typically considered when conservative measures fail to alleviate symptoms of Snapping Hip Syndrome (SHS). The primary surgical options include arthroscopic surgery and open surgery. Arthroscopic surgery is a minimally invasive technique that allows for direct visualization and treatment of the snapping structures within the hip joint, such as the iliopsoas tendon or the iliotibial band[23]. In cases where arthroscopy is not feasible due to complex or significant anatomical issues, open surgical approaches may be employed to address these challenges.

Physiotherapy (PT) plays a crucial role in managing Snapping Hip Syndrome (SHS) and is often a primary intervention. The primary goals of Physiotherapy include reducing pain, improving range of motion, and enhancing hip strength and stability[24]. Common Physiotherapy techniques used in the treatment of SHS include manual therapy, which involves techniques such as joint mobilization and soft tissue manipulation to alleviate pain and improve hip function by addressing restrictions in the joint and surrounding tissues. Stretching exercises targeting the iliotibial band, iliopsoas, and other tight structures help relieve the snapping sensation, enhance flexibility, and reduce muscle tightness. Strengthening exercises for the hip abductors, extensors, and rotators are essential for stabilizing the hip joint and preventing symptom recurrence, often involving resistance training and functional movements. Additionally, postural and biomechanical education is provided to help patients adopt proper posture and body mechanics during activities that stress the hip joint. A tailored Physiotherapy program developed can significantly improve outcomes for patients with SHS.

Despite extensive research into various aspects of SHS, several gaps remain in the literature concerning the effectiveness of Physiotherapy interventions on hip strength and range of motion.

Current studies predominantly focus on the general treatment outcomes of SHS, with limited evidence specifically addressing the comparative efficacy of different Physiotherapy modalities. For instance, while some research highlights the benefits of stretching and strengthening exercises, there is a notable scarcity of studies that systematically compare these interventions to determine their relative effectiveness[25].

Studies comparing stretching exercises, strengthening protocols, and combined therapeutic approaches would be instrumental in identifying the most effective methods for enhancing hip function and alleviating symptoms. Additionally, a comparative analysis can help refine Physiotherapy practices, ensuring that interventions are tailored to individual patient needs and conditions[26].

The aim of this study is to evaluate and compare the effectiveness of different Physiotherapy interventions in improving hip strength and range of motion in patients with Snapping Hip Syndrome (SHS). The specific objectives include assessing the baseline hip strength and range of motion in SHS patients and comparing the effects of various Physiotherapy interventions, such as stretching exercises, strengthening exercises, and

manual therapy, on these parameters. Additionally, the study seeks to identify the most effective intervention for improving symptoms and functional outcomes in SHS patients, ultimately providing evidence-based recommendations for Physiotherapy practice based on a comparative analysis of the intervention outcomes.

METHODOLOGY

This study was a comparative evaluation of different Physiotherapy interventions on hip strength and range of motion (ROM) in patients with Snapping Hip Syndrome (SHS). The study involved 40 participants, randomly assigned to two groups of 20 each. Group A received strengthening exercises and manual therapy, while Group B followed stretching protocols combined with manual therapy and therapeutic exercises. Participants were selected based on specific inclusion and exclusion criteria, including age between 18 and 45, both male and female, and no prior hip surgeries. Exclusions were made for patients with congenital hip deformities, severe trauma, systemic musculoskeletal disorders, pregnant women, and those undergoing other treatments for SHS. The primary parameters measured were hip strength, assessed using a handheld dynamometer, and ROM, evaluated using a goniometer to measure hip flexion, extension, abduction, and internal/external rotation. These tools ensured accurate measurement of outcomes, helping to determine the effectiveness of the interventions in improving SHS symptoms.

PROCEDURE:

Participants in Group A underwent a structured strengthening program aimed at improving muscle strength around the hip joint, specifically targeting the hip abductors, adductors, flexors, and extensors to stabilize the hip and prevent Snapping Hip Syndrome (SHS) symptoms[34,35]. The exercise protocol included resistance training with elastic bands, ankle weights, and bodyweight exercises like squats, lunges, and leg raises, with progression achieved by increasing resistance or repetitions. Each session began with a 10-minute warm-up involving light aerobic exercises such as walking or cycling, followed by dynamic stretching of the lower limbs. Core exercises focused on controlled movements, including hip abduction in side-lying, hip extension in prone, and hip flexion in standing positions, to maximize muscle engagement while minimizing injury risk. Manual therapy was provided by incorporating joint mobilizations, soft tissue manipulation, and myofascial release to improve joint mobility, reduce muscle tightness, and relieve pain[36]. Joint mobilizations targeted the hip's posterior capsule, using Grade III and IV techniques to enhance hip flexion and internal rotation, while soft tissue manipulation, including deep tissue massage and trigger point release, was applied to alleviate tension in the iliopsoas and tensor fasciae latae muscles[38].

