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An exploratory study on effect of Bihu dance practice on vo_2max and respiratory efficiency in female Bihu dancers in Assam among adolescents

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Abstract: *Dance, a type of art that generally refers to the rhythmic body movements,is performed in many different cultures.It provides an energetic , non-competitive form of exercise which has potential positive impact on physical health and may enhance physical fitness.Bihu dance in Assam is a culturally set emotional expression and energy releasing process in sequence of steps done with music by rhythmic movement of body parts , has wide range of physical and mental benefits. Regular dance training , performed in various duration and intensity according to different regional tradition have positive impact ,at different levels of motor skill such as strength/power, agility and endurance.Every folk Dance differs in terms of style and technique as well as energy pathway that are used. So the aim of the study was to measure the effect of Bihu dance practice on vo2max and respiratory efficiency among adolescents*

Key words*: Bihu dance, vo_2max, respiratory efficiency, peak flow meter, peak flow rate, Queens college step test.*

1.INTRODUCTION:

Dance is a type of art that refers to rhythmic body movements and provide an active, non competitive form of exercise that has potential positive effect for physical health , mental and emotional well being.[1,2] It is practiced all over the world in different styles and cultures which makes a benefaction to a healthy life. Studies have shown that dance practice and physical activity can have a positive effect on physical fitness, increases lung function, flexibility and aerobic capacity.[3,4] Bihu dance is an indigenous Folk dance from Indian state of Assam, related to Bihu festival characterized by brisk dance steps, rapid hand movements which are quick and energetic that has lot of pelvic movements and hip bending which helps in maintaining strength, flexibility, cardio vascular fitness and it also works on core muscles as it involves squeezing of abdomen.[5,6] Regular dance training , performed in various duration and intensity according to different regional tradition have positive impact ,at different levels of motor skill such as strength/power, agility and endurance.[7] Every folk Dance differs in terms of style and technique as well as energy pathway that are used. [8]Also Depending on dance style and level of expertise dancer can exhibit large difference in vo_2max [9]

Vo_2max is the highest rate at which oxygen can be utilised by the body and provides measure of cardio respiratory fitness ,it is a strong predictor of future cardiac events and is the most commonly applied measure to indicate change in aerobic capacity as a result of training[10,11,12] Cardiorespiratory fitness (CRF) is a health related component of physical fitness is not only a sensitive and reliable measure of habitual activity but also a relatively low cost and useful health indicator for both symptomatic and asymptomatic patients in clinical practice[13,14,15,16,17].

Various studies were done on effect of different dance forms like Bharatnatyam, Kathak and folk dance that assessed the cardio respiratory system. As major difference in vo_2max is observed based on dance style and Bihu dance may have positive impact on v02 max at different level of endurance .So the purpose of this study is to find the effect of Bihu dance on vo_2max using Queen's college step test and respiratory efficiency by peak expiratory flow meter.

2.MATERIALS:

1. Step of 16.25 inches /41.3cm 2.stopwatch , 3.Metronome or cadence tape ,4.Heart rate monitor ,5.Peak flow meter ,6.Pen, 7.copy

3.METHOD:

Total 100 adolescent girls between the age group of 13-18 who fulfils the inclusion and exclusion criteria were selected randomly. A brief explanation of the procedure, also the importance and benefit of the procedure was explained to all the participants prior to starting of the programme with Screening of health risks and basic information such as name, age, height, body weight was recorded. The vo2max and peak expiratory flow rate was measured at the beginning practice session of Bihu dance and after completion of 6 weeks of practice at a same schedule(1 hour/day for 3 days /week), Vo_2 max was measured using Queen's college step test .The subject was asked to step up and down on the 41.3 cm platform and with the metronome set at a rate of 88 beats /min using a four-step cadence, "up-up-down-down" for 3 minutes .Subjects were asked to stop after 3 mins and the heart rate was noted and vo_2max was calculated using the equation - female: vo_2max (ml/kg/min) = 65.81-(o.1847 x heart rate[bpm]) [18,19] The data was noted for each participants. Peak flow meter was used to check the respiratory efficiency where subjects were asked to expire forcefully into the peak flow meter after a deep inspiration through the mouthpiece of the device by calibrating the knob to zero[20]. At the end of procedure the air blown out during forceful exhalation was measured in lit/min. Then the participants were advised to continue their Bihu dance practice continuously for 6 weeks. They were informed not to perform any other sports activity during these days and to maintain their schedule as informed. The participants were called again after completion of 6 weeks[21] , and their vo_2max and respiratory efficiency was measured by using the same procedure .

