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Effect of Pilates over the Health of Female Bharatnatyam Dancers

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ABSTRACT
Indian classical dance has a tradition that goes back at least 26,2000 A.D back. The principles of modernday and physiology lifestyle have therefore not be incorporated into the technical aspect of training in Bharatnatyam. As a part of aesthetics, this dance involves the kinetics of body movement and understanding of body language as a reflection of its anatomy as well as physiology aspect. The dancers usually faces a lot of problems while dancing due to their 3 weak muscles, poor body composition (involving BMI, waist and hip circumferences), psychological related parameters like anxiety, depression, fatigueless, breathing difficulties, less stamina which may result to poor body shaping & to the poor body corporation, due to which it goes hard for them to perform effectively and efficiently for the performer. The goal of the study was to see the impact of Pilates Exercises on Body Mass Index & Waist-Hip Ratio of Female Bharatnatyam Dancers. In this study, 40 Bharatnatyam dancers in which 20 dancers were selected and kept in each group one is experimental in which Pilates training were given to them and the other is non-experimental group where the other 20 young Bharatnatyam dancers were on their normal routine of practice. The age group of the dancers was from 11- 18 years. The study was taken for 3 weeks and checked the ratio simultaneously. The Pilates training given to the dancers for four days in a week and 3 weeks constantly. Changes was observed in very first week on 20 experimental dancers there was decrease in Body Mass Index (BMI) as well as Waist – Hip ratio (W-H ratio) but no categorical changes is been seen in on non-experimental group. The study concluded that there was a slight decrement in Body Mass Index (BMI) and Waist-Hip Ratio in dancers doing Pilates training in comparison to the dancers who were not the part of this Pilates training but on their daily routine. It plays major role in Physical and psychological health being in Bharatnatyam dancers.

KEY WORDS: *Pilates, Bharatnatyam, Body Mass Index*

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INTRODUCTION

In the Late nineteenth century, Pilates had a rare and unique connection with the Physical culture involving physical activities and he understood the importance of being physically & mentally healthy, thus he clearly decided and made the connection with this apparatus and allow the exercises to cure physical, mental, emotional, psychological and the vocational aspects of health[1].Pilates exercises also contributes to corrective exercise or medical gymnastics[2]. Joseph Pilates & Heinrich Freidrich Pilates (his father) accompanied & concluded this method with the variety of equipments, and termed as "apparatus"[1]. Every piece of equipment is meant to aid in the process of stretching, strengthening, body alignment, and greater core strength[3].

Nowadays, not only dancers, athletes but also the other population uses this training for the better upliftment and physical fitness of the body[3].The Pilates exercise training yields numerous benefits[3]. The systematic training leads to an increase in tidal volume with the enhancement of oxygen and blood circulation[4]. It enhance the joint health, functions & condition with bone density[4]. The basis of this exercise is to perform every movement slowly while inhaling and exhaling deeply during the Pilates movement[4]. While exercising the Pilates, each and every movement must be included by the following 9 principles. In Further, Pilates exercise also promotes physical fitness, beauty,& composition to the body[5]. Thus, it has gained a particular high rise of interest amidst the young women. In addition, a 103mental health study reported that Pilates exercise also boost up the physical self-efficacy and the view towards optimism[6].