Participants in Group B followed a stretching protocol combined with manual therapy and additional therapeutic exercises aimed at improving flexibility and joint stability. The stretching protocol targeted the flexibility of the iliopsoas, tensor fasciae latae, and gluteal muscles, which are often implicated in Snapping Hip Syndrome (SHS). Each stretch was held for 30 seconds and repeated three times per muscle group, with a 10-second rest between repetitions. Specific stretches included the iliopsoas stretch in a kneeling lunge position, the tensor fasciae latae stretch in a standing cross-legged position, and the gluteal stretch in a supine position with the hip flexed and externally rotated. Similar to Group A, each session began with a 10-minute warm-up to increase blood flow and enhance the effectiveness of the stretches. Manual therapy in Group B was similar to that of Group A, focusing on joint mobilizations and soft tissue techniques to improve hip joint function and muscle extensibility. Special attention was given to mobilizing the hip joint in a way that complemented the stretching exercises, increasing the overall range of motion and reducing SHS symptoms. In addition to stretching and manual therapy, Group B participants performed therapeutic exercises aimed at enhancing hip stability and proprioception. These exercises included single-leg stance drills, hip bridging, and pelvic tilts, all chosen to improve dynamic stability and prevent the recurrence of symptoms, contributing to better functional outcomes.

RESULTS

The paired t-test analysis was performed to assess the statistical significance of changes in pre-test and post-test measurements within both Group A and Group B for range of motion (ROM) and hip strength. In terms of flexion, Group A's mean ROM improved from 92.25° (±1.55) to 102.75° (±5.01), with a t-value of -8.51 ($p < 0.01$), showing extremely significant improvement. Similarly, Group B's mean ROM increased from 92.55° (±2.04) to 102.95° (±3.98), with a t-value of -10.26 ($p < 0.01$), confirming extremely significant results. For extension, Group A's ROM improved from 6.7° (±1.03) to 12.1° (±2.83), with a t-value of -7.32 ($p < 0.01$), while Group B showed an improvement from 6.95° (±1.19) to 10.35° (±3.01), with a t-value of -4.25 ($p = 0.0004$). Both groups demonstrated significant improvements in abduction and adduction. Group A's abduction increased from 26.3° (±0.73) to 28.7° (±1.03) (t-value of -8.43, $p < 0.01$), and adduction rose from 8.55° (±0.51) to 17.7° (±4.88) (t-value of -8.42, $p < 0.01$). Group B's abduction improved from 26.0° (±0.65) to 28.6° (±0.94) (t-value of -10.18, $p < 0.01$), and adduction increased from 9.25° (±0.64) to 17.25° (±3.6) (t-value of -9.22, $p < 0.01$).

For hip strength, Group A's flexor strength improved from 4.5 (±0.75) to 5.89 (±0.92) (t-value of -7.61, $p < 0.01$), while Group B's flexor strength increased from 4.0 (±0.85) to 4.08 (±0.54) (t-value of -6.45, $p < 0.01$). In extensor strength, Group A showed an improvement from 8.0 (±0.95) to 9.78 (±0.48) (t-value of -13.36, $p < 0.01$), and Group B improved from 7.5 (±0.72) to 7.88 (±0.42) (t-value of -9.26, $p < 0.01$). Abductor strength also significantly improved, with Group A increasing from 6.5 (±0.73) to 7.33 (±0.66) (t-value of -9.83, $p < 0.01$) and Group B improving from 5.2 (±0.94) to 5.29 (±0.66) (t-value of -7.56, $p < 0.01$). Finally, adductor strength showed significant gains, with Group A increasing from 4.9 (±1.05) to 5.24 (±1.27) (t-value of -3.18, $p < 0.01$), and Group B improving from 6.1 (±1.15) to 6.67 (±1.55) (t-value of -2.95, $p < 0.01$).

