International Journal of Health Sciences and Research
[Indexed, Peer-Reviewed Journal]
Volume 15; Issue: 4; April 2025
Website: www.ijhsr.org
Original Research Article *ISSN: 2249-9571*

Pelvic Floor Exercises with Trunk Stabilization Versus Pelvic Floor Exercises with Interferential Therapy in Rehabilitation of Stress Urinary Incontinence in Recreational Female Athletes - A Randomized Controlled Trial

Nidhi Panchal[1], Parth Trivedi[2]

[1]Assistant Professor, Shree M. M. Shah Physiotherapy College, Mahemdavad, Gujarat, India,
[2]Associate Professor and PG Guide, Kadi Sarva Vishwavidyalaya, Gandhinagar, Gujarat, India

Corresponding Author: Nidhi Panchal

DOI: https://doi.org/10.52403/ijhsr.20250423

ABSTRACT

Question: Which treatment is the best for stress urinary incontinence among conventional physiotherapy, pelvic floor exercise with trunk stabilization or pelvic floor exercise with Interferential therapy in recreational female athletes?
Design: A randomized controlled trial with concealed allocation
Participants: 75 recreational female athletes in the age group of 18-30 years were included and divided into three groups in which two experimental and one conventional group with 25 participants in each group.
Intervention: Group A received Conventional exercises, Group B received Pelvic floor exercises with Trunk stabilization and Group C received Pelvic floor exercises with interferential therapy. All the groups received total training for 6 weeks, thrice a week.
Outcome measures: Urine loss was measured by the Pad Test and Quality of life was measured by the Urogenital Distress Inventory-6.
Results: Intergroup baseline was done by parametric one-way ANOVA intergroup comparison of pre and post intervention score of variables was done using parametric paired t-test. Intergroup comparison of post-intervention score of variables was done by one way ANOVA. All the three groups improved statistically significant at the end of 6th weeks of intervention.
Conclusion: All the three interventions improved the pelvic floor muscles strength and quality of life, but pelvic floor exercise with trunk stabilization is more effective to improve pelvic floor muscles strength and quality of life of recreational female athletes.
Clinical Trial Registration of India Number: CTRI/2021/03/031672
Keywords: Pelvic floor exercises, Trunk Stabilization, Interferential Therapy, Urogenital Distress Inventory, Pad Test

INTRODUCTION

A recreational athlete is someone who participates in physical activity but does not prepare for competition with the same intensity and attention as a competitive or elite athlete[1]. As recreational athlete plays without proper awareness of activities, any fitness training, protocol, stretching, warm

up and cool down; various types of problems like tightness of muscles, reduced muscle strength, urinary incontinence, balance, endurance, coordination and micro trauma of muscles occur. According to Almeida MB 2016, among all the conditions Urinary incontinence is more common in recreational athlete due weak core and pelvic floor muscles; which will impact negatively on quality of life[2].

Urinary incontinence is commonly defined as any unintentional urine leakage. Urine loss in recreational athletes tends to be due to the extent at which athletes are exposed to increased intra-abdominal pressure, which is triggered by the abdominal muscle contraction in high impact sports and strengthening of pelvic floor muscle activities without proper awareness. The sports like gymnastics, basketball, jumping, running, skiing, tennis, skating and jogging that increase intraabdominal pressure can overload and chronically damage the perineum and decrease the contraction force of pelvic floor muscle[3]. Other risk factors are increased age, female gender, hypoestrogenic amenorrhea, heavy exertion, parity that is increased and possible obesity[4].

According to Carls C 2007 Approximately 50% of athletes who reported urinary leakage complained of stress urinary incontinence, 11% had urge urinary incontinence and 36% of them had mixed urinary incontinence[5]. Assessing stress urinary incontinence is of utmost important and there are various types of method like biofeedback, manual grading of the strength of a pelvic floor muscles contraction, visual analogue scale, electromyography, perineometer, foley catheter, tampon, vaginal cones, pad test and urogenital distress inventory to assess stress urinary incontinence[6].