4. ANALYSIS:

The collected data was statistically analysed using SPSS(20). Data was reported as Mean±SD. The following tests were performed - A Wilcoxon Signed Rank test was used to measure difference between pre and post vo_2max and respiratory efficiency. Spearman Rank correlational analysis was done to find the correlation of vo_2max with RE, age, height and weight.

5. RESULT :

Table1.1 : Frequency Distribution and Descriptive Statistics of Age (n=100)

Age (Yrs)	Frequency	Percentage	Range	Mean ± SD	Median	Mode
13	4	4%	13-18	15.74±1.19	16	15
14	8	8%				
15	32	32%				
16	28	28%				
17	22	22%				
18	6	6%				
Total	100	100%				

Table 1.2 : Frequency Distribution and Descriptive Statistics of Height(cm) **(n=100)**

Height(cm)	Frequency	Percent	Range	Mean ± SD	Median	Mode
150-155 cm	48	48%	150-165	156.50±3.75	156.5	156
155-160 cm	36	36%				
160-165 cm	16	16%				
Total	100	100%				

Table 1.3 : Frequency Distribution and Descriptive Statistics of Weight(kg) (n=100)

Weight(kg)	Frequency	Percent	Range	Mean ± SD	Median	Mode
<40 Kg	3	3.0%	38-52	44.88±2.85	45	45
40-45 Kg	55	55.0				
45-50 Kg	41	41.0				
> 50 Kg	1	1.0				
Total	100	100.0				

Table 1.4: Baseline Descriptive Statistics of VO2 max(ml/kg/min) and RE (L/min) **and** Shapiro-Wilk Test of Normality **(n=100)**

Pre Test	Range	Mean ± SD	W	*P*-value
VO2 max(ml/kg/min)	36.07-41.43	39.14±1.34	0.920	<.001***
RE (L/min)	330-480	396.90±25.49	0.916	<.001***

***Significant at p<.001

TABLE 1.5 : EFFECT OF BIHU DANCE ON VO2MAX(ml/kg/min)

Age	VO2 max	Mean± SD	MD± SDD	Q1	Q2	Q3	Z	*P*-Value
13 Yrs	Pre Test	39.86±0.55	2.09±0.17	39.58	39.58	40.41	-1.84	.066[NS]
	Post Test	41.95±0.58		41.52	41.80	42.53		
14 Yrs	Pre Test	39.56±0.57	2.12±0.17	39.03	39.40	40.23	-2.55	.011*
	Post Test	41.68±0.55		41.15	41.61	42.21		
15 Yrs	Pre Test	38.83±1.61	3.03±6.23	37.09	39.21	40.32	-4.96	<.001***
	Post Test	41.86±6.04		39.12	41.52	42.54		
16 Yrs	Pre Test	39.45±1.33	2.1±0.36	39.12	39.86	40.32	-4.66	<.001***
	Post Test	41.55±1.54		41.29	42.17	42.35		
17 Yrs	Pre Test	39.06±1.25	2.07±0.35	38.29	39.21	40.04	-4.12	<.001***
	Post Test	41.13±1.49		40.37	41.24	42.21		
18 Yrs	Pre Test	38.69±0.93	1.97±0.45	38.11	38.94	39.21	-2.21	.027*
	Post Test	40.66±1.24		40.14	40.78	41.24		
Overall	Pre Test	39.14±1.34	2.38±3.53	38.47	39.58	40.28	-8.72	<.001***
	Post Test	41.53±3.57		40.69	41.80	42.35		