The unpaired t-test analysis was performed to compare post-test range of motion (ROM) and strength between Group A and Group B, assessing differences following the interventions. In terms of ROM, flexion results showed no significant difference between the two groups, with Group A having a mean post-test

Table I Group A & Group B Post Test ROM

Group	Mean A	Std A	SE A	Mean B	Std B	SE B	T-value	P-value
Flexion Group A & B	102.75	5.01	1.12	102.95	3.98	0.89	-0.14	0.8896
Extension Group A & B	12.1	2.83	0.63	10.35	3.01	0.67	1.89	0.0658
Abduction Group A & B	28.45	1.1	0.25	28.6	0.94	0.21	-0.46	0.6454
Adduction Group A & B	17.7	4.88	1.09	17.25	3.6	0.8	0.33	0.7417

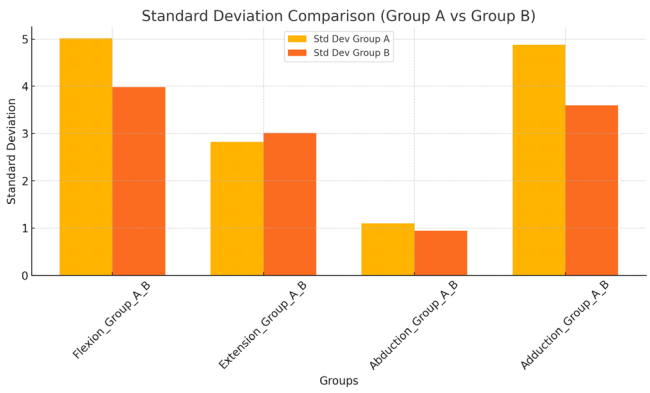
Table II Group A & B Post Test for Strength

Group	Mean A	Std A	SE A	Mean B	Std B	SE B	T-value	P-value
Flexors Group A & B	5.89	0.92	0.21	4.08	0.54	0.12	7.61	0.0
Extensors Group A & B	9.78	0.48	0.11	7.88	0.42	0.09	13.36	0.0
Abductors Group A & B	7.33	0.66	0.15	5.29	0.66	0.15	9.83	0.0
Adductors Group A & B	5.24	1.27	0.28	6.67	1.55	0.35	-3.18	0.0029

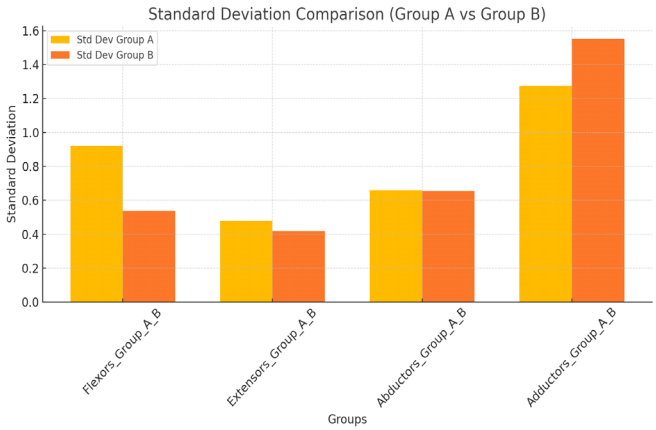
ROM of 102.75° (±5.01) and Group B with 102.95° (±3.98), resulting in a t-value of -0.14 (p = 0.8896). Similarly, extension showed no significant difference, with Group A's post-test mean at 12.1° (±2.83) and Group B's at 10.35° (±3.01), yielding a t-value of 1.89 (p = 0.0658). For abduction, Group A had a post-test mean of 28.45° (±1.1) and Group B 28.6° (±0.94), resulting in a t-value of -0.46 (p = 0.6454), and adduction post-test means were 17.7° (±4.88) for Group A and 17.25° (±3.6) for Group B, with a t-value of 0.33 (p = 0.7417), all indicating no significant differences in ROM between the groups.