Control – Contrology" was based on the idea of muscle controlment[6].
Centering - All actions that begin by focusing and engaging the core muscles[6]. It aids in the improvement of one's balance and coordination, as well as one's posture[5]. It acts as "the powerhouse of the body"[5]. All the movements starts from the center and travels towards the periphery of the limbs[5].
Flow- Pilates emphasized movement grace and prudence, generating flow via the use of proper transitions[6]. Once clarity achieves, the exercises which are intended to derive within and build the strength and stamina[6].
Precision- Keeping, the awareness to each exercise. Needed to be done precisely& properly for the benefit[3]. Flow of movement-should start slowly and gently from a strong centre[6]. Once precision is established, the movements are designed to flow inside and into one another in order to increase strength and stamina[3].During exercises postural alignment is important as it improves safety by correcting muscle imbalances and optimizing the coordination[6].Relaxation helps in correcting the muscle firing patterns and mental concentration. It has a vital role and prevents from further injuries and other pathological damages[11].Increased precision also gives its positive effect on stamina, motion becomes more efficient, resulting in reduced stress when performing workouts[6]. As the stamina is the energy and strength needed by the dancer in order to perform at their best for an extended period of time[10].
The dancers usually faces a lot of problems while dancing due to weak muscles, poor body composition and the body shaping[19], psychological stress, physical stress due to which it goes hard for them to perform and give the result effective and efficiently at their full best[19].Pilates is a complete method of stretching and strengthening muscles aimed at building a powerful body according to the philosophy of control of the mind over the body[1]. It brings physiological benefits[11]. Strength, muscle strength, psychological functions directly plays an essential role in making and maintaining the accurate Body Mass Index[23] and Waist-Hip ratio[25].
The "Bharatnatyam" a classical dance form, based upon the half squatting position "Araimandi" & thefull squat "Muzumandi" with the rhythmic pounding of the feet, the variety of sharp and meaningful hand gestures[10]. Unity appears as a coordinated movement pattern of the feet, thighs, torso, arms, hands, neck and eyes[10].This classical dance involves some unique movements[10]. Thus, Breathing, core stability, strength, concentration, a lot of stamina, precise movements (sharp movements) and flexibility are emphasized in Pilates exercises for the better enhancement & upliftment of it[20]. The dancer's body while performing must be forming the three triangles[10]. The first from head – shoulder – sternum, the second from shoulders to the umbilical (inverted triangle) and the third one is from waist to the knees. When the dancer is able to make these 3 imaginary triangles of the body the dancer is said to be as the perfectionist dancer[10]. And it can onlycore stability, strength, concentration, stamina, precise movements, posture alignment, flow of movement and flexibility are emphasized in Pilates Exercises such as controlling movement, posture and breathing[13]. All these features of Pilates Exercise benefits the dancer's in maintaining the BMI[23] and Waist – Hip Ratio (WHR)[25] which is very essential in the dancer's life[19]. Thus as we know that the Indian Classical dance form demands the beauty and the grace therefore in order to making that connection & the bond between the dancer and the audience it is important for them to be fit[22].Thus the BMI and Waist –Hip ratio matters a lot it helps in adding beauty to the body[22]. The Measurement, assessment and monitoring of [1]body weight and height (body mass Index), hip circumferences, waist circumferences in dancers plays a very vital role in their professional life[19]. Human body weight, height, hip circumferences & waist circumferences are the broadest measure of body size[19]. But there is always be the pathological, psychological, social, emotional & vocational factors that may affect the circumference and results in disturbing the body ratio and its composition which may further creates the problem in dancer's life while performing, in career, in personal issue, health issues, and in community as well[19].Thus the factors are important to be balanced in accordance of avoiding the physically, psychologically, socially, emotionally, & vocationally problems[11].

STATEMENT OF PROBLEM

Bharatnatyam dancers usually have high Waist-Hip ratio[23] and high Body Mass Index(BMI)[25] which may create inconvenience's &affects their performances& body figure[19]. Need felt for further analyzing and improving the same through Pilates exercises and for this, the project work has been carried out.

METHODOLOGY

Design

Experimental study

Study Centre

- Lok Kala Manch, Lodhi Road, New Delhi
- Nrityabharati Dance Academy, Tilak Nagar, New Delhi

Sample
40 Bharatnatyam dancers participated in this study
(20 experimental & 20 control group)
Sample
Convenient sampling
Study Population
Young Female Bharatnatyam dancers aged between 11-18 years[14].
INTERVENTION PERIOD
Three Weeks
INCLUSION CRITERIA
Participants:-Female Bharatanatyam dancers undergoing training aged between 11 – 18 years.
Experience: - Minimum two years practice[10].
Training Hours: - Regular Training for 2 hours per day for at least 3 days in a week[10].
Specific Selection: - Dancers who faces stamina problem[10].
-Dancers facing fatigue problem at initial stage of dance[25].
- Dancers finding difficulty in doing fast steps via: taking fast turns, bending,jumping due to over/under weight, wider/narrower waist and hip circumferences[19].
EXCLUSION CRITERIA
-Dancers with the history of past surgery at any stage[10].
- Dancers having history of recent trauma or any physiological condition[10].
-Dancers who were already involved in regular Pilates classes[10].
VARIABLES
Dependent variable: Pilates Exercises[1]
Independent variables: Body Mass Index & Waist-Hip Ratio.