There are various treatments which are used to restore the function of pelvic floor muscles such as drug therapy, surgical treatment and physiotherapy[7]. Dr. Arnold Kegel first reported successful outcomes in female with stress urinary incontinence symptoms using pelvic floor muscles exercise in 1948. Kegel exercises being defined as a program of repeated voluntary pelvic floor muscles contraction are taught and supervised by a health care professional. Since 1948, several physiotherapy methods have been used in the treatment of urinary incontinence with different success rates[8].

Restoration of urinary incontinence is also possible after electrical stimulation through different modalities. Electrostimulation has been found to be especially valuable in case of urinary incontinence since it is more effective than drug treatment and can produce re-education of incontinence. Neurophysiological studies have demonstrated spinal reflex mechanisms influencing the pelvic floor musculature and bladder motility during electrical stimulation[9]. The pelvic floor muscles strength is improved by the activating the trunk stabilizing muscles with use of different types of exercises like diaphragmatic breathing exercise, tonic activation of transverse abdominis, abdominal muscle strengthening mainly transverse abdominis, internal obliques and external obliques, forced expiratory exercise and impact activities like running and jumping[10].

Therefore, the research question for this randomised controlled trial was:

Which treatment is the best for stress urinary incontinence among conventional physiotherapy, pelvic floor exercise with trunk stabilization or pelvic floor exercise with Interferential therapy in recreational female athletes?

MATERIALS & METHODS

Design

After institutional ethical approval the Trial was registered prospectively with clinical trial registry of India on 19/02/2021 with registration number CTRI/2021/03/031672. After that, all the study participants completed a detailed assessment and then

they were included in the study as per the inclusion and exclusion criteria. Before participating, study participants were instructed and explained about the intervention procedure and outcome measures as study participant information form. Study Participants who were suitable for participation were asked to sign bilingual informed consent form. The selection and allocation of study participants into three groups was done by using a computerized random number sampling method.

Participants

The inclusion criteria were: 18-30 years of age group, female, BMI:18-24 kg/ m^2, nulliparous female athletes, recreational female athletes those who exercise 45-90 minutes, 2-3 times per week, recreational athletes who complaint of stress urinary incontinence, who can understand English. The Exclusion Criteria were: Pelvic fractures patients those who undergone previous gynaecological or neurological operations for correction of stress incontinence, tumor, urge incontinence, psychological impairment, any gynaecological infections, irregular menstruation, diabetes mellitus, not willing to participate in the study.

Interventions

Group-A Pelvic Floor Exercises[11]				
WEEK	**POSITION**	**CONTRACTION**	**HOLD**	**SET**
1^{ST} & 2^{ND}	Lying down supine with one pillow below the hips	10-15 contraction per set Total contraction: 20-30	2-4 Seconds	2-3
3^{RD} & 4^{TH}	Sitting on Chair	30-40 contraction per set Total contraction: 60-120	2-4 Seconds	2-3
5^{TH} & 6^{TH}	Standing with legs slightly kept apart	50-60 contraction per set Total contraction: 150-180	2-4 Seconds	2-3
Dosage: 3 days/ week for 6 weeks				

Group-B Pelvic Floor Exercises with Trunk Stabilization[12]				
TECHNIQUES	**POSITION**	**PROCEDURE**	**REPETITIONS**	**SET**
Diaphragmatic breathing	sitting unsupported and supported	Visual feedback using a mirror, Diaphragmatic breathing exercises	5 repetitions	2 sets
Functional expiratory patterns	Sitting upright, unsupported,	Nose Blow (abdominal activation)	5 Repetitions	2 sets
Tonic activation	Standing	Transverse abdominal with co-contraction of pelvic floor muscle, Hand placement: Medial to ASIS	5 Repetitions, Hold: 15 Seconds and gradually increase 30-40 seconds	2 sets
Muscle strengthening	Walking		5 Repetitions, Hold: 15 Seconds and gradually increase 30-40 seconds	2 sets
Impact Activities	Running		5 Repetitions, Hold: 15 Seconds and gradually increase 30-40 seconds	2 sets
Dosage: 3 days/ week for 6 weeks				

