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Effect of Stretching, Eccentric Strengthening and Neural Slider on Bio-Motor Ability of Footballers with Hamstring Tightness": A Randomized Control Trial

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Abstract
Background: *Football being considered intermittent high intensity sport. It requires flexibility, power, strength and balance for finishing the game without any injury. The purpose of the present study is that there are many techniques to improve hamstring flexibility and prevent injury due to tight hamstring as per recent studies, in this study we are comparing as to which technique is most effective for improving the hamstring flexibility as well as bio motor abilities among male football players.*
Aim: *Static-Stretching, Eccentric-strengthening and neural-slider to improve the flexibility and performance of football player.*
Method: *60 male football players were selected based on inclusion and exclusion criteria with age of 14-24 years. They were randomly assigned into four equal groups. The control group (Group-A) received no treatment. The other groups received static stretching (Group-B), static stretching plus eccentric strengthening (Group-C), static stretching plus eccentric strengthening plus neural slider(Group-D) and. The treatment was given for 3 days a week for 6 weeks continuously. Pre-test and post-test measurements of vertical jump test, Y balance, T test and sit and reach test were conducted.*
Results and Discussion: *Pre and Post Analysis were done by T-test, ANOVA and POST HOC BONFERRONI through SPSS version 20.0. Improvement was seen in hamstring muscles and bio motor abilities in Group-D after receiving the treatment for 6 weeks. Statistical improvement is seen in some of the components of bio motor abilities also.*
Conclusions: *The interventional Group-D with static stretching, eccentric strengthening and neural slider was more effective compared to other groups. It indicates that the combined protocol can be used to prevent injuries related to tightness in football players and improve bio motor abilities.*
Keywords: *Football, Sit and reach test, Vertical jump test, T-Test, Y-Balance test, Static stretching, Eccentric strengthening, Neural slider, Hamstring, Tightness, Bio-motor ability.*

Introduction

Soccer Is Considered to Be One of the Most Popular Sports, Which Is Played by More Than 200 Million Professional Players Across the Globe[1]. Soccer Is Defined as High Intensity, Intermittent and Non-Contiguous Game Physiologically[2]. High Intensity Demanding Sports Like Running, Football and Hurdles Commonly Causes Hamstring Muscle Strain Among Professional Athletes and Adolescents and High School Children[3].About Quarter of the musculoskeletal injuries lesion are found in thigh and groin in football players[4]. The games major portion Covers Maximum Speed Activities Like Speeding up, speeding down, Jumping, Cutting Pivoting, Turning and striking the Ball[5]. The Large Number Injuries Occurred at The Lower Extremities Around 68% To 88%[6]. One of The Main Risk Factor of Injury to The Muscle Group Is Poor Flexibility of Hamstring Due to Which Person's Level of Function Is Severely Affected and Chances of Overuse Injuries Increases as Flexibility Is Important for Normal Functions[7]. Hamstring Plays Vital Role to Cover the Same Distance by Fewer Contraction Cycles and by Increasing the Stride Length While Running. This Helps in Reducing the Chances of Injury and Enhances the Performance Before Fatigue by Conserving the Energy[8]. The Action of Joint's Motions Decreases Resulted from Inability of Muscle to Deform and That Cause Muscle Tightness[9]. The Increase in Passive Resistance While Walking and Running During Swing Phase Leads to Hamstring Tightness Due to Which There Is Increase in Patellofemoral Compression [10]. Patellar Tendinopathy and Patello-Femoral Pain Is Increasing Risk Factors of Inadequate Hamstring Motion. Exacerbation of Agonising Pain in Patient with Low Back Pain, Reduced Lumber Lordosis and Posterior Pelvic Tilting Are the Causes Reported Due to Hamstring Tightness [11]. To Increase Muscle Length Static Stretching Is One of the Harmless Methods Used [12]. To Avoid Exciting a Stretch Reflex a Slow and Gradual Stretch Is Applied at A Constant Force. According to Literature to Improve Muscle Length a Static Stretch with 30 Seconds Hold and 3 Repetitions Per Single Session Is Enough[13]. Elongation of Muscles Helps the Subject by Contracting the Antagonist Muscle eccentrically, the Agonist Muscle Group is stretched in slow controlled manner, the joint is moved through the full available range. Training helps the muscles elongation naturally and in its relaxed state [14].A Sliding Movement of Neural Structures Relative to Their Mechanical Interfaces Is Generated by The Neurodynamic Slider Technique. Tension of The Nerve Distally Is Released and Via Joint Movement There Is Tension on the Targeted Nerve Structure Proximally Than the Sequence Is Reversed in This Technique[15]. To Improve the Course of the Visible Hamstring Extensibility.[16]And Posture Balance the Efficiency of Ns Is Suggested[17]. Weppler and Magnusson[18]. Proposed That Instead of Musculotendinous Structures There Could Be Changes in Individual Tolerance Stretch as A Result of Increased Joint Rom Short Stretching Session. Furthermore, Firing Rates of Mechano-sensitivity and Proprioceptors Which Affects the Sensory Adaptions Is Also Lessened with Strong Afferent Inputs of Acute Stretch[19]. Ns Also Gives Many Movements in Neural Structures Which Otherwise Results in Decreasing of Neural Mechanosensitivity[20]. Along with The Hamstring Muscles, By the Performance of Joint Movements the Nerve Beds and Fascial System Gets Stretched and The Ns Induce Sliding of the Static Nerve on the Thigh Relative to Its Nerve Beds by Moving the Joint [21]. This May Results in Increased Joint Rom. There Are Several Researchers Claiming of Improvement in Visible Hamstring Extensibility in Professional Footballers After Taking Short Neural Slider Course with Hamstring Tightness .[16]