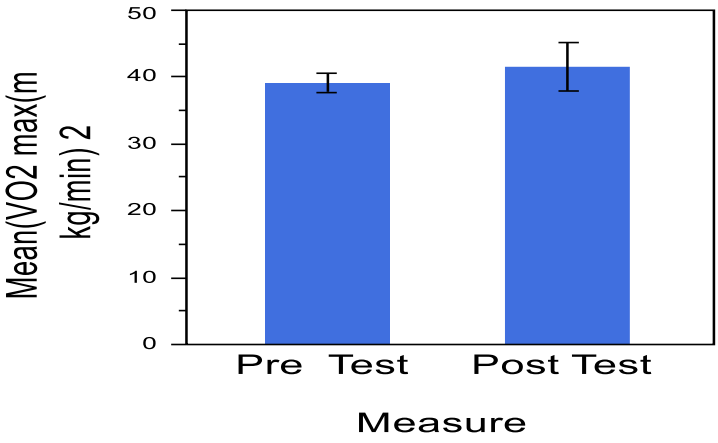
[NS]Not Significant *Significant at *P*<.05, ***Significant at *P*<.001

TABLE 1. 6 : EFFECT OF BIHU DANCE ON RE (L/min) ON FEMALE BIHU DANCERS

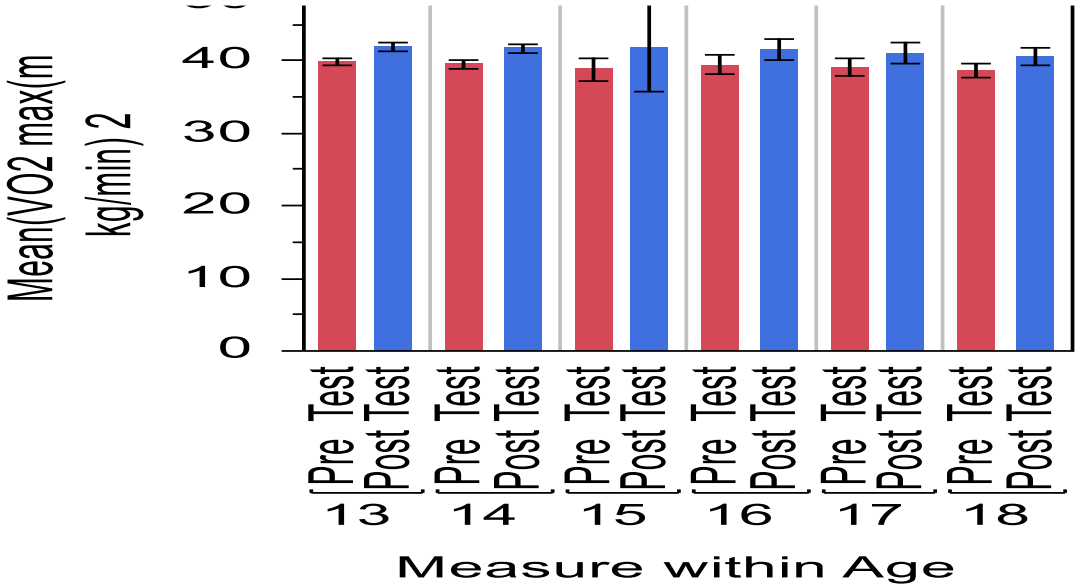
Age	RE	Mean± SD	MD± SDD	Q1	Q2	Q3	Wilcoxon Signed Rank test	
							Z	*P*-Value
13 Yrs	Pre Test	405.00±10.00	95.00±10.00	400.00	400.00	415.00	-1.89	.059 [NS]
	Post Test	500.00±16.33		485.00	500.00	515.00		
14 Yrs	Pre Test	401.25±12.46	83.75±7.44	392.50	400.00	400.00	2.64	.008**
	Post Test	485.00±14.14		472.50	480.00	497.50		
15 Yrs	Pre Test	391.25±32.8	76.56±24.44	362.50	400.00	410.00	-4.94	<.001***
	Post Test	467.81±39.9		440.00	480.00	500.00		
16 Yrs	Pre Test	402.50±17.56	85.36±17.74	392.50	405.00	417.50	-4.65	<.001***
	Post Test	487.86±31.19		470.00	500.00	510.00		
17 Yrs	Pre Test	395.45±28.24	85±21.33	380.00	400.00	420.00	-4.12	<.001***
	Post Test	480.45±36.84		450.00	500.00	500.00		
18 Yrs	Pre Test	395.00±20.74	73.33±17.51	382.50	395.00	412.50	-2.23	.026*
	Post Test	468.33±33.12		442.50	465.00	502.50		
Overall	Pre Test	396.90±25.49	82.00±20.45	390.00	400.00	410.00	-8.72	<.001***
	Post Test	478.90±34.93		460.00	490.00	500.00		

