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RESEARCH ARTICLE

"A STUDY TO EVALUATE THE EFFECT OF INTRINSIC FOOT MUSCLE STRENGTHENING EXERCISES ON FOOT POSTURAL DEVIATIONS IN KATHAK DANCERS": AN EXPERIMENTAL STUDY

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ABSTRACT

Background: Kathak is the typical form of Indian classical dancing originated in northen India. The normal stance position of kathak dancers during the performance consists of overly turning out the foot. This results in the typical, functional hyper pronated foot. So, the purpose of the study was to find of the effects of intrinsic foot muscles strengthening exercises on foot postural deviations in the Kathak dancers. **Objective:** To evaluate the effect of intrinsic foot muscle strengthening exercises on foot postural deviation in Kathak dancers. **Methodology:** 40 asymptomatic femalebetween age of 8-23 years were randomly divided into two groups. Group-A performed intrinsic foot muscle strengthening exercises performed intrinsic foot muscle strengthening exercises and Group-B was the control group, not participating in any intervention. The duration of treatment was 4 weeks. The outcome measures were measured at 0 day and 4th week. **Outcome Measure**– Navicular Drop Test (NDT), Foot Posture Index-6 (FPI-6). **Data Analysis:** Data were analysed using SPPS statistical software version 20.0 for windows. **Results**: Group-A showed significant reduction in NDT and FPI-6($p<0.05$) in a subjects treated with intrinsic foot muscle strengthening exercises. **Conclusion**: It is concluded that intrinsic foot muscle strengthening exercises are effective in reducing navicular drop test and foot posture index in female Kathak dancers.

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INTRODUCTION

Indian Classical dance techniques are categorized into major seven kinds: Kathak, Bharatnatyam, Manipuri, Kathakali, Odissi, Kuchipudi, and Mohiniattam (DuttAmita, 2008). All Indian Classical dances are rooted in Natyashastra to some extent sharing similar features as arc illustration, certain body gestures and hand mudras with the addition of dramatic expression and abhinaya. The Indian Classical music provides the accompaniment for the dance along with percussion is such an immanent of the tradition. The dancers of nearly all the styles wear ghunghroos around their ankles to felicitate the percussion and an instance of expressive praise to percussion (Arpita Chatterjee, 2013). The whole feeling is conveyed by the dancer by narrative dance filter of hasta mudras (hand gestures), the poses and even the walk. Katha stimulates the body entirely as the dancers depend on their ghunghroos (bells) for balancing in chakkars (spins), facial muscles for abhinaya (expression) and proper position of arms and feet and mudras. The fast footwork helps to liberate anger and stress. The thatt performed in this dance form includes the therapeutic torso movements. Kathak is a new revolutionary new way to convey feelings signifying the importance of dance (Arpita Chatterjee, 2013). The normal stance position of Kathak dancers during the performance made up of overly turning out the foot. Due to the overturning of forefeet than the foot axis, the inner side of the feet bears an additional strain (Simmel, 2017). The basic foot movements in Kathakare Sama, Udghattita, Agratalasanchara, Anchita, and Kunchita (RoopikaSabharwal, 2017). The initial position of the Kathak dance performance is Sama where the feet are placed on the ground in a neutral position. Forefoot patterns in Udghattitaare as follows: Forefoot comes in contact with the ground bearing the weight and then after the heel is brought down. In Agratalasanchara, heel remains raised with toes on the ground and all the fingers in bent position. In Anchita, the heel is in contact with the ground with raised forefoot and all the fingers held in bent fingers. Certain times Soochi is performed where whole foot is raised up with only a big toe is in contact with the ground. This footwork is responsible for the typical

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functional hyperpronated foot (Roopika Sabharwal, 2017). Combination of abduction, plantar-flexion, and eversion causes excessive pronation of foot (Carlyn Kisner, 2012). Being an intricate structure, the foot is a compound network of bones, ligaments, and muscles that work synchronized to maintain its shape and allow motions such as walking and running (Mckeon, 2015). The muscles acting on the foot can be divided into two distinct groups; extrinsic and intrinsic muscles. The intrinsic muscles are located within the foot and are responsible for the fine motor actions of the foot. There are only two intrinsic muscles located in the dorsal compartment, the extensor digitorumbrevis and the extensor halluces brevis, its functions are extending the lateral four toes at meta-tarsophalangeal and interphalangeal joints and extending the great toe at the metatarsophalangeal joint (Zelik, 2015). The medial longitudinal arch is maintained by the intrinsic foot muscles which control the degree and velocity of arch deformation (Headlee, 2008) which helping in controlling posture during gait and stance (Lees, 2005). The purpose of this study is to find out the effects of intrinsic foot muscle strengthening exercises in foot postural deviations in Kathak dancers because as Kathak is considered there is a correlation between pronated feet and Kathak dancers which leads to develop many types of foot problems and injuries. Therefore, there is a need to advise them about the prevention and treatment of their foot problems.