Need of the study

Static Stretching Is One of The Safest and Most Commonly Performed Stretching Methods Used to Increase Muscle Length. Eccentric Strengthening Exercise Prevent Injury to the

Muscle Tendon Unit by Improving the Muscle's Ability to Absorb More Energy before Failing. It Is A Better Training Strategy to Improve the Flexibility and Able to Increase in Strength and Protect Against Muscle Damage. The Effectiveness of Neural Slider Has Been Proposed to Improve Measures of Apparent Hamstring Extensibility and Postural Balance. Thus, We Are Comparing All The 3 Techniques to Know That Which Mechanism Is Better in Improving Hamstring Flexibility as Well as Its Bio Motor Ability.

Aim and Objective

Aim

Static-Stretching, Eccentric-Strengthening and Neural-Slider to Improve the Flexibility and Performance of Football Player.

Objective

- The Effect of Stretching Technique in Hamstring Tightness.
- The Effect of Eccentric Exercise in Hamstring Tightness.
- The Effect of Neural Slider in Hamstring Tightness.
- The Combined Effect and Particular Effect on Tightness and Performance.

Hypothesis

Null hypothesis

There Is a Significant Effect of Stretching with Eccentric Training and Neural Sliders on Bio Motor Abilities Among Footballer with Hamstring Tightness.

Alternative hypothesis

There Is No Significant Effect of Stretching with Eccentric Training and Neural Sliders on Bio Motor Abilities Among Footballer with Hamstring Tightness.

Material & Methods

Sample Size: 60 Football Player.

Sampling Technique: Convenient Sampling.

Design of the Study: Experimental Study.

Duration of Study: 6 weeks

Study Setting: Football Sports Stadium, Race Course, Rajkot

Inclusion Criteria

- Elite and Sub Elite Football Players.
- Age –Group: 14-24 Years
- Hamstring Tightness.
- At Least 1000 Playing Hours.

Exclusion Criteria

- Any Recent Injury Which Makes Them Unable to Practice/Play.
- Not Involved in The Game from The Last 6-8 Week.

Materials Required

- Assessment Form
- Consent Form
- Stop Watch
- Cones
- Pen
- Pencil
- Ruler
- Weighing Scale
- Chart Paper
- Plastic Tape
- Chalk

Procedure

Before starting the data collection, the study was presented at Ethical Committee of RK. University. After receiving the ethical clearance from them, initially, an approach was made to the football coach and football players at Indoor Sports Stadium, Rajkot with ethical clearance letter and NOC from the Director of School of Physiotherapy. In return, a written NOC from the coach was taken. After the approval from the coach, the ethically approved Informed Consent Form was given to the football players which described and outlined the study. Then, those football players who were willing to participate in the study should give their consent in writing Based on the inclusion and exclusion criteria player will be selected and divided in to 4 Groups by the Chit Draw method with 15 players in each group.

