

Optimising Hip and Knee Joint Mobility in College Women Students: Assessing the Influence of Hydraulic Resistance Training with Self-Myofascial Release

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Abstract

Objective

The study aims to examine the impact of modern lifestyle on college women students' health, specifically focusing on their hip and knee joint mobility. The objective is to assess the influence of hydraulic resistance training with self-myofascial release technique on improving joint mobility in college women students. The study also aims to compare the effectiveness of hydraulic resistance training with and without self-myofascial release technique on hip and knee joint mobility.

Methods

The study used a randomised controlled trial design to recruit thirty college women students aged 18-25 through campus advertisements and announcements. Screening for medical conditions or injuries that might affect participation was conducted. Participants were randomly assigned to Group A (Hydraulic Resistance Training with Self-Myofascial Technique) or Group B (Hydraulic Resistance Training without Self-Myofascial Technique). Baseline assessments included joint range of motion (ROM) measurements using a goniometer. Certified trainers supervised the training sessions, and the data was analysed using mean and standard deviation by SPSS.

Results

The study aimed to evaluate the impact of hydraulic resistance training with self-myofascial release on hip and knee joint mobility among college women students. The results showed that both groups improved hip and knee flexion with and without the self-myofascial release technique. However, the group using the self-myofascial release technique (Group A) showed a more significant improvement, as indicated by the smaller p-value compared to Group B. It was suggested that the self-myofascial release technique may enhance hip and knee joint mobility.

Conclusion

The study concludes that Hydraulic Resistance Training with Self-Myofascial Release (HSMR) could improve hip and knee joint mobility among college women students. The findings suggest that integrating the self-myofascial release technique into training regimens can benefit joint mobility. However, further research with larger sample sizes and extended intervention periods is needed to understand these improvements' long-term effects and sustainability.

Keywords: Hydraulic Resistance Training, Self-Myofascial Release, Hip and Knee Joint Mobility, College Women Students.

1. Introduction

The dynamic and multifaceted nature of college women students' lifestyle emphasises its pivotal role in shaping their well-being and personal growth. The Characterized was a transitional phase of newfound freedom, exploration, and self-discovery, and it brings a unique blend of academic pursuits, social interactions, and personal responsibilities. The influence of diverse cultural,

societal, and technological factors on their choices is acknowledged. Especially the impact of COVID-19 on college women students' lifestyles, considering the disruptions it has introduced to their routines, learning formats, and overall well-being. The subsequent sections will delve into specific components of their lifestyle, such as sleep, diet, physical activity, stress management, social interactions, and digital engagement. The goal is to

comprehensively understand their lives, identify influencing factors, and explore opportunities for interventions to promote their overall health and well-being.

The study aims to examine the impact of modern lifestyle on medical students' health through a literature review and a questionnaire. Findings reveal high percentages of sedentary lifestyles, breakfast skipping, and unhealthy diets among participants. The conclusion emphasises the need for individuals to be attentive to daily practices due to the potential adverse effects of modern lifestyle on quality of life (Victoire et al., 2022).

The study compares the caloric expenditure, heart rate, and perceived exertion of different exercise modalities, including treadmill, cycle, weights, and a hydraulic resistance system (HRS). The aim is to determine the most effective exercise method for energy expenditure and potential benefits for body composition and athletic performance (Falcone et al., 2015). The study comprised 60 healthy, untrained women randomly assigned to different training teams. The document provides information about the training procedures, testing procedures, statistical techniques, and results (Manosakthi & Kalimuthu, 2023a). Hydraulic and ladder training has significantly changed the lipid profile of TCL, LDL and HDL for College women Students (Manosakthi & Kalimuthu, 2023).

This study aims to evaluate the acute effect of self-myofascial release on muscle flexibility in long-distance runners. The results show that the self-myofascial release technique significantly improved muscle flexibility, particularly in the piriformis, adductor, and tensor fasciae latae muscles. However, only the iliopsoas muscles showed improvement in the control group. These findings suggest that the self-myofascial release technique can improve muscle flexibility in long-distance runners (Sulowska-Daszyk & Skiba, 2022). This study investigates the impact of an 8-week self-myofascial release program on the isokinetic hamstrings-to-quadriceps strength ratio (H/QRatio) and knee joint range of motion (ROM) among male athletes with hamstring shortness. The results, analysed using repeated-measure analysis of variance, showed a significant increase in

hamstring ROM within the FOAM group ($P = .001$). The study concludes that self-myofascial release using foam rolling may be effective in enhancing hamstring ROM without adversely affecting the H/Q ratio in individuals with hamstring shortness. The findings suggest that this technique could offer a valuable alternative to other stretching methods for improving flexibility while maintaining muscle strength (Hamzeh Shalamzari et al., 2022).