Weight Measurement: - Ideal weight, Overweight, Underweight[19]
Height Measurement: - Ideal height, Long height, Short height[14]
Body Mass Index (BMI):- Weight (In kilograms) / Height Square (In meter^2)[21]
Circumference: - Waist, Hip[21]
Waist-Hip Ratio : - Low – 0.80 or lower
Moderate - 0.81 – 0.85
High - 0.86 or higher

PROCEDURE
- Participants were picked based on the inclusion and exclusion criteria[10].
- The exercise program procedure has been fully explained to them[10].
- Participants were asked to perform the exercises for four days in a week consistently for three weeks under the supervision[10].
- On each day their height, weight, BMI, waist circumference, hip circumference, and Waist-Hip ratio were measured before starting the protocol[10/21].
- At the end of each week their measurements were taken in order to keep the record and analyze the deviation in protocol[10].
- After three weeks, participants were evaluated and their measurements were recorded[10].
- Pilates Exercise Protocol was prepared for them[10].
- Sessions were conducted four times in a week and the duration of each session was of 26,50 minutes including 10 minutes of warmup with light breathing & stretching carried by 5 minutes of cool down[10].
- The Exercises were performed under the supervision of a physical therapist, taking into the account of potential benefits[10].
- The protocol was composed of the training needed for core strengthening, increasing the breathing capacity , maintaining the body weight, height (BMI) & Waist – Hip ratio so that the Pilates exercises helps in [2]improving the body image and enhancing the performance[21/24].
- Individual limits were respected while training and exercises were adapted to the subject's abilities[10].
- Each activity was demonstrated by the trainer and used verbal - visual instructions to facilitate correct posture and movement[10].
- All exercises were performed in groups with 10 second rest interval between each exercise[10].

Pilates Mat Exercise Protocol[10]

Phase 1 (1st week)[10]	Phase 2 (2nd week)[10]	Phase3 (3rd week)[10]
➢ Warm up (10 mints)	➢ Warm up (10 mints)	➢ Warm up (10 mints)
➢ 20 crunches extended legs and arms (vertical crunches)	➢ 20 crunches/ extended legs and arms(vertical crunches)	➢ 20 crunches/ extended legs and arms(vertical crunches)
➢ Bent knee crunch	➢ Bent knee crunch	➢ Bent knee crunch
➢ Rolling like a ball	➢ Rolling like a ball	➢ Rolling like a ball
➢ Bent knee raise in crawling position	➢ Bent knee raise in crawling position	➢ Bent knee raise in crawling position
➢ Fire hydrants	➢ Fire hydrants	➢ Fire hydrants
➢ Hip isometrics	➢ Hip isometrics	➢ Hip isometrics
➢ Plank Jacks exercises	➢ Plank Jacks exercises	➢ Plank Jacks exercises
➢ Pulse Lunges	➢ Pulse Lunges	➢ Pulse Lunges
➢ Leg balance sculpture	➢ Leg balance sculpture	➢ Leg balance sculpture
➢ Cool down (5min)	➢ Statue Toner	➢ Statue Toner
➢	➢ Resistance band plie squat Exercise	➢ Resistance band plie squat Exercise
	➢ Criss Cross Exercise	➢ Criss Cross Exercise
	➢ Heel- up Exercise	➢ Heel- up Exercise
	➢ Kneeling Side Kicks	➢ Kneeling Side Kicks
	➢ Cool Down (5 min)	➢ Leg Pull up Exercise
		➢ Cork Screw seal Pattern Exercise
		➢ Cool Down (5 min)

- BMI-for-age percentage growth charts are the most commonly used indicator for measuring height and growth patterns in adolescent boys and girls.