[NS]Not Significant *Significant at *P*<.05, ***Significant at *P*<.001

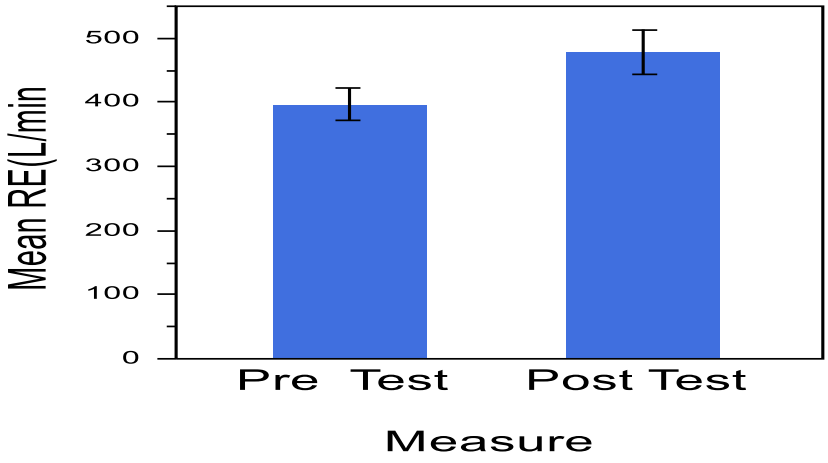
GRAPH 1.1: BAR CHART SHOWING PRE AND POST TEST MEAN VO_2max