Group-C Pelvic Floor Exercises with Interferential Therapy[11]				
Position of Patient	**Position of electrodes**	**Frequency**	**Intensity**	**Duration**
Supine position with knees placed apart.	Four electrodes of standard size (50mm x 20mm), two placed in lower abdomen (below the level of anterior superior iliac spine on both the sides) and the other two was placed on the medial aspects of both the thighs	0-10 Hz	Intensity based on subject's tolerance level	15 minutes
Dosage: 3 days/week for 6 weeks				

Study participants were requested to continue normal activities and avoid other forms of treatment of pelvic floor muscle during the duration of the study. Study participants other than the designated protocol were not permitted to administer any other forms of therapy or other techniques during the intervention period of the trial.

Outcome measures

Primary Outcome: Pad Test

The urine loss was measured by the pad test. The test was started without an athlete urinating. A pre-weighted absorbent perineal pad was put on and the timing was counted. The athlete was asked not to void until the end of the test. The athlete was asked to drink 500 ml of sodium free liquid (water) within 15 minutes, then sit or rest till the end of the first half hour. In the following half hour, the athlete was asked to walk around, step up and down and perform the exercises like standing up from sitting (×10), running on a spot for 1 minute, bending down to pick up a small object (pen) (×5), washing hands under cold running water for 1 minute. At the end of hour, the pad was removed and weighed; any difference from the starting pad weight constitutes fluid loss and that was recorded[13].

Secondary Outcome: Urogenital Distress Inventory- 6

The Quality of life was measured by the Urogenital Distress Inventory -6. The Urogenital Distress Inventory -6 questionnaire contained six questions regarding such symptoms as frequent urination, leakage related to feeling of urgency, leakage related to physical activity, coughing or sneezing, small amount of leakage (drops), difficulty emptying bladder, pain or discomfort in lower abdominal or genital area. The scale of 0 to 3 (0 - not at all, 1 - slightly, 2 - moderately, 3- greatly bothered) was applied. The average score was calculated and multiplied by 33 1/3 to put the score on the scale 0-100. The scale was divided into four sections to closely describe the urogenital distress level: 1-25, 26- 50, 51-75, and 76-100[14]