Pre-Data will be taken by the above given outcome measures and the intervention will be done and data will be collected again post intervention for statically analysis

Interventions[1,2]

Passive Static Stretching

1. The position of subject was supine lying.
2. The hip and knee were passively positioned. The hip at 90 flexion and the knee was done in extension than in this position the stretch was given as per patient's tolerance level.
3. The opposite Extremity Remained Flat on the Plinth.
4. There were 3 sets of static stretching given per single session with 30 second hold and 10 second rest interval after each stretch.
5. The treatment protocol was given to the subject 3 days/week for 6 weeks continuously.

Eccentric Training

1. Position of patient supine lying with the opposite side leg in full extension.
2. The heel was wrapped with black Thera band piece of 3 feet (0.91) and the ends of the bands are held by the subject on each side.
3. The knee to be treated was locked in full extended position and the hip was kept in neutral position throughout the activity as instructed by the examiner.
4. Then the instruction was given to the subject to bring the treatment leg in full flexion by pulling the Thera band with both the ends and to see that the knee remains in locked position.
5. When the hip was pulled in full flexion by the ends, the subject was asked to resist the hip flexion simultaneously by contracting the hamstring muscle eccentrically throughout the hip flexion range of motion.
6. Enough Resistance was provided with The Arms as instructed by the examiner, To Overcome the Eccentric Activity of Hamstring Muscle.
7. Then the Extremity Was Gently Lowered to Ground.

Neural Slider

1. This Technique Started with subject Sitting-On-Chair Position, Thoracic Slump, Both Hands Clasped Posteriorly at Lumbosacral Level, Feet Unsupported, Off the Floor.
2. Followed by Two Alternating Sets of Movements of Cervical Flexion, Knee Flexion, And Ankle Plantar Flexion, And Cervical Extension, Knee Extension, And Ankle Dorsiflexion.
3. Active Alternation Between (1) And (2) Were Performed for 60-Second Time Periods and Repeated Five Times.

Neural Slider

Outcome Measures[22]

- Y-Balance Test
- Sit & Reach Test
- T-Test
- Vertical Jump Test

Figure: Sit and Reach Test

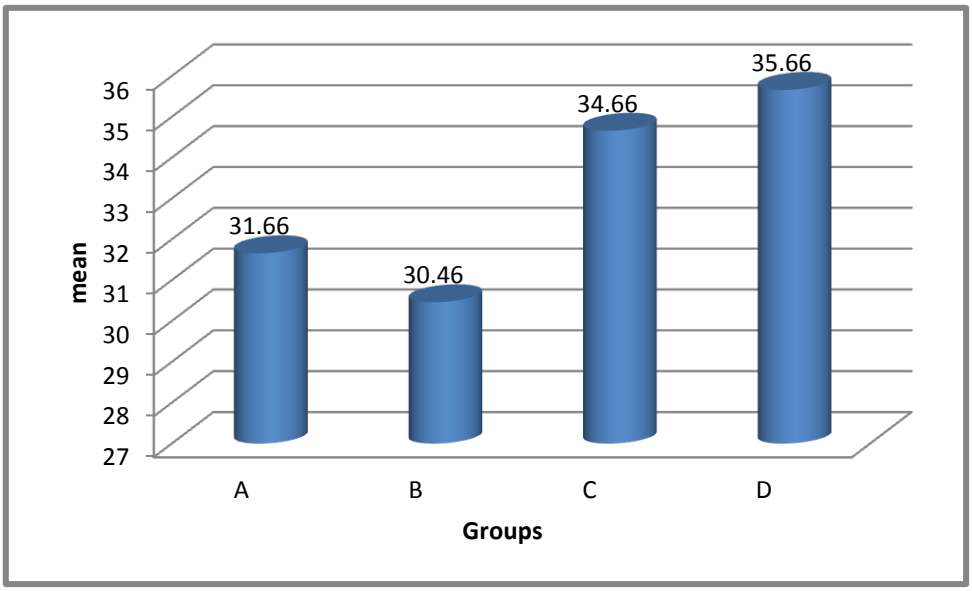
Results

Data Analysis

This Study Included 60 Young State and National Footballers. For Statistical Analysis SPSS Version 20.0 of Window with T-Test, Anova and Post hoc Bonferroni Was Used. The Level of Significance for All the Test Was Kept Being 0.005.