GRAPH 1.2: BAR CHART SHOWING AGE WISE PREAND POST TEST MEAN VO_2max

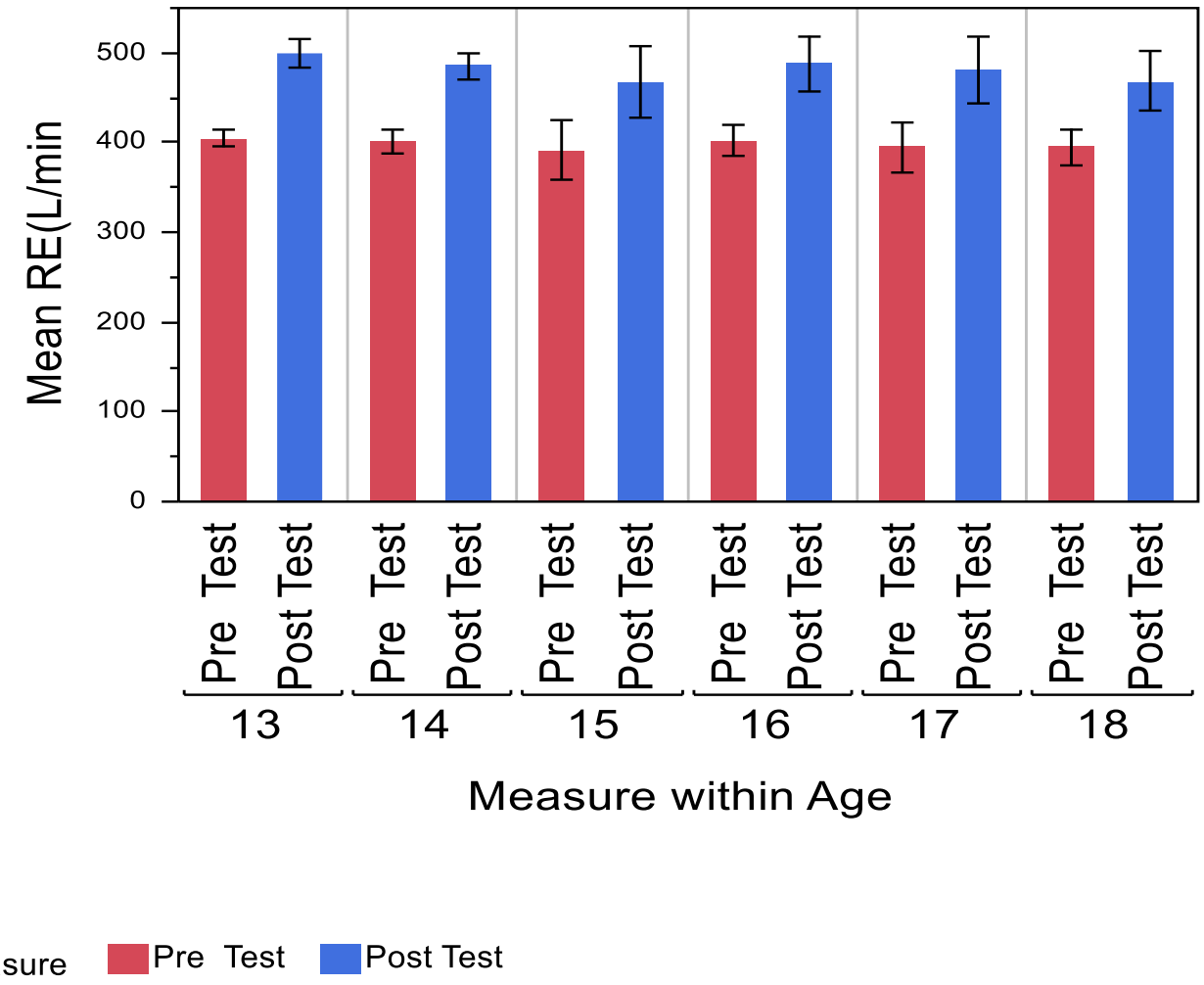


GRAPH 1. 3: BAR CHART SHOWING PREA ND POST TEST MEAN RE



Each error bar used SD from mean.

GRAPH 1.4: BAR CHART SHOWING AGE WISE PREAND POST TEST MEAN RE



Each error bar used SD from mean.