The study's purpose was to effectively compare the effects of hydraulic training with and without self-myofascial technique on hip and knee joint mobility among college women students. The primary hypothesis proposed that hydraulic training with a self-myofascial release technique would provide similar significance in the range of motion and increase hip and knee joint mobility. Secondly, the hypothesis was that hip and knee joints would not be impaired after self-myofascial release intervention but that decrements would be associated with hydraulic resistance training.

2. Methods

Participants

Thirty college women students aged 18-25 will be recruited through campus advertisements and announcements. Screening for any medical conditions or injuries that might affect participants' participation in the study will be conducted.

Study Design

This study will service a randomised controlled trial design, randomly assigning participants to Group A (Hydraulic Resistance Training with Self-Myofascial Technique) and Group B (Hydraulic Resistance Training without Self-Myofascial Technique).

Procedure

Participants will be informed about the study's objectives and procedures. They will sign informed consent forms. For each participant, baseline assessments will be conducted, including a joint range of motion (ROM) hip and knee joint mobility measures used by the goniometer. The goniometer can measure the joint angles. Participants will be randomly given to either Group A or Group B. Group A will conduct hydraulic resistance training sessions with the self-myofascial release (SMR) technique and Group B without SMR hydraulic resistance training thrice weekly for eight weeks. Certified trainers will supervise the sessions.

Hip Joint Mobility Measures

The manual measurement of hip joint flexion is crucial for assessing the hip joint's range of motion (ROM). It involves ensuring the participant's comfort in a supine position with extended and aligned legs. Reference opinions such as the anterior superior iliac spine (ASIS) and greater trochanter are identified and marked as landmarks. A neutral position is established with the goniometer to guide the opposite leg into hip flexion, eliminating lumbar curvature. During measurement, the patient is instructed to flex their hip while stabilising the opposite leg to prevent lumbar movement. The goniometer records the angle at maximum hip flexion, indicating the hip flexion ROM. Proper knee position is emphasised, as full hip flexion is accurate when the measured leg's knee is flexed, considering hamstring tension limitations.

Knee Joint Mobility Measures

Manual measurement of knee flexion utilising a goniometer is a fundamental technique for evaluating the knee joint's range of motion (ROM). The procedure involves positioning the patient supinely on an examination table with extended and aligned legs. Reference points like the lateral epicondyle of the femur and the side

malleolus of the ankle are identified and marked as landmarks. The goniometer is applied by aligning its fulcrum centre over the lateral epicondyle, with one arm directed along the femur's lateral midline and the other arm along the lateral midline of the lower leg. The patient is then instructed to actively flex the knee while ensuring hip stability and opposing leg steadiness. The angle indicated on the goniometer when the knee reaches maximum flexion represents the knee flexion ROM.

3. Statistics

The data of each group was analysed using mean and standard deviation by SPSS. A participation t-test compares both groups' pre-training and post-training scores. Differences between the two groups for hip and knee flexion of the left and right leg were determined using a paired "t" test. A significant value of $\leq .05$ was accepted to establish the significance criteria, and a value of less than .05 indicated a significant variance between the compared values. Finally, they discussed the obtained results. Table 1 shows the hip and knee mobility paired with samples t-test with and without self-myofascial release technique and hydraulic resistance training values.

4. Results

All 30 participants completed the study with hydraulic resistance training with or without the self-myofascial release technique, and no participants had to drop out due to pain or other

reasons. Table 1 presents the means \pm SDs for all test parameters before and after eight weeks of the training schedule for groups A and B.

Pre-To-Post-Intervention Measures Of The Hydraulic Resistance Training With Smr (Hsmr) And Hydraulic Resistance Training Without Smr (Hrt)

Group	Variables	Mean \pm SE	N	Std. Deviation	T ratio	p-value
Hydraulic Resistance Training With SMR (HSMR)	Hip Flexion	126.20 \pm 1.13	15	4.39	12.77*	.001
		134.53 \pm 1.29	15	5.02		
	Knee Flexion	130.33 \pm 1.65	15	6.39	8.41*	.001
		139.93 \pm 1.17	15	4.55		
Hydraulic Resistance Training Without SMR (HRT)	Hip Flexion	127.33 \pm 1.70	15	6.61	3.34*	.005
		132.49 \pm 1.47	15	5.70		
	Knee Flexion	129.01 \pm 1.72	15	6.68	3.52*	.003
		132.33 \pm 1.63	15	6.34		

Significant at 0.05 level of confidence Table value for df (14) at 0.05 level = 2.76.