Table 5.1: vertical jump test score at pre-treatment (inter-group comparison)

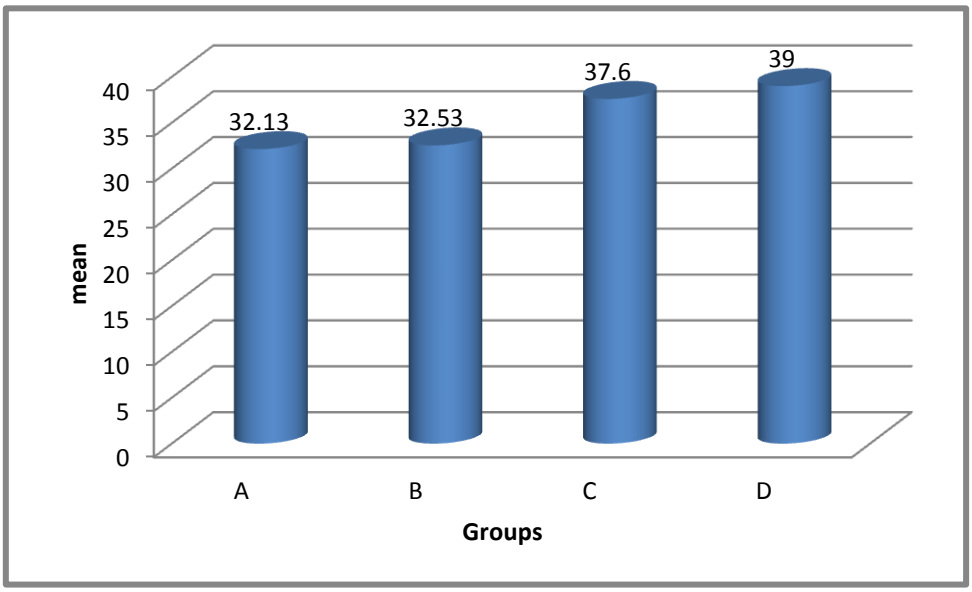
Groups	Mean	Minimum	Maximum	P value
A	31.66	24.00	38.00	0.003 (S)
B	30.46	24.00	39.00	
C	34.66	29.00	41.00	
D	35.66	28.00	46.00	
Total	33.11	24.00	46.00	



Graph 5.1: Inter Group Comparison (Pre-Vertical Jump Test)

Table 5.2: Vertical Jump Test Score at Post Treatment (Inter-Group Comparison)

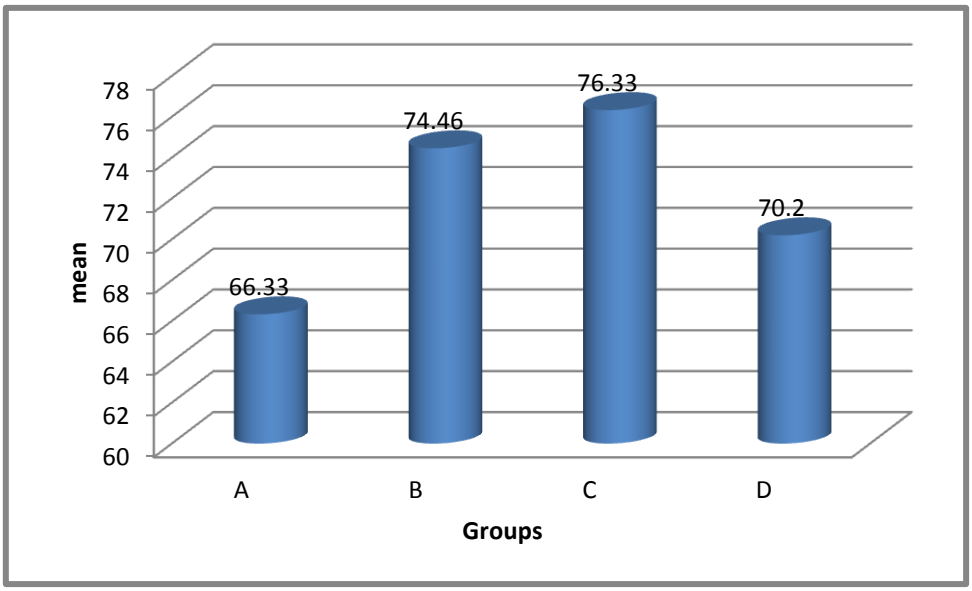
	Mean	Minimum	Maximum	P Value
A	32.13	25.00	38.00	0.001 (S)
B	32.53	27.00	42.00	
C	37.6	33.00	43.00	
D	39.0	34.00	48.00	
Total	35.31	25.00	48.00	