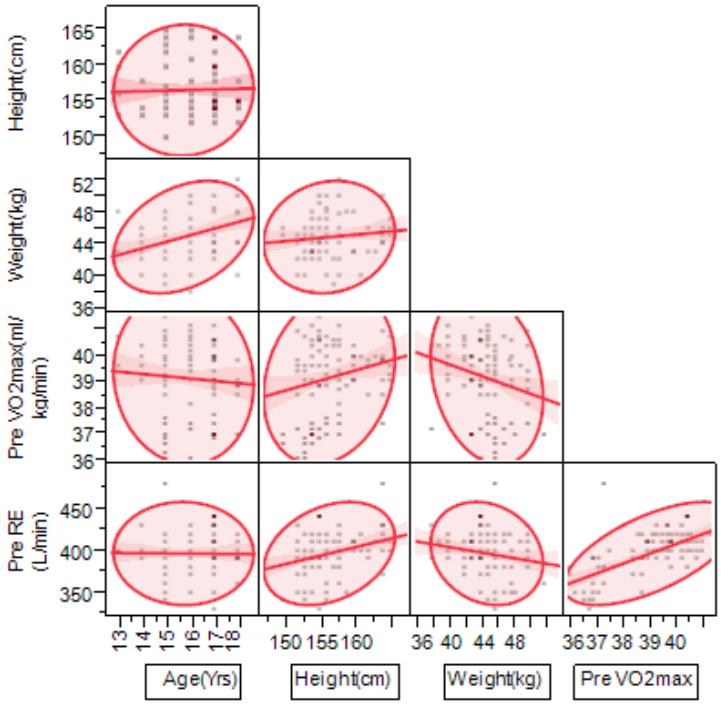
CORRELATION BETWEEN MEASURES

Table 1.7 : Descriptive Correlational Statistics at Baseline (n=100)

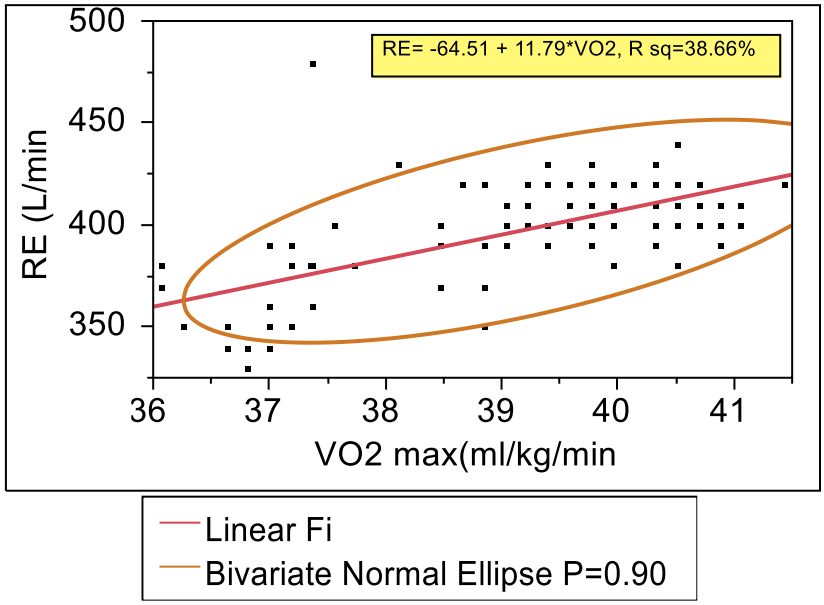
	Spearman Rank Correlations	Height (cm)	Weight (kg)	VO2 max (ml/kg/min) Pre	RE (L/min) Pre
Age (Yrs)	*Rho*	.030	.281**	-.074	.018
	P-value	.764	.005	.462	.860
Height(cm)	*Rho*		.116	.197*	.279**
	P-value		.250	.049	.005
Weight(kg)	*Rho*			-.267**	-.174
	P-value			.007	.083
Pre VO2 Max (ml/kg/min)	*Rho*				.538**
	P-value				<.001

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

GRAPH 1. 5: Scatterplot Matrix



GRAPH 1. 6. Bivariate Regression of RE on VO2max



Simple linear Regression
RE (L/min) = -64.51 + 11.79*VO2 max (ml/kg/min) , R sq=38.66%