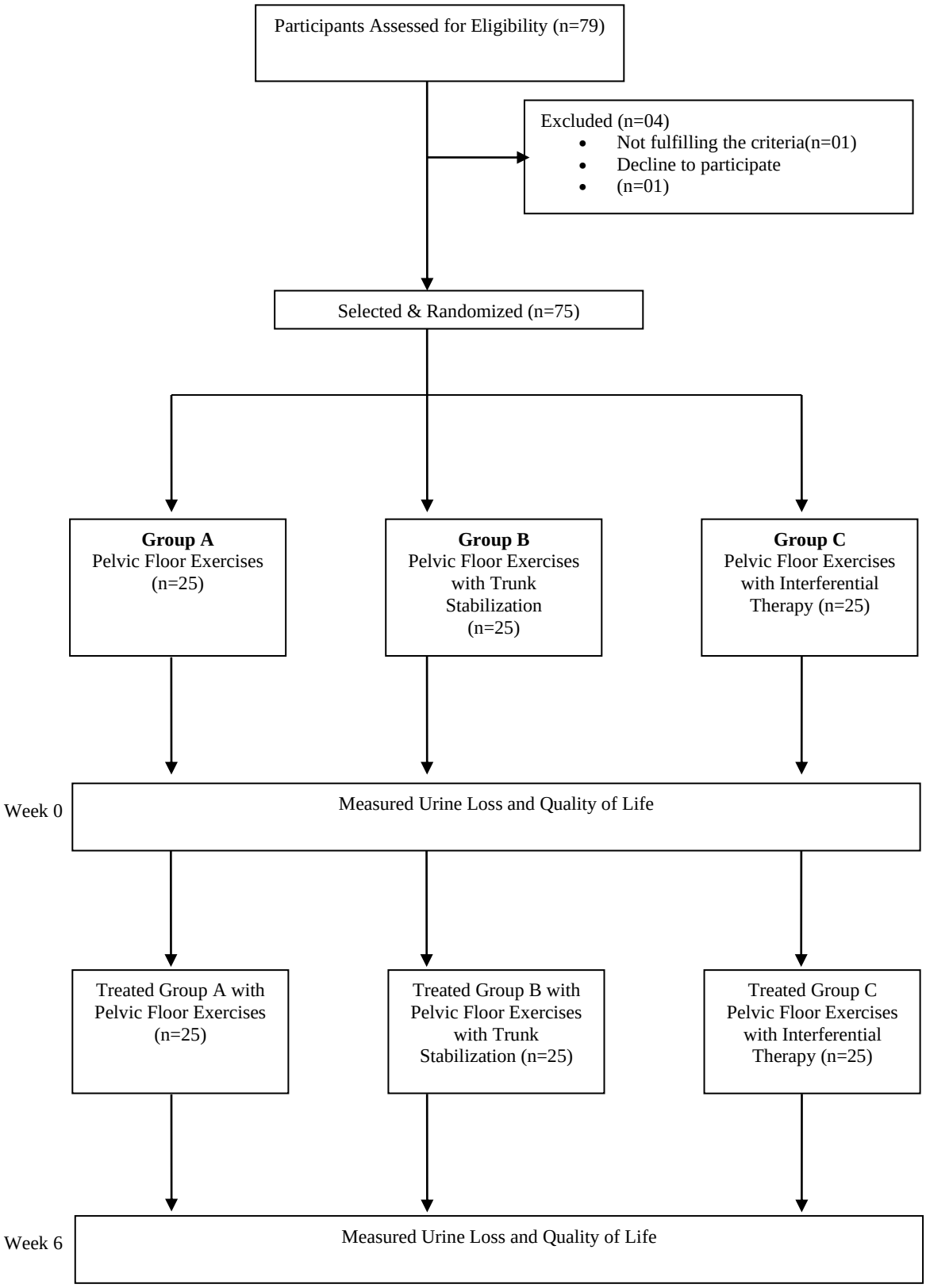
Data analysis

The sample size of this study was calculated based on the effect size of previous literatures to avoid statistical error. A total sample size of 75 participants was determined and each of the three intervention groups required 25 participants.

RESULT

All statistical analysis was done using SPSS 24.0 software for windows. Descriptive analysis was obtained by mean & standard deviation. Intergroup baseline comparison was done by parametric one-way ANOVA. Intragroup comparison of pre & post-treatment scores of PAD TEST & Urogenital Distress Inventory-6 were done using parametric Paired t-test. Intergroup comparison of post-treatment scores of PAD TEST & Urogenital Distress Inventory-6 were done by one way ANOVA. One Way ANOVA post hoc analysis was done to compare the difference in effectiveness within the groups. The confidence interval of 95% and p=0.05 were analyzed.

Flow of participants through the study



Baseline characteristics

Table 1: Inter-group Baseline Data Comparison of Demographic Details

Group	Age (SD)	Min/ Max	Height (m) (SD)	Min/ Max	Weight (kg) (SD)	Min/Max	BMI (kg/m^2) (SD)	Min/ Max
A (n=25)	24.44 (2.61)	18/29	1.60 (0.05)	1.45/ 1.7	56.64 (7.64)	40/80	21.60 (2.09)	18.7/ 24
B (n=25)	24.96 (2.24)	19/29	1.63 (0.03)	1.54/ 1.71	58.12 (7.20)	51/86	21.60 (2.04)	18.9/ 24
C (n=25)	24.08 (2.30)	18/29	1.60 (0.04)	1.54/ 1.67	54.41 (3.75)	45/60	21.12 (1.05)	19/ 23.14
P-value	0.430		0.120		0.140		0.435	
SD= Standard deviation, Min= minimum, Max= Maximum, m= meter, kg=kilogram, BMI= Body Mass Index								