Group 5.2: Inter Group Comparison (Post Vertical Jump Test)

Table 5.3: Y Balance Test Score at Pre-Treatment (Inter-Group Comparison)

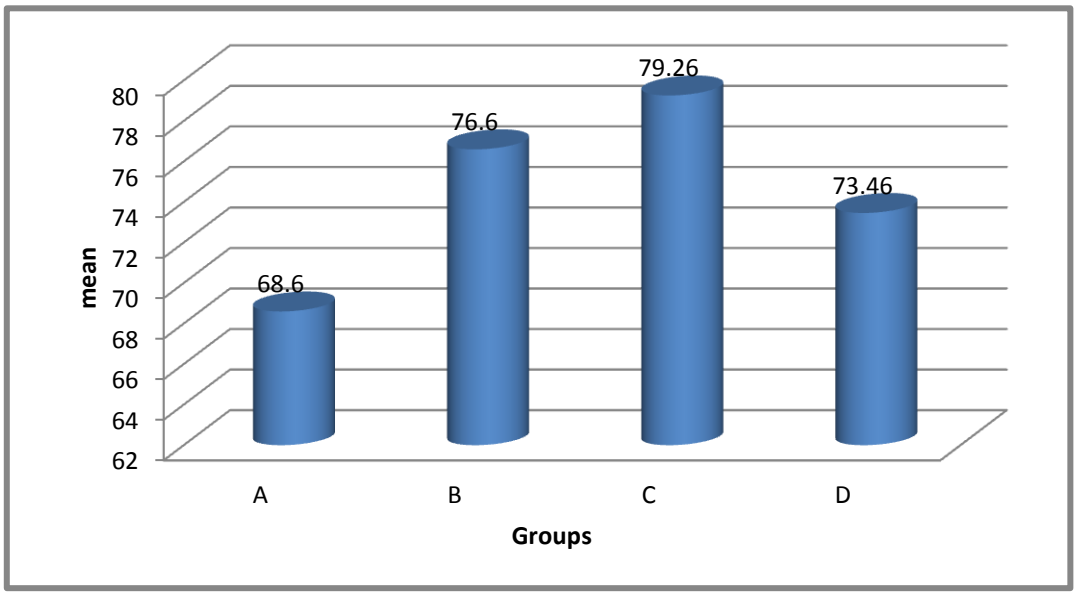
	Mean	Minimum	Maximum	P value
A	66.33	47.00	84.00	0.01 (S)
B	74.46	64.00	84.00	
C	76.33	59.00	91.00	
D	70.2	58.00	86.00	
Total	71.83	47.00	91.00	



Graph 5.3: Inter Group Comparison (Pre-Y Balance Test)

Table 5.4: Y Balance Test Score at Post Treatment (Inter-Group Comparison)

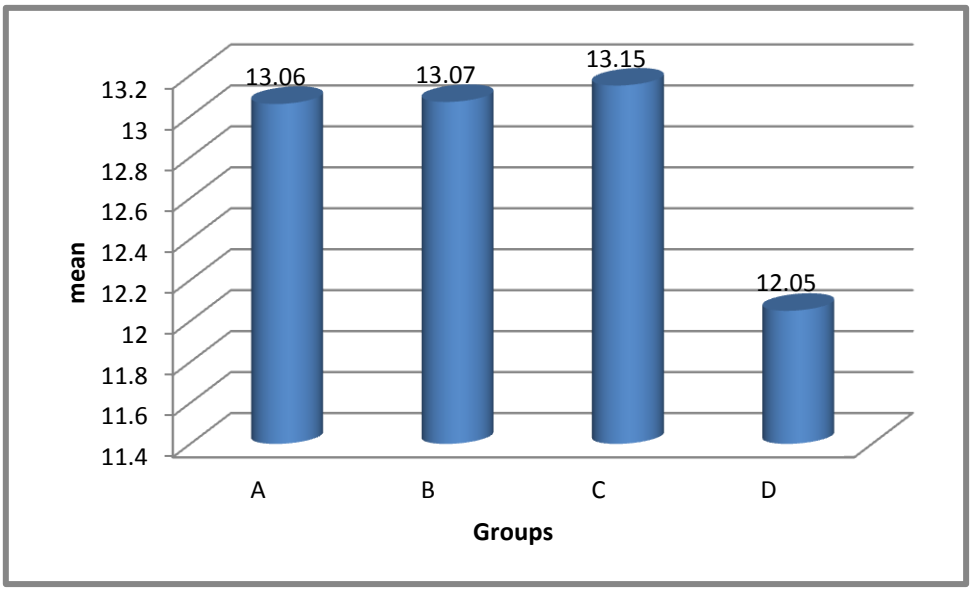
	Mean	Minimum	Maximum	P value
A	68.6	48.00	95.00	0.02 (S)
B	76.6	66.00	86.00	
C	79.26	62.00	94.00	
D	73.46	60.00	89.00	
Total	74.48	48.00	95.00	