Figure 1- Criss Cross Exercise.

Figure 2-Plank Jacks Exercise

Figure 3- Corkscrew Pilates Exercise

DATA ANALYSIS

BMI for Adolescents

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Normal or Healthy Weight	5th percentile to less than the 85th percentile
Overweight	5th to less than the 95th percentile
Obesity	Equal to or greater than the 95th percentile

FORMULA –

BMI[23] **=** Weight (In kilograms) / Height Square (In meter^2)

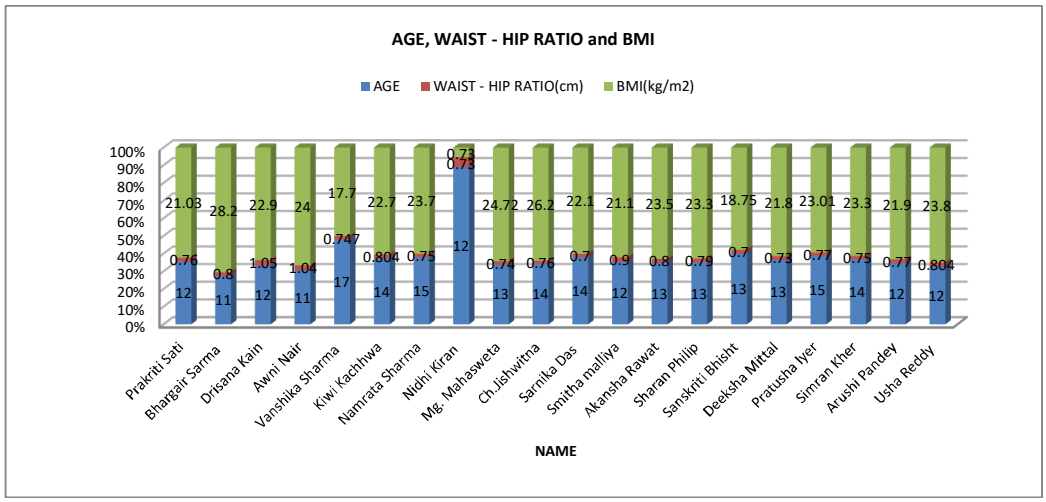
The normal value of waist-hip ratio are-:

Low – 0.80 or lower

Moderate - 0.81 – 0.85

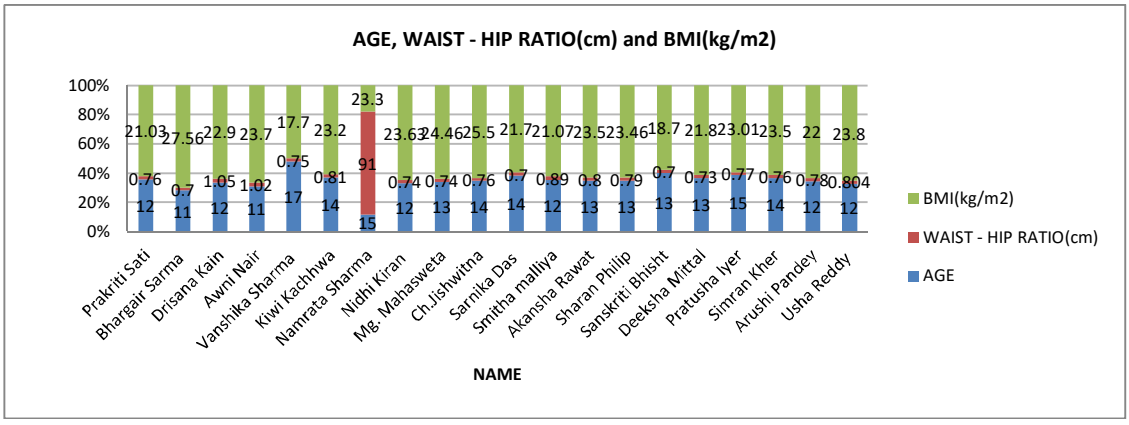
High - 0.86 or higher
Hip-Waist Ratio[25]**=** Waist circumference (cm)/ Hip circumference (cm)