Table 2: Inter-group Baseline Data Comparison of Pad Test and Urogenital Distress Inventory -6

Group	Pad Test (SD)	Min/ Max (gram)	UDI-6 (SD)	Min/Max
A (n=25)	11.76 (2.10)	8/16	10.98 (3.96)	4.2/ 16.66
B (n=25)	12.76 (1.53)	10/16	12.98 (4.54)	4.2/ 20.8
C (n=25)	12.00 (2.00)	9/16	11.30 (4.71)	4.16/ 20.5
P- Value	0.158		0.237	
SD= Standard deviation, Min= minimum, Max= Maximum, UDI-6= Urogenital Distress Inventory				

Table 3: Intra-group Comparison of Variables

Variables		Pad Test			UDI-6		
		Mean (SD)	P value	Effect Size	Mean (SD)	P value	Effect Size
Group A	Pre	11.76±2.10	0.000	1.14	10.98±3.96	0.000	1.32
	Post	9.60±1.65			5.83±3.79		
Group B	Pre	12.76±1.53	0.000	3.58	12.98±4.54	0.000	2.35
	Post	8.08±1.03			3.33±3.60		
Group C	Pre	12.00±2.00	0.000	2.14	11.30±4.71	0.000	1.51
	Post	8.44±1.22			4.67±4.04		
Effect Size (Cohen's d) = 0.2-Small, 0.5-Medium, >0.8-Large							
SD= Standard Deviation, UDI-6= Urogenital Distress Inventory							

The above table shows the comparison of pre & post-treatment scores of pad test & Urogenital Distress Inventory-6 of Group A, Group B, and Group C. The Pre & Post Comparison of pad test and Urogenital Distress Inventory-6 has been done with Paired t-test. The p-value being <0.05 shows a highly significant difference between the pre-treatment & post-treatment scores of pad test and Urogenital Distress Inventory-6.

Inter-group comparison

Table 4: Inter-group comparison of Variables post six weeks of intervention

Variables		Sum of Squares	DF	Mean Square	Sig.	Effect size
Pad Test	Between Groups	31.547	2	15.773	0.000	0.4964
	Within Groups	128.00	72	1.778		
	Total	272.747	92	-		
UDI-6	Between Groups	78.336	2	39.168	0.075	0.2734
	Within Groups	1048.291	72	14.560		
	Total	1126.627	74	-		
Effect size (Eta squared) = Small - 0.01, Medium - 0.059, Large - 0.14 Small effect size						
DF= Degree of freedom, Sig= Significance, UDI-6 Urogenital Distress Inventory						

Table 4 Shows the inter group comparison post six-week of intervention. The data above states that variable pad test p-value is < 0.05 in both between and within group analysis with effect size of 0.4964 whereas variable Urogenital Distress Inventory-6 p-value is > 0.05 in between and within group analysis with effect size of 0.2734 this states

that statistically there is significant difference in pad test in between and within group but no significant difference is seen in Urogenital Distress Inventory-6 score.

Thereby, accept the experimental hypothesis for Pad Test in between and within groups and accept null hypothesis for Urogenital Distress Inventory-6 in between and within groups.

Table 5: Post-hoc analysis

Variable	Group		Mean Difference	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Pad Test	A	B	1.52000*	.37712	.000	.6175	2.4225
		C	1.16000*	.37712	.008	.2575	2.0625
	B	A	-1.52000*	.37712	.000	-2.4225	-.6175
		C	-.36000	.37712	.608	-1.2625	.5425
	C	A	-1.16000*	.37712	.008	-2.0625	-.2575
		B	.36000	.37712	.608	-.5425	1.2625
UDI-6	A	B	2.50080	1.07924	.060	-.0820	5.0836
		C	1.15200	1.07924	.537	-1.4308	3.7348
	B	A	-2.50080	1.07924	.060	-5.0836	.0820
		C	-1.34880	1.07924	.428	-3.9316	1.2340
	C	A	-1.15200	1.07924	.537	-3.7348	1.4308
		B	1.34880	1.07924	.428	-1.2340	3.9316
**. The mean difference is significant at the 0.05 level.*							
Std= standard, Sig= Significance, UDI-6= Urogenital Distress Inventory							