However, significant differences were found in post-test strength between Group A and Group B. Flexor strength in Group A was significantly higher at 5.89 (±0.92) compared to 4.08 (±0.54) in Group B, with a t-value of 7.61 ($p < 0.01$). Extensor strength also showed extremely significant differences, with Group A's mean at 9.78 (±0.48) and Group B's at 7.88 (±0.42), resulting in a t-value of 13.36 ($p < 0.01$). Abductor strength was significantly higher in Group A (7.33 ±0.66) compared to Group B (5.29 ±0.66), yielding a t-value of 9.83 ($p < 0.01$). Conversely, adductor strength was significantly higher in Group B (6.67 ±1.55) compared to Group A (5.24 ±1.27), with a t-value of -3.18 (p = 0.0029), indicating extremely significant differences.

This analysis reveals that while both groups showed similar improvements in ROM, Group A demonstrated significantly higher strength gains in flexors, extensors, and abductors, whereas Group B showed superior adductor strength post-intervention.



Graph I Standard Deviation Comparison of Rom



Graph I Standard Deviation Comparison of Strength

DISCUSSION

The current study aimed to evaluate and compare the effects of two Physiotherapy interventions on hip strength and range of motion (ROM) in patients diagnosed with Snapping Hip Syndrome (SHS). The study included Group A, which underwent a strengthening-focused intervention, and Group B, which received a stretching-focused intervention. Paired and unpaired t-tests were conducted to assess pre- and post-intervention improvements in flexion, extension, abduction, and adduction.

The key findings include Both groups showed significant improvements in ROM across all exercises, with no significant differences between the two groups in post-intervention ROM. Hip strength improvements were significantly greater in Group A, especially in flexors, extensors, abductors, and adductors, where Group A demonstrated extremely significant gains compared to Group B.

The improvements in both hip strength and ROM observed in this study align with previous research in the field of Physiotherapy for SHS. Several studies, such as those by Patil[29] et al. (2021) and Kemp[31] et al. (2021), emphasize the role of targeted strengthening and stretching exercises in improving functional outcomes in SHS patients. The current study's findings support these observations, particularly regarding the effectiveness of strengthening interventions in enhancing hip

muscle strength.

The ROM improvements observed in both groups suggest that Physiotherapy, regardless of its focus on either stretching or strengthening, is effective in enhancing hip flexibility in SHS patients. These findings are consistent with research by Mayers[5] et al. (2020), which highlights the general effectiveness of flexibility interventions in improving joint ROM. However, the current study's observation that there were no significant differences in ROM between Group A (strength-focused) and Group B (stretch-focused) diverges from Mayers[5] et al.'s findings, which suggested that stretching protocols lead to greater flexibility gains. This discrepancy could indicate that in SHS patients, both strength and flexibility contribute to ROM improvements, making a combined approach more effective.

The most notable finding of the study was the significantly greater improvement in hip strength in Group A compared to Group B. Group A, which underwent a strength-targeted intervention, exhibited extremely significant increases in flexor, extensor, abductor, and adductor strength. These findings are consistent with those of Kemp et al. (2021), who demonstrated that strength-based interventions have a superior impact on muscle function compared to stretching protocols. The results of this study suggest that strength-focused therapy is essential for SHS patients to improve muscular control and stability of the hip joint, both of which are critical in managing SHS symptoms.

The variation in results between the two groups can be explained by several factors. Firstly, the type of intervention played a significant role. Group A experienced greater strength improvements, likely due to their more intensive resistance-based exercises, which directly targeted the muscles involved in hip stabilization. On the other hand, Group B's focus on stretching was less effective at inducing muscle hypertrophy and strength adaptations. Additionally, the time frame of the intervention may have impacted Group B's outcomes. The 8-week period might not have been long enough for stretching protocols to produce significant strength gains, as these generally require more extended durations to show measurable effects. Future research involving longer interventions may provide more balanced results between flexibility and strength improvements. Lastly, baseline differences among participants could also account for the observed variations. Individuals with lower initial strength likely saw more significant gains in Group A, while those with tighter hip muscles benefited more from Group B's stretching regimen. Individual responses to Physiotherapy can differ widely, which may explain some of the discrepancies in the outcomes.

The findings of this study support the hypothesis that strength-targeted interventions result in greater improvements in hip strength than stretching-focused interventions in SHS patients. The results show that strengthening protocols specifically enhance hip flexor, extensor, abductor, and adductor strength, all of which are essential for controlling hip movement and preventing snapping sensations caused by muscle imbalances or tightness.