RESULT
DANCERS ON PILATES TRAINING



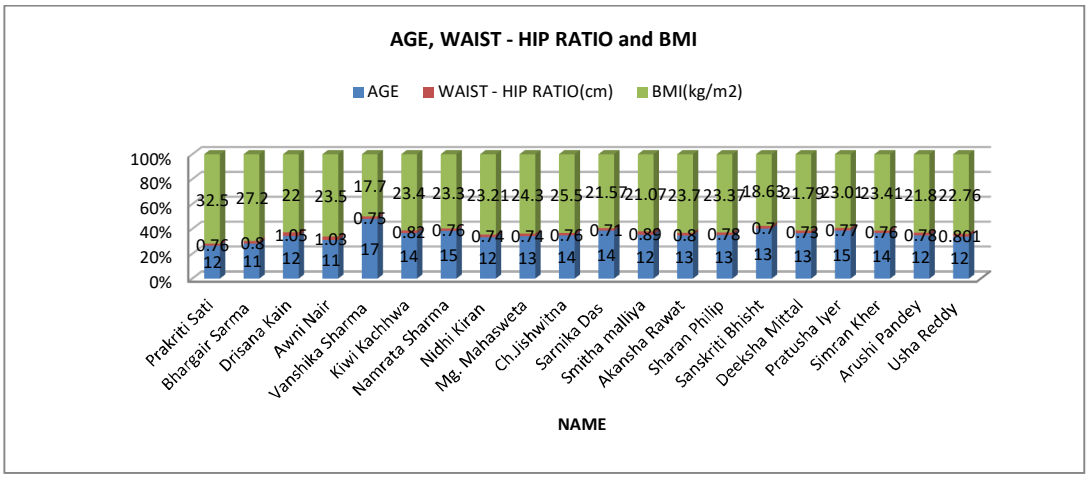
GRAPH 1 At the start-Measurements were taken on day1 at the start for both BMI & Waist-Hip ratio

1st WEEK



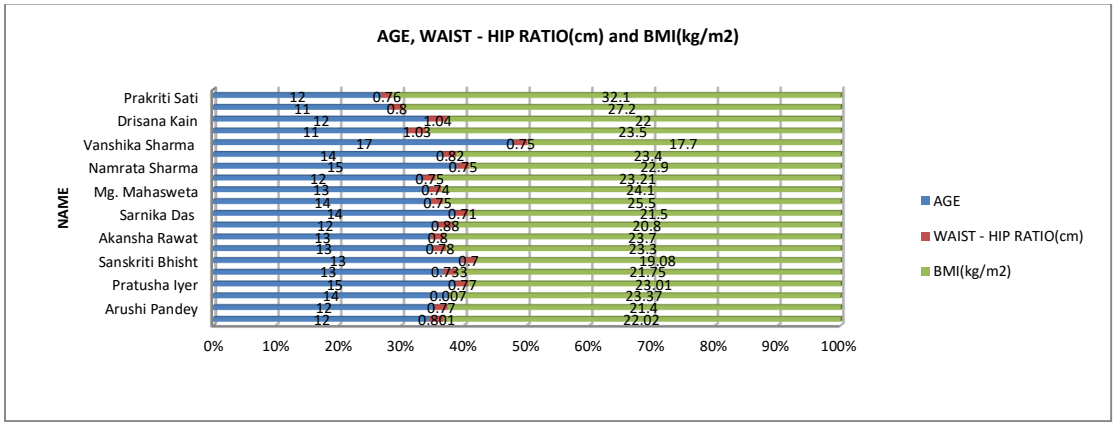
GRAPH – 2: 1st week Measurements were taken on 1st week of both BMI & Waist-Hip ratio