Table 5 shows Tukey post-hoc analysis between group for variables Pad Test and Urogenital Distress Inventory-6 post intervention i.e. after 6 weeks. It is clearly seen that in Pad test variable comparison between group B and C, $p > 0.05$; and in Urogenital Distress Inventory-6 variable comparison among all the three groups $p > 0.05$stating that there is no statistically significant difference.

DISCUSSION

This Randomized controlled trial sheds light in finding an optimum line of management to improve overall performance of pelvic floor focusing on strength of pelvic floor muscles and quality of life in recreational female athlete having stress urinary incontinence.

Stress urinary incontinence in athletes is a known fact as various literatures have already reported. To understand the severity of stress urinary incontinence in female athletes around Gandhinagar and Ahmedabad, Gujarat prior to this study; a survey was undertaken by us. According to this survey 86.30% of female athletes have history of stress urinary incontinence and 47.10% of participants were felt shy to share this condition[15]. The finding of this survey study is similar to previous literature by Cristina Jacome and Daniela Oliveira which mentions that stress urinary incontinence in their study was experienced by 41.5% of the female athletes and most (95.5%) athletes had never discussed their condition with a health professional[16].

To assess the intervention effect on the pelvic floor muscle strength, the Pad Test outcome was used. In our study baseline mean of Pad test in grams for Group A was 11.76, in Group B was 12.76 and in Group C was 12.00 which resembles the previous literature reporting the normative value of Pad Test as 17 gram[11]. After 6 weeks of post intervention, the mean value in Group A was 9.60 in Group B was 8.08 and in Group C was 8.44; if the pre and post mean difference of Pad Test is calculated in percentage than in Group A Pad Test by 18.36%, whereas in Group B and Group C was improved by 36.67% and 29.66% respectively.

The reason for the improvement in both experimental groups is because trunk stabilization intervention program focuses on the function of the pelvic floor muscles due to co-contraction of trunk muscles. The correct breathing technique is very important in pelvic floor muscle training. The diaphragm is a respiratory muscle participating in the stabilization of the lumbar spine by enhancing abdominal pressure, which in turn stabilizes the lumbar spine which increases the pelvic floor muscle strength[12]. As reported by Sapsford RR et al 2001 that the abdominal muscle activity was a normal response to pelvic floor exercise in subjects with no symptoms of pelvic floor muscle dysfunction and provide preliminary evidence that specific abdominal exercises activate the pelvic floor muscles[17].

Whereas interferential therapy focuses mainly on the stimulation frequency which appears to be the most critical factor for influencing continence mechanism via pudendal nerve reflexes. Stimulation at a relatively high frequency can cause pelvic floor muscle contraction through a pudendal nerve reflex loop. Stimulation at a low frequency can activate pudendal nerve to pelvic floor reflex that depresses or eliminates uninhibited bladder contractions. Stimulation of pudendal nerve triggers long latency spinal cord reflex response. As reported by Malhotra N et al 2018 in addition to direct motor response, the reflex stimulus causes a widespread contraction of pelvic floor muscles which increases muscle strength[11].

To assess the intervention effect on the quality of life, the UDI-6 outcome was used. In our study baseline mean score of UDI-6 in Group A was 10.98, in Group B was 12.98 and in Group C was 11.30 which resembles the previous literature reporting the normative value of UDI-6 as 10.8 score[18]. After 6 weeks of post intervention, the mean value in Group A was 5.83 in Group B was 3.33 and in Group C was 4.67; if the pre and post mean difference of UDI-6 is calculated in percentage than in Group A UDI-6 by 46.93%, whereas in Group B and Group C was improved by 74.34% and 58.62% respectively.