Aim and Objectives: To evaluate the effect of intrinsic foot muscle strengthening exercises on foot postural deviations in kathak dancers.

MATERIALS AND METHODOLOGY

Ethical clearance for the study was obtained from the Ethics Committee, School of Physiotherapy, RK University, Rajkot. Subjects fromvarious dance academies of Rajkot were selected. The selection of subjects was done by convenient sampling. All the subjects were explained about the purpose and the test procedures involved in the study before their enrolment in the study. Written consent was taken from subjects who fulfilled both the criteria and were willing to participate in the study. Total 40 subjects who fulfilled the inclusion criteria were selected and group allocation done by random sampling technique.

- **Group A (n=20):** Intrinsic Foot Muscles Strengthening Exercises.
- **Group B (n=20):** Control Group

Criteria for Selection

Inclusion Criteria (Sabharwal, 2017)

- Asymptomatic female Kathak dancers.
- Subjects between the age group of 8 - 23 years.
- Minimum dancing experience of 2 years.
- Practice dance regularly for at least an hour for 6 days a week.

Exclusion Criteria (Sabharwal, 2017)

- Subjects with a history or any recent surgery of L/L.
- Any neurological deficit.
- Dancers who were professionally included in any outdoor sports such as Football, Badminton, Soccer, Judo, etc. Were excluded from the study in order to restrain the result of the study from an error. Previous fractures hindering dancing.

The outcome measures were measured at 0 day and 4th week using the Navicular drop test and Foot Posture Index-6. Group-A received Intrinsic foot muscle strengthening exercises which includes short foot exercise, Toe-spread exercise, First-toe and second toe to fifth-toe extension for three times a day for four weeks with two sets of 15 repetitions. Group-B was control group, 20 subjects not participating in any intervention.

RESULTS

All the statistical analysis was done by the Statistical Package for the Social Sciences (SPSS) statistical software version 20.0 for windows. Microsoft Excel and word were used to generate graphs and tables. Navicular drop test was analyzed using Parametric test. For NDT, Intragroup analysis was done using Paired t-test and intergroup analysis was done using Independent sample t-test. Foot posture index-6 was analyzed using Non-parametric test.. For FPI-6, Intragroup analysis was done using Wilcoxon sign rank test and intergroup analysis was done using the Mann Whitney U test. Level of significance (p-value) was set to 0.05 level.

Table 1. Age distribution

AGE	GROUP A	GROUP B
8-11	10 (50%)	5 (25%)
12-16	7 (35%)	10 (50%)
16-19	1 (5%)	3 (15%)
20-23	2 (10%)	2 (10%)
TOTAL	20	20
MEAN	13.3	12.15
SD	± 4.24	± 3.55

Interpretation: The above table shows the age group distribution (in years).

Table 2. Intragroup comparison of NDT& FPI-6 in both the feet of Group A

Outcomes	Foot Side		Mean	SD	p-value
NDT	LEFT	PRE	8.24	±3.80	0.000
		POST	5.11	±2.47	
	RIGHT	PRE	11.12	±4.00	0.000
		POST	4.86	±2.23	
FPI-6	LEFT	PRE	9.56	±2.20	0.001
		POST	6.40	±2.30	
	RIGHT	PRE	7.75	±2.89	0.000
		POST	9.56	±2.20	

Interpretation: The above table show the intragroup comparison of NDT and FPI and it shows a significant difference ($p<0.05$) in both the feet of Group A.

Table 3. Intragroup comparison of NDT& FPI-6 in both the feet of Group B

Outcomes	Foot Side		Mean	SD	p-Value
NDT	LEFT	PRE	8.66	±2.94	0.515
		POST	8.71	±2.81	
	RIGHT	PRE	9.46	±3.59	0.322
		POST	9.42	±3.59	
FPI-6	LEFT	PRE	9.70	±2.83	1.00
		POST	9.70	±2.83	
	RIGHT	PRE	6.64	±2.90	1.00
		POST	6.65	±2.90	

Interpretation: The above table show the intragroup comparison of NDT and FPI and it shows a no any significant difference ($p<0.05$) in both the feet of Group B.