Descriptive Analysis of Hip and Knee Flexion

A groundbreaking study unveils the contrasting impacts of Hydraulic Resistance Training with Self-Myofascial Release (HSMR) and Hydraulic Resistance Training without Self-Myofascial Release (HRT) on hip and knee flexion. The study involved two groups, each undergoing different training protocols, and measured the flexion angles of the hip and knee joints in pre- and post-test conditions.

Hydraulic Resistance Training With Self-myofascial Release (HSMR) Group

Hip Flexion: The participants in the HSMR group exhibited a mean hip flexion angle of 126.20 degrees with a standard error of 1.13 degrees. The data collected from a sample size of 15 individuals revealed a standard deviation of 4.39 degrees. A T ratio of 12.77 was calculated for the pre-post difference, and the p-value associated with this difference was found to be 0.001, indicating a statistically significant increase in hip flexion after the training program.

Knee Flexion: For knee flexion, the mean angle was 130.33 degrees, with a standard error of 1.65 degrees. The standard deviation was calculated as 6.39 degrees based on data from 15 participants. The calculated T ratio was 8.41, and the corresponding p-value was 0.001. These values indicate a statistically significant improvement in the knee flexion angle.

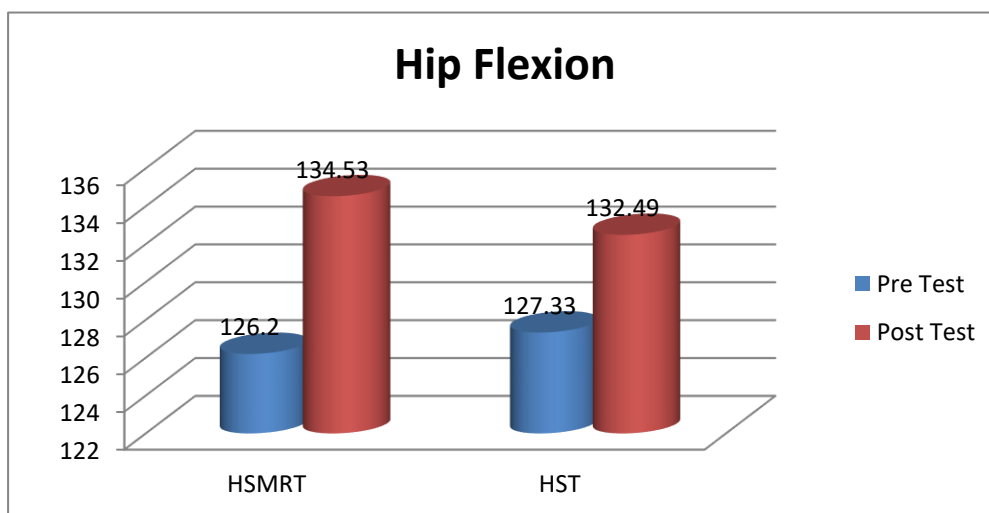
Hydraulic Resistance Training without SMR (HRT) Group:

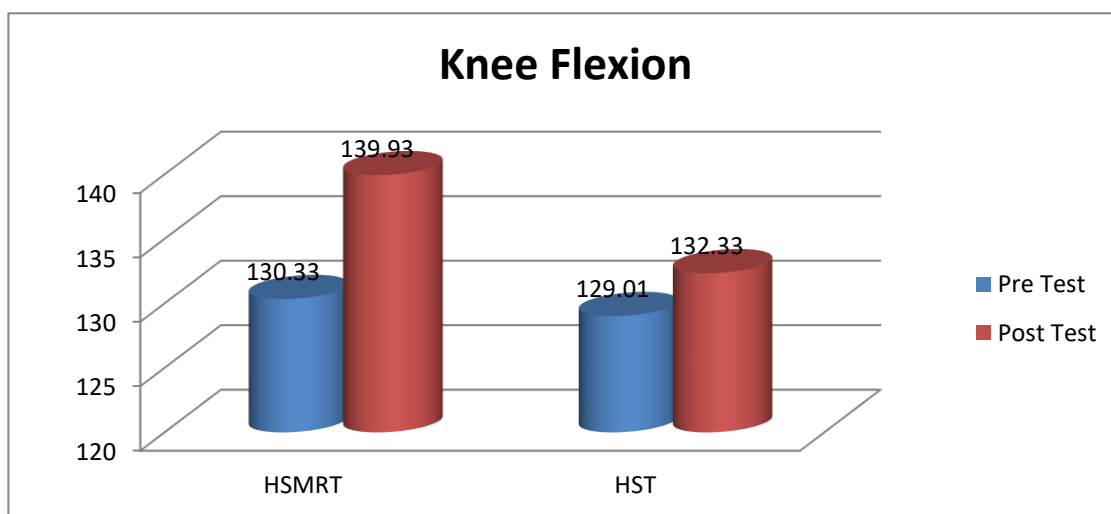
Hip Flexion: The mean hip flexion angle in the HRT group was 127.33 degrees, with a standard error of 1.70. The SD, computed from an SS 15, was 6.61 degrees. A T ratio of 3.34 and a p-value of 0.005 were determined for the pre-post difference, demonstrating a statistically significant increase in hip flexion after the training.