2nd WEEK



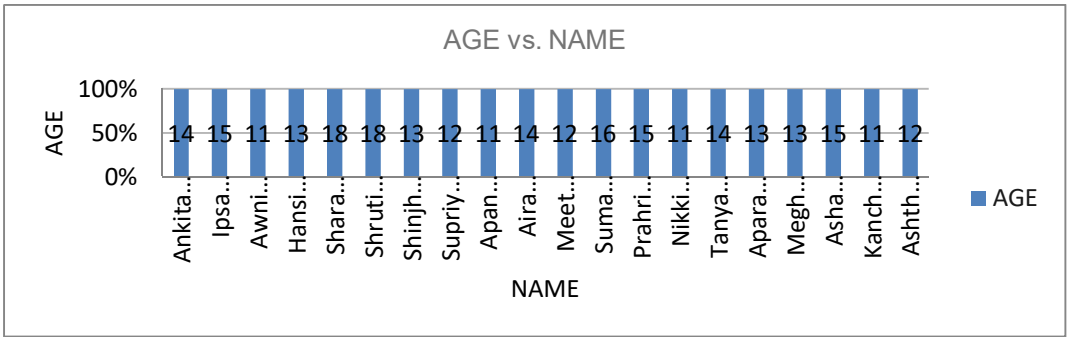
GRAPH 3: 2nd Week Measurements were taken on 2nd week of both BMI & Waist-Hip ratio

3rd WEEK



GRAPH4-3rd Week Measurements were taken on 3rd week of both Body Mass Index & Waist-Hip ratio

DANCERS ON NORMAL ROUTINE WITHOUT PILATES TRAINING



GRAPH 5 Dancers who were on their normal routine without the Pilates Exercises training.

RESULT

The Pilates Exercises performed in participants and it has been observed that -:
Average Mean for BMI -:
In 20 experimental dancers - 23.077
& in 20 non experimental dancers - 22.298
&Standard Deviation
In 20 experimental dancers – 2.952
In 20 Non experimental dancers – 3.278
Whereas the Average Mean for Waist- Hip ratio -:
In 20 experimental dancers -0.757
In 20 Non experimental dancers – 0.843
&Standard Deviation
In 20 experimental dancers -0.198
In 20 Non experimental dancers – 0.094
Thus, thereby the gross effect on the Dancers can be seeing clearly.

IN 2O EXPERIMENTAL DANCERS :

Dancers who were on Pilates Exercises Training

BMI

	MEAN	AVERAGE MEAN	STANDARD DEVIATION
0th WEEK	**21.722**	**21.722**	**5.444887124**
1st WEEK	**22.776**	**22.776**	**2.162674757**
2nd WEEK	**23.186**	**23.186**	**3.020941645**
3rd WEEK	**23.077**	**23.077**	**2.952267817**

WAIST-HIP RATIO

	MEAN	AVERAGE MEAN	STANDARD DEVIATION
0th WEEK	0.79475	0.79475	0.096215151
1st WEEK	5.3027	5.3027	20.17127161
2nd WEEK	0.79655	0.79655	0.09303733
3rd WEEK	0.75705	0.75705	0.19857982

IN CONTROL GROUP (20 DANCERS)

Dancers who were on their daily routine

BMI

	MEAN	AVERAGE MEAN	STANDARD DEVIATION
0th WEEK	**22.298**	**22.298**	**3.278933716**
1st WEEK	**22.298**	**22.298**	**3.278933716**
2nd WEEK	**22.298**	**22.298**	**3.278933716**
3rd WEEK	**22.298**	**22.298**	**3.278933716**

WAIST – HIP RATIO

	MEAN	AVERAGE MEAN	STANDARD DEVIATION
0th WEEK	**0.843**	**0.843**	**0.094429032**
1st WEEK	**0.843**	**0.843**	**0.094429032**
2nd WEE	**0.843**	**0.843**	**0.094429032**
3rd WEEK	**0.843**	**0.843**	**0.094429032**

DISCUSSION

Forty healthy female Bharatnatyam dancers having no definite systematic diseases were recruited in the study. A total of twenty dancers were signed up for each, with the one Pilates exercise group and the second control group. The Pilates exercise group participated in the exercise program 50 minutes a day, 4 days a week for 3 weeks[10], while the control group (non-experimental dancers) enjoyed daily life. The Pilates exercise group also recommended consuming good nutrition during the exercise period[8]. The exercise group warmed up with light breathing and stretching for 10 minutes, main exercise for 50 minutes, and cool-down for 5 minutes, for a total of 70-80 minutes[10]. The Pilates exercise program was based on "A Six Week Pilates Exercise Protocol to Improve Physical and Mental Health Parameters" by Eda Akbas and Banu Unver[2.]