Graph 5.4: Inter Group Comparison (Post Y Balance Test)

Table 5.5: T Test Score at Pre-Treatment (Inter-Group Comparison)

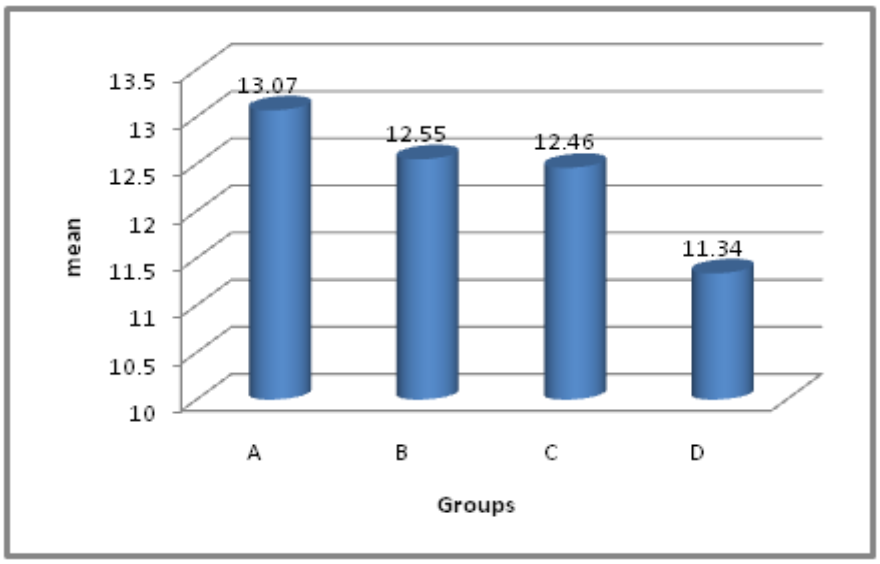
	Mean	Minimum	Maximum	P value
A	13.06	11.99	13.94	<0.001 (S)
B	13.07	12.19	14.22	
C	13.15	12.30	14.91	
D	12.05	11.00	13.79	
Total	12.83	11.00	14.91	



Graph 5.5: Inter Group Comparison (Pre-T- Test)

Table 5.6: T Test Score at Post Treatment (Inter-Group Comparison)