In terms of ROM, the hypothesis that there would be significant differences between the two groups post-intervention was not supported. Both groups showed similar improvements in ROM, suggesting that flexibility gains are achievable through either strengthening or stretching protocols. These findings have practical implications for clinical practice, as they highlight the importance of incorporating strength training into Physiotherapy programs for SHS patients.

The practical implications of these findings suggest that strengthening exercises should be a priority in rehabilitation programs for Snapping Hip Syndrome (SHS) to improve hip stability, reduce snapping, and prevent symptom recurrence. Specifically, exercises targeting the hip flexors and abductors have demonstrated significant improvements in muscle function and strength. Although stretching exercises can enhance range of motion (ROM), the results indicate that combining both strengthening and flexibility training offers a more comprehensive solution. This balanced approach would address both mobility and muscle strength, leading to better overall outcomes in rehabilitation.

The study has several strengths that enhance its significance. Firstly, the use of objective measures, such as paired and unpaired t-tests, reinforces the validity of the findings by ensuring the results are grounded in statistically significant data. Secondly, the comparative design, which assessed the outcomes of two distinct Physiotherapy interventions, provides valuable insights into the relative effectiveness of different treatment approaches for Snapping Hip Syndrome (SHS). Lastly, the inclusion of both strength and range of motion (ROM) assessments allows for a comprehensive evaluation of the interventions' impact on hip function, contributing to a more holistic understanding of their effectiveness.

The study has several limitations that should be considered. The small sample size of 40 participants limits the generalizability of the findings, and a larger cohort would provide more robust data applicable to a broader population of SHS patients. Additionally, the 8-week intervention duration may have been insufficient to capture long-term effects, and while improvements in strength and ROM were observed, longer-term studies are needed to assess the sustainability of these gains. The study also did not account for individual variations in participants' baseline fitness levels, flexibility, or muscle strength, which could have influenced the results. Future research should consider longer follow-up periods, larger sample sizes, and explore hybrid training programs that combine strengthening and flexibility exercises. Investigating the benefits of individualized treatment plans based on baseline characteristics and delving into the underlying mechanisms of SHS to understand how different interventions affect the root causes of snapping sensations and muscle imbalances would also be beneficial.

CONCLUSION

This study evaluated the effects of two distinct Physiotherapy interventions on hip strength and range of motion (ROM) in patients diagnosed with Snapping Hip Syndrome (SHS). Group A, which followed a strength-targeted intervention, demonstrated significantly greater improvements in hip strength compared to Group B, which received a stretching-focused protocol. Both groups, however, exhibited similar improvements in ROM, indicating that both interventions were effective in enhancing flexibility.

The results indicate that strength-based interventions are

more effective in improving muscle strength, particularly in the hip flexors, extensors, abductors, and adductors. Despite the similarity in ROM improvements, the significant gains in strength observed in Group A suggest that targeting muscle strength may offer greater benefits in managing SHS, particularly in stabilizing the hip and reducing snapping sensations.

The practical implications of these findings emphasize the importance of incorporating strengthening exercises into rehabilitation programs for SHS to improve muscle function, hip stability, and prevent the recurrence of symptoms. While both interventions positively impacted ROM, a combination of strengthening and flexibility training could provide a more comprehensive approach to addressing both mobility and muscle strength.

Several strengths contribute to the validity of this study. The use of objective measures, such as paired and unpaired t-tests, provides a statistically robust analysis of the interventions' effectiveness. Additionally, the comparative design allows for a direct evaluation of the relative impact of two distinct therapy approaches. However, limitations include the small sample size and the relatively short duration of the intervention period, which may affect the generalizability of the findings. Future research with larger sample sizes and longer follow-up periods is recommended to assess the long-term effects of these interventions.

In conclusion, strengthening-focused interventions offer superior benefits for improving hip strength in patients with SHS, while both strength and flexibility training positively impact ROM. The results suggest that rehabilitation programs incorporating both elements may provide the most comprehensive improvements in hip function.

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How to cite this article:

Sudesh Thalathoti ., Anil Kumar Harimanikyam., D Namrata and P Jeevana Jyothi.(2024). Snapping hip syndrome: a comparative study of the effects of physiotherapy interventions on hip strength and range of motion. *Int J Recent Sci Res*.15(09), pp.4935-4942.

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