Pilates exercise is one of the most important method for weight management and slimming globally[19] and is often used by women (Von Sperling De Souza & Brum Vieria, 2016).

Pilates training has shownan incredible increment in the popularity among the dancers in recent years[1]. Many trials have proven the different periods and intensities of Pilates training's effect on such parameters[25].

In this study of 3 weeks Pilates mat exercise protocol, a change in weight, height, BMI, waist, Hip circumferences & Waist-Hip ratio were compared to the baseline outcomes of the participants[23,25.] Although the study by Savkin (2014) it is state that 8 weeks Pilates training is enough to make the participant slimmer in the waist and other areas of the body[26].In today's Bharatanatyam, the body image problems are unluckily becoming widespread among the dancers[19]. The control in these variables may improve the dancer's satisfaction with body image and physical health[1,2]. In my study I have taken forty number of Bharatnatyam dancers out of which 20 dancers were selected and kept in each group. The age group of the dancers was from 11- 18 years. The study was taken for 3 weeks and checked the ratio simultaneously. In my study I found that in 20 experimental dancers there was decrease in Body Mass Index[23] (BMI) as well as Waist-Hip ratio (W-H ratio)[25] but no categorical changes has seen in neither BMI

nor Waist-Hip ratio, but the changes seen from the 1st week onwards.The effects were evident in first week onwards where the BMI increased, which can be due to the fact that most of the samples were belonging to the puberty stage where the growth hormone becomes at its peak[6]. The increase in height and weight could be the reason of increase in BMI total (which were expecting to be decreased but due to the 15growth hormone at its peak, BMI increases) another reason can be said that as the mass increases the fat & the muscle distribution take place which can be the reason of increase in the weight of hip & waist circumference but on the other side it is well known that if the fat & the mass distribution would occur than the folding of the skin longitudinally[25] will take place which may inturn be the reason for decrease in the BMI & the waist, hip circumference's which can be seen upto the 3rd week.
Same reason can be said for second week as in overall the mean BMI & the W-H ratio got increased from first week. Whereas, in week 3rd, there was slight reduction in mean BMI & the W-H ratio[25].In case of Pilates Exercises training, girls who were not doing Pilates & going for their regular exercises doing on normal routine basis, showed same results throughout the all three weeks. And when we compare Waist-Hip ratio in both the groups, we saw a change in Waist-Hip ratio of group doing Pilates for 3 weeks but we were not able to see any kind of change in the other 20 dancers who were not having Pilates training in their regime for 3 weeks[6,8].Thus, in accordance to the findings, the current Pilates exercise protocol promises to achieve.The present study also indicates about that the level of anxiety and depression which the dancers usually faces before the performance among the young female dancers, the Pilates training helps in decreasing when compared to the baseline[2,12].The most practical, simple and entertaining programs may help the dancers to incorporate into the such exercises in their lifestyle's and provide it a permanence of positive effects[1,3,4].
Thus, according to the current study, it can be stated that the current Pilates Exercise has shown some effects on Bharatnatyam dancers between the ages of 11-18 years.

CONCLUSION

The results showed that there was a change in Body Mass Index (BMI) and Waist-Hip Ratio in dancers doing Pilates training in comparison to the dancers who were not doing the Pilates training.
It also contributes to the psychological well - being in young Bharatnatyam dancers.
However, there is the need of developing a long term training protocol for the dancers.

LIMITATION OF THE STUDY

Due to the pandemic disease COVID-19, the training could not be taken as group training but on online video calling through ZOOM app, the training was given to them.

FUTURE SCOPE OF THIS STUDY

It is very beneficial for the dancers as it help them to know about the effect of it, over the body and how it will help them to become a good dancer by improving the different aspects of the body through this Plates exercise and their lifestyle.
If the dancers will continue this then for surely it will in turn into the good result.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest. The research received no specific grant from any funding agency in the public, community, or non-for profit sectors.

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