6. DISCUSSION:

" Previous studies done on Bharatnatyam dancers suggested that there is significant improvement pulmonary function and respiratory efficiency with ($p<0.05$) compared to control group[20]. Also study done by Ujwal LYeole el al showed that Indian classical dancers had significantly higher vo_2max and lower BMI as compared to yoga practitioner[19]. But as every dance style is different , the purpose of our study was to find the effect of Bihu dance on vo_2max and respiratory efficiency.Considering this our study was conducted with 100 females adolescents of age group 13- 18 who were fresher. Findings of the study are : Wilcoxon signed rank test was used to check the difference

between pre and post test vo_2max and respiratory efficiency and results showed a significant improvement on both post test vo_2max ,p<.001 and respiratory efficiency, p<.001 .Difference in vo_2max and respiratory efficiency was also seen according to age group where adolescents of 14-18 age group showed significant increase in vo_2max (p<0.001)and respiratory efficiency(P<.001) .But adolescents of age 13 didn't show significant improvement both in vo_2max(p=.066) and respiratory efficiency (p=.059) even after 6 weeks of Bihu dance practice . It could be probably because adolescents of this group are physically active and have a better baseline vo_2max and respiratory efficiency. Also the total number of subjects for this age group was only 4, which makes it difficult to conclude .For better results, to see the effect of Bihu dance on vo_2max and respiratory efficiency on 13 years old Bihu dancers, we would recommend to do further studies with greater number of subjects of this age group. In our study Spearman correlation test was used to find the correlation of VO_2 max with height,weight ,age and RE, it was found that height was correlated with vo_2max (rho=.197, p=.049) which is also supported by a study done by Lotfali Bolboli et al who revealed that tall girls had a higher vo_2max on Queen's college step test and treadmill test than short girls(queens :44.09+/-2.66 vs 38.96+/-1.65)[22] Height was also correlated with respiratory efficiency(rho=.279, p=.005) which is supported by a study done by Alejandro Talaminos Barroso et al who stated that Peak expiratory flow is greater in taller individuals[23]On the other hand vo_2max was correlated with RE (rho=.538, p<.001). Linear association between vo_2max and respiratory efficiency found simple linear regression as RE (L/min)= -64.51+11.79*vo_2max (ml/kg/min) , that explained 38.66% of total variability in RE with rate of change of RE with respect to unit change of vo_2max at 11.79 ml/kg/min.During dance practice requirement for oxygen and substrate in skeletal muscle , removal of metabolites and co_2 are increased . The cardiorespiratory changes observed are directly proportional to the extremity involved, continuation, frequency and duration of the dance training the individual undergoes. All these facts together could be the cause for the enhanced vo_2max and respiratory efficiency observed among the dancers in this study. Evidence has shown that playing wind instrument and singing improves peak expiratory flow as it works on respiratory muscles. As our study included only female Bihu dancers who were not a part of singing or playing wind instruments we recommend to do further studies which includes the dancers who also sing and play wind instrument for a long duration with a follow up to check the long term effect of Bihu dance on cardiorespiratory fitness. Also the study can be done for a long duration with a follow up to check the long term effect of Bihu dance on cardiorespiratory fitness.

7. CONCLUSION:

On completion of study , we concluded that regular practicing of Bihu dance is an effective way to improve vo_2max and respiratory efficiency as Wilcoxon Signed Rank test revealed that post test vo_2max (41.53±3.57 ml/kg/min) was significantly increased by 2.38±3.53 ml/kg/min over pre test vo_2max (39.14±1.34 ml/kg/min), p<.001.Similarly, post test RE (478.90±34.93 L/min) was also increased by 82.00±20.45 L/min over pre test RE (396.90±25.49 L/min),p<.001.In addition from correlation half matrix (Table 7, Fig.10) it was evident that age was correlated with weight (Spearman *rho*=.281 , *p*=.005) whereas height was correlated with VO2 max (*rho*=.197 , *p*=.049) and RE(*rho*.279, *p*=.005). Weight was correlated with VO_2 max (*rho*= .267 , *p*=.007). On the other hand, VO_2 Max was correlated with RE(*rho*=.538, *p*<.001). Linear association between VO_2 Max and RE found simple linear Regression as RE (L/min) = -64.51 + 11.79*VO2 max (ml/kg/min) , that explained 38.66% of total variability in RE with rate of change of RE with respect to unit change of VO2 Max at 11.79 ml/kg/min.

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