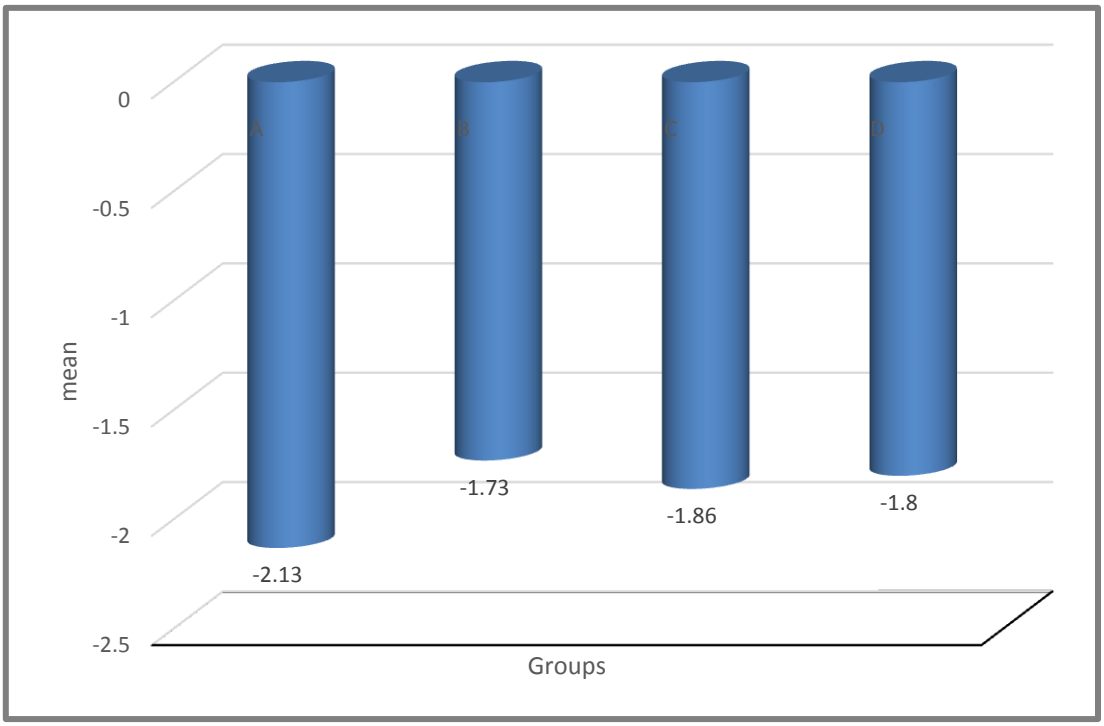
	Mean	Minimum	Maximum	P value
A	13.07	11.98	13.88	<0.001 (S)
B	12.55	11.60	14.10	
C	12.46	11.41	14.40	
D	11.34	10.00	13.70	
Total	12.35	10.00	14.40	



Graph 5.6: Inter Group Comparison (Post T- Test)

Table 5.7: Sit and Reach Test at Pre-Treatment (Inter-Group Comparison)

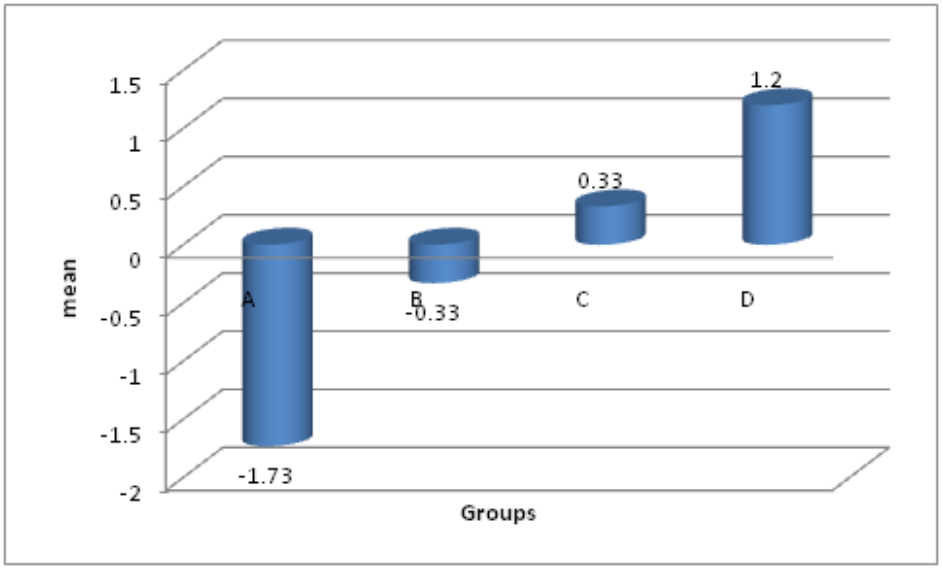
	Mean	Minimum	Maximum	P value
A	-2.13	-7.00	-1.00	0.78
B	-1.73	-4.00	-1.00	
C	-1.86	-4.00	-1.00	
D	-1.80	-4.00	-1.00	
Total	-1.88	-7.00	-1.00	



Graph 5.7: Inter Group Comparison (Pre-Sit and Reach Test)

Table 5.8: Sit and Reach Test at Post Treatment (Inter-Group Comparison)

	Mean	Minimum	Maximum	P value
A	-1.73	-6.00	0.00	0.001 (S)
B	-0.33	-3.00	1.00	
C	0.33	-1.00	2.00	
D	1.2	-1.00	2.00	
Total	-0.13	-6.00	2.00	



Graph 5.8: Inter Group Comparison (Post Sit and Reach Test)

Discussion

This Study Demonstrated That A 6-Week Passive Static Stretching, Eccentric Strengthening and Neural Slider Techniques Reduced Tightness and Improved Bio-Motor Abilities in Footballers with Hamstring Tightness.