The reason for the improvement in both experimental groups is because trunk stabilization intervention program focuses on the various functional tasks such as coughing, sneezing, lifting and nose blowing the coordinated recruitment of pelvic floor and abdominal muscles was seen leading to increase intra-abdominal pressure as this gives a feeling of urge to void[12.] Also due to co-contraction of trunk muscles and pelvic floor muscles; the strength of pelvic floor muscles increases and because of that the score of all the three parameters like irritative symptoms, stress symptoms and obstructive discomfort of urogenital distress inventory 6 reduces as reported by Isaac Samir Wasfy (2021)[19].

Thus, the findings of our study support the previous literature in term of improvement of strength of pelvic floor muscle in recreational female athletes.

The present study has important clinical implication because it provides support for using combination of trunk stabilization and interferential therapy that does not hinder function in conjunction with conventional intervention in recreational athletes with an additive advantage of having no side effects. In this study an honest and sincere effort was done by us to find out the best therapeutic intervention which increases strength and quality of life in female recreational athletes in which the inclusion criteria were strongly supported by the epidemiological studies. Apart from this, this is the only study which compares two therapeutic interventions i.e. Trunk stabilization and Interferential therapy which is registered with Clinical Trail Registration of India. But as every research has its own limitations; this research also had few limitations like the study included only female recreational athletes and competitive athletes were not included in this study due to probability of non-

availability of competitive players due to their competition schedule. Also, the long-term follow-up of the intervention was not done as the study duration was short.

In recreational female athletes suffering from stress urinary incontinence both the experimental interventions i.e. trunk stabilization and interferential therapy are effective as they improved the pelvic floor muscle strength and quality of life. But statistically trunk stabilization is superior to interferential therapy in terms of improvement in pelvic floor muscle strength and quality of life. Thus, we recommend future studies to focus on elite athletes suffering with stress urinary incontinence with a follow up data and better quantitative outcomes so that better insight can be achieved regarding the use of trunk stabilization intervention or interferential therapy intervention for their effectiveness in improving pelvic floor muscle strength and quality of life.

CONCLUSION

- Pelvic floor strengthening with Trunk Stabilization is effective in the management of stress urinary incontinence in recreational female athletes.
- Pelvic floor strengthening with Interferential Therapy is effective in the management of stress urinary incontinence in recreational female athletes.
- Pelvic floor strengthening with Trunk Stabilization is more effective than pelvic floor strengthening with Interferential Therapy in management of stress urinary incontinence in recreational female athletes.

Declaration by Authors

Ethical Approval: The study protocol was approved by institutional ethics committee of C. M. Patel College of Physiotherapy, Gandhinagar at Kadi University, India. All participants gave written informed consent before data collection began.

Acknowledgement: We acknowledge the support of our parent institute C. M. Patel College of Physiotherapy, Gandhinagar for providing support and various sports academies around Ahmedabad and Gandhinagar, Gujarat, India for providing contact details of players. We heartfully thank all the study participants for sparing their valuable time for this study.

Source of Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. McKinney J, Velghe J, Fee J, Isserow S, Drezner JA. Defining athletes and exercisers. *Am J Cardiol*. 2019;123(3):532-535. doi: 10.1016/j.amjcard.2018.11.001
2. Almeida MBA, Barra AA, Saltiel F, Silva-Filho AL, Fonseca AMRM, Figueiredo EM. Urinary incontinence and other pelvic floor dysfunctions in female athletes in Brazil: A cross-sectional study: Pelvic floor dysfunctions in female athletes. *Scand J Med Sci Sports*. 2016;26(9):1109-1116. doi:10.1111/sms.12546
3. Manore MM. Nutritional needs of the female athlete. *Clin Sports Med*. 1999;18(3):549-563. doi:10.1016/s0278-5919(05)70168-x
4. Laquale K. Nutritional needs of the recreational athlete. *Athl Ther Today*. 2009;14(1):12-15. doi:10.1123/att.14.1.12.
5. Mincer AB. The prevalence of stress urinary incontinence in high school and college-age female athletes in the Midwest: Implications for education and prevention. *J Womens Health Phys Therap*. 2008;32(1):35. doi:10.1097/01274882-200832010-00025
6. Capelini MV, Riccetto CL, Dambros M, Tamanini JT, Herrmann V, Muller V. Pelvic floor exercises with biofeedback for stress urinary incontinence. *Int Braz J Urol*. 2006;32(4):462-468; discussion 469. doi:10.1590/s1677-55382006000400015
7. Greydanus DE, Omar H, Pratt HD. The adolescent female athlete: current concepts and conundrums. *Pediatr Clin North Am*.