Knee Flexion: The mean angle for knee flexion in the HRT group was 129.01 degrees, with a standard error of 1.72 degrees. The standard deviation was 6.68 degrees based on data from 15 participants. A T ratio of 3.52 and a p-value of 0.003 indicated a statistically significant improvement in knee flexion angles following the training program.

In this study, the group using hydraulic resistance training with the self-myofascial technique (Group A) shows a more significant result regarding improving hip and knee joint flexion and mobility. It is indicated by the smaller p-value compared to the group without the self-myofascial technique (Group B) with a p-value. The substantial evidence provided by the small p-value for Group A suggests that the self-myofascial technique likely contributes to the observed hip and knee flexion improvement.

The Pre and Post-test mean values graphically represented the hydraulic training group with and without self-myofascial release technique groups on hip and knee joint flexion in Figures 1 and 2.





5. Discussion

This study was conducted to assess how Hydraulic Resistance Training with Self-Myofascial Release (HSMR) compares to Hydraulic Resistance Training without Self-Myofascial Release (HRT) in terms of their effects on hip and knee joint mobility among college women students. The results offer valuable perspectives on the potential advantages of integrating the self-myofascial technique into hydraulic resistance training to improve joint mobility. The results reveal that the HSMR group generally exhibited slightly more significant joint mobility improvements than the HRT group.

This observation suggests that integrating the self-myofascial release technique may have contributed to the increased effectiveness of the training program. The technique might have facilitated muscle relaxation, reduced muscular restrictions, and improved tissue extensibility, thus enhancing joint range of motion. The statistically significant differences observed between the groups' pre and post-test measurements further support the potential benefits of self-myofascial release when combined with hydraulic resistance training. The small p-values for both groups suggest that the interventions significantly impacted hip and knee flexion, and the p-values were smaller for the HSMR group, indicating a potentially more substantial effect.

While both groups showed improvements, the HSMR group's results hint at an additional advantage associated with the self-myofascial release technique. The study focused on the effects

of different stretching interventions on range of motion (ROM), dynamic angular velocity, reaction time (RT), and movement time (MT) in participants. The results showed a positive main effect for time in ROM measures, with a 3.5% improvement post-intervention. However, there was a negative main effect for time in dynamic angular velocity, with a 9.2% decrease post-intervention. MT was also slower after the stretching protocols, with a 3.4% increase. These findings suggest that the type of stretching intervention can have varying effects on ROM, dynamic angular velocity, and MT. It would be valuable to discuss the implications of these findings for exercise physiology and potential applications in training and rehabilitation programmes (Maddigan et al., 2012). While both groups showed improvements, the HSMR group's results hint at an additional advantage associated with the self-myofascial release technique.

6. Conclusion

In conclusion, the findings of this study support the hypothesis that Hydraulic Resistance Training with Self-Myofascial Release could lead to improved hip and knee joint mobility among college women students. The outcomes underscore the potential significance of integrating the self-myofascial technique into training regimens to improve joint mobility. However, further research with larger sample sizes and extended intervention periods would provide more comprehensive insights into these improvements' long-term effects and sustainability.

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Contributions

Ms K.Manosakthi and Dr K.Divya have given good-sized contributions to the idea or the layout of the manuscript; Ms K.Manosakthi amassed the data, Ms K.Manosakthi and Dr K.Divya analysed and interpreted data. In addition, all authors have participated in drafting the manuscript, and Dr K.Divya revised it critically.

Finally, all authors studied and accepted the last model of the manuscript.

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Ethical Declarations

Ethics Approval and Consent Participation

The project entitled "Isolated and Combined Effect of Hydraulic and Ladder Training on Selected Physical Physiological and Biochemical Variables of College Women Students" was approved on 15 November 2019 by the Alagappa University College of Physical Education, Alagappa University, Karaikudi, Tamil Nadu, India. Therefore, this manuscript was created, and all participants gave their written consent to participate in the experiments according to the principles outlined in the Declaration of WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects. Furthermore, all methods were

performed according to relevant guidelines and regulations.

Consent for Publication

Not Applicable.

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