The Purpose of This Study to Compare the Effect of Combination of Passive Static Stretching,

Eccentric Strengthening and Neural Slider Technique Group Versus Passive Static Stretching and Eccentric Strengthening Group Versus Passive Static Stretching Group Alone with No Intervention Group.

Hence to assess the effectiveness of a combined protocol of eccentric strengthening Plus Static Stretching, Eccentric Strengthening Plus Static Stretching Plus Neural Slider and Static Stretching Alone on Hamstring Elasticity the present study was commenced.

The Pre–Post -Test Values Were Compared of Sit and Reach Test, Agility Test, Y Balance Test and Vertical Jump Test for The Study Groups Through Which It Was Seen That There Was Significant Improvement in All Three Interventional Groups.

Thus, It Is Assumed That These Techniques Are Helpful in Reducing Hamstring Tightness in Football Players.

After the Comparison of Effectiveness of These Techniques Among the Groups, The Group with Combination of Eccentric Strengthening Plus Static Stretching Plus Neural Slider Got Better Bio-Motor Abilities Than the Other Groups.

Thus, This Study Is Evident That the Combination of Eccentric Strengthening, Static Stretching and Neural Slider Techniques Is Ideal in Reducing the Hamstring Tightness in The Football Players.

Pattanasin Areendomwong Et. Al. Conducted A Randomised, Placebo-Controlled Trial to Evaluate the Effects of Neural Slider on Apparent Hamstring Extensibility and Activity in Footballers with Hamstring Tightness.

Knee Extension Was Measured by Passive Knee Extension and Maximal Voluntary Isometric Contraction of Hamstring Was Measured by Surface Emg in 40 Eligible Healthy Male Football Players. They Concluded That There Was Increase in Knee Extension Angle, Increased Apparent Hamstring Extensibility but No Change in Emg Activity of Hamstring Muscles with 4 Week Neural Slider Technique.

Anoops Et. Al. Compared the Effectiveness of static Stretching Protocol in enhancing Hamstring elasticity in Football Players by Passive Static Stretching and Eccentric Training Alone and Their Combination for Total 6 Weeks. The Author Showed That to Improve the Hamstring elasticity the Combination of Static Stretching Plus Eccentric Stretching Is Effective Than Static Stretching Alone in the football players. Hamstring Flexibility Was Measured by Sit and Reach Test.

Several Studies Have Been Done on the Different Techniques for Improving the Hamstring Flexibility but No Study Has Been Done on the Combination of Techniques with Control Group That Show the Effect on Both Hamstring Flexibility as Well as Bio-Motor Abilities of the Football Players.

Anoops Et. Al. Compared the Stretching Protocol effectiveness in enhancing the Hamstring Flexibility in Football Players by Passive Static Stretching and Eccentric Training Alone and Their Combination for Total 6 Weeks. The Author Showed That in football players, the combination of static stretching plus eccentric strengthening is more effective than static stretching alone. Flexibility of hamstring Was Measured by Sit and Reach Test. Thus, It Improved the Hamstring Flexibility in Football Players.

Several Studies Have Been Done on the Different Techniques for Improving the Hamstring Flexibility but No Study Has Been Done on the Combination of Techniques with Control Group That Show the Effect on Both Hamstring Flexibility as Well as Bio-Motor Abilities of the Football Players.

Limitations of the study

- Only Healthy Young Male Footballers Included.
- Lack of Blinding of Participants.

Future recommendations of the study

- Can Be Done on Only National Players.
- More Long-Term Protocol Can Be Used.
- Carry Out with Larger Sample Size.

Conclusion

The Results from This Study Reveals That There Was Significant Improvement in The Three Interventional Group and No Significant Changes in The Control Group but The Interventional Group with Static Stretching, Eccentric Strengthening and Neural Slider Was More Effective Compared to Other Groups. It Indicates That the Combined Protocol Can Be Used to Prevent Injuries Related to Tightness in Football Players.

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