Table 4. Intergroup comparison of NDT & FPI-6 in both the feet (Group-A & Group-B)

Outcomes	Foot Side		Mean	SD	p-value
NDT	LEFT	GROUP-A	3.12	±2.09	0.00
		GROUP-B	0.12	±0.35	
	RIGHT	GROUP-A	6.24	±3.14	0.00
		GROUP-B	0.07	±0.16	
FPI	LEFT	GROUP-A	4.15	±2.34	0.00
		GROUP-B	0.00	±0.00	
	RIGHT	GROUP-A	3.50	±1.98	0.00
		GROUP-B	0.00	±0.00	

Interpretation: The above table show the intergroup comparison of NDT and FPI-6 and it shows a significant difference ($p<0.05$) in both the Groups in both thefoot.

DISCUSSION

The primary aim of the present study was to find out the effect of intrinsic foot muscles strengthening exercises on foot postural deviation in female Kathak dancers. A study was carried out in 40 female Kathak dancers between the age group of 8-23 years and they divided into two groups. Group A (N=20) who receive intrinsic foot muscles strengthening exercises and Group B (N=20) control group. The results of the present study gives us important information about that intrinsic foot muscles strengthening exercise are effective in the navicular drop and foot posture index mainly in right foot. According to Norkus et al when the ankle is either in the fully dorsiflexed or plantarflexed position in syndesmotic ligaments are under maximum tensile loading (Bahram Jam, 2004). In addition, these positions may also cause the talus to press against the lateral malleolus which places considerable stress on the ankle mortise thus putting the foot into high risk of instability. Repetition of these postures throughout the performance may slacken the ligaments causing strength deficit in muscles (Brody, 1982).

The significant improvement could be because of intrinsic foot muscles strengthening exercise. Intrinsic muscles have a functional role for stabilizing the foot during single limb balance (Bill Vicezino, 2004), and helps in stabilizing the tarsal and metatarsal bones (Takayuki Hashimoto, 2013 and Hyong, 2009). Its function similar to elastic springs by supporting the MLA and maintain the concavity of the foot (Edward, 2013).

The results are in the line with the study done by Mulligan et al (2013), they concluded that a 4-weeks short foot exercise training program emphasizing the recruitment of plantar intrinsic foot muscles may have value in dynamically supporting the medial longitudinal arch of foot (Fourchet, 2016). However, Lynn et al concluded that the short foot exercise is more effective than toe-curling exercises at training the intrinsic foot muscle to maintain the height of the medial longitudinal arch during dynamic-balance tasks (Dewes, 2008). Among the prior study, Takayuki Hasmito et al conducted a study on strength training for the intrinsic flexor muscles of the foot: Effects on muscle strength scores, foot arch and dynamic parameters before and after the training. They concluded that this muscle strength training method significantly improved muscle strength scores, foot arch shape, and movement performance (Hyong, 2009). The results of a present study that suggested that the effective neuromuscular control of the intrinsic foot muscle strengthening exercise is essential in order to stabilize the tarsal and metatarsal bones and modulate the rate of pronation. This 'fine tune' control is not only required for static control of the medial longitudinal arch but is likely essential for the dynamic control of the MLA from the heel-strike to the toe-off phase of the gait cycle (Takayuki Hashimoto, 2013 and Hyong, 2009). Limitation of the study: Only female subjects were included and No evaluation of muscle strength due to lack of adequate equipment Future recommendation: Large sample size, The study can be done on both male & female and also find out the effects of the extrinsic foot muscles strengthening exercise. Clinical implication: As Kathak dancers are more prone to develop pronated foot, intrinsic foot muscle strengthening exercises are effective to reduce the navicular drop test and foot posture index in female Kathak dancers. This will help in reducing the effect of dance form on foot posture deviations and prevents any kind of instability in Kathak dancers.

Conclusion

The present study concluded that intrinsic foot muscle strengthening exercises are more effective in reducing navicular drop test and foot posture index in female Kathak dancers. This will help in reducing the effect of dance form on foot posture deviations and prevents any kind of instability in Kathak dancers.