2010;57(3):697-718. doi: 10.1016/j.pcl.2010.02.005
8. Dalal A. D C Dutta's textbook of gynaecology and textbook of obstetrics. *J Obstet Gynaecol India*. 2016;66(4):303-304. doi:10.1007/s13224-016-0848-4
9. Laycock J, Green RJ. Interferential therapy in the treatment of incontinence. *Physiotherapy*. 1988;74(4):161-168. doi:10.1016/s0031-9406(10)63497-9
10. Yoshimura N, Miyazato M. Neurophysiology and therapeutic receptor targets for stress urinary incontinence: Neurophysiology and receptor targets for SUI. *Int J Urol*. 2012;19(6):524-537. doi:10.1111/j.1442-2042.2012. 02976.x
11. Malhotra N, Chahal A. The effectiveness of pelvic floor exercises on symptoms in females with stress urinary incontinence. *Biosci Biotechnol Res Commun*. 2018;11(4):681-686. doi:10.21786/bbrc/11.4/19.
12. Sapsford R. Rehabilitation of pelvic floor muscles utilizing trunk stabilization. *Man Ther*. 2004;9(1):3-12. doi:10.1016/s1356-689x(03)00131-0
13. Margaret Polden and Jill Mantle, the first edition of Physiotherapy in Obstetrics and Gynaecology, Butterworth-Heinemann, 1990
14. Cam C, Sakalli M, Ay P, Cam M, Karateke A. Validation of the short forms of the incontinence impact questionnaire (IIQ-7) and the urogenital distress inventory (UDI-6) in a Turkish population. *Neurourol Urodyn*. 2007;26(1):129-133. doi:10.1002/nau.20292.
15. Trivedi P. Nidhi Panchal analysis of stress urinary incontinence and awareness of physiotherapy in recreational female athlete-A survey. 2021; 12:976-0997.
16. Jácome C, Oliveira D, Marques A, Sá-Couto P. Prevalence and impact of urinary incontinence among female athletes. *Int J Gynaecol Obstet*. 2011;114(1):60-63. doi: 10.1016/j.ijgo.2011.02.004
17. Sapsford RR, Hodges PW, Richardson CA, Cooper DH, Markwell SJ, Jull GA. Co-activation of the abdominal and pelvic floor muscles during voluntary exercises. Neurourol Urodyn. 2001;20(1):31-42. doi: 10.1002/1520-6777(2001)20:1<31: aid-nau5>3.0.co;2-p. PMID: 11135380.
18. Khan S, Agrawal R, Syed A. Effect of core and pelvic floor muscle exercise on symptom severity and quality of life in women with stress urinary incontinence. *Indian journal of physical therapy and research*. 2021;3(2):102-106. doi: 10.4103/ijptr.ijptr_41_20
19. Wasfy IS, Soltan EM, Abdelwahab HA, Salama HM. Predictors of urogenital distress and impaired quality of life in adult Egyptians with lower urinary tract symptoms. *Afr J Urol*. 2021;27(1). doi:10.1186/s12301-021-00124-2

How to cite this article: Nidhi Panchal, Parth Trivedi. Pelvic floor exercises with trunk stabilization versus pelvic floor exercises with interferential therapy in rehabilitation of stress urinary incontinence in recreational female athletes - a randomized controlled trial. *Int J Health Sci Res.* 2025; 15(4):145-154. DOI: *https://doi.org/10.52403/ijhsr.20250423*

******