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REFERENCES

Arpita Chatterjee. The therapeutic value of Indian Classical, Folk and Innovative dance form. *Rupkatha Journal on Interdisciplinary studies in Humanities* 2013; 5(1).

Bahram Jam, Mephty. Evaluation and retraining of intrinsic foot muscles for pain syndromes related to abnormal control of pronation Advanced physical therapy Education Institute(APTEI) July 2004.

Bill Vicezino. Orthotics in the treatmentof lower limb conditions: musculoskeletal physiotherapy perspective. Manual therapy 2004;9(4):185-196.

Brody DM. Techniques in evaluation and treatment of injured runner. *OrthopClinnorth Am.* 1982;13(3):541-55.

CarlynKisner, Lynn Allen Colby, 2012. Therapeutic Exercise: Foundations and Technique. 6th edition.

Dewes LK, Beazell J, Mullins M. Four weeks of short foot exercises affect lower extremity function, but not alignment in patients with lower extremity injury. *J Athl Train.* 2008; 3:5105.

Dutt Amita. Some Indian Dance Forms: Kathaka, Bharatnatyam, Kuchipudi. History of Science, Philosophy and culture in Indian Civilization, Center for studies in Civilizations. 2008; 5(1):27-489.

Edward P. Mulligan, Patrick G. Cook. Effect of plantar intrinsic muscle training on medial longitudinal arch morphology and dynamic function. *Manual Therapy* 2013; 18(5): 425-430.

Fourchet F. Foot Core Strengthening: relevance in injury prevention and rehabilitation for runners. *Swiss Sports & Exercise Medicine* 2016; 64(1).

Headlee DL, Leonard JL, Hart JM, Ingersoll CD, Hertel J. Fatigue of the planter intrinsic foot muscles increases navicular drop. *Journal of Electromyography and Kinesiology* 2008; 18(3): 420-425.

Hyong IH, Kim HS, Lee GC. The effects of mucle activities and dynamic balance ability with mobilization and active exercise on pronation foot. *Journal of Sport and Leisure Studies* 2009;37(2):1023-1032.

Hyong IH, Kim HS, Lee GC. The effects of mucle activities and dynamic balance ability with mobilization and active exercise on pronation foot. *Journal of Sport and Leisure Studies* 2009;37(2):1023-1032.

Lees A, Lake m, Klenerman L. Shock absorption during forefoot running and its relationship to medial longitudinal arch height. *Foot Ankle International* 2005; 26(12): 1081-1088.

Mckeon PO., Hertel J., Bramble D, Davis I. The foot core system: a new paradigm for understanding intrinsic foot muscle function. *Br J Sports Med*. 2015; 49(5): 290.

Norkus SA, Floyd RT. The anatomy and mechanisms of syndesmotic ankle sprains. *J AthlTra*2001;36:68-73.

Pawell M, Post WR, Keener J. Effective treatment of chronic plantar fasciitis with dorsiflexion night splints: a crossover prospective randomized clinical trial. *Foot Ankle Int.* 1998;19(1):10-8.

RoopikaSabharwal, Sonia Singh. Prevalence of ankle instabilities and disabilities among femaleKathak dancers. *The Journal of Indian Association of Physiotherapists* 2017; 11(2)

Sabharwal, R., & Singh, S. Foot postural deviations in female kathak dancers. *International Journal of Physiotherapy* 2017*;*4(1):38-43.

Simmel L. Dance Medicine in practice: Anatomy, Injury Prevention and Training 2013; 1st edition.

Suan Peng Ng, Rosemary Korda, Mark Clements, Isabel Latz et al. Validity of self-reported height and weight and derived body mass index in middle-aged and elderly individuals in Australia. *Australian and New Zealand Journal Of Public Health* 2011;36(6).

Takayuki Hashimoto et al. Strength training for the intrinsic flexor muscles of the foot: Effects on muscle strength, the foot arch and dynamic parameters before and after the training. 2013.

Thomas M. Gooding, Joseph M. Hart, Jay Hertel. Intrinsic Foot Muscle Activation During Specific Exercises: A T2 Time Magnetic Resonance Imaging Study. *Journal of Athletic Training* 2016;51(8):644–650.

Zelik KE et al. Coordination of intrinsic and extrinsic foot muscles during walking. *Eur J Appl Physiol*, 2015; 114(4):691-701.

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