

Effect of Plyometric Exercise Vs Mat Exercise in Reducing Abdominal Obesity in Young Coastal Population

Received: 23 October 2022, **Revised:** 24 November 2022, **Accepted:** 23 December 2022

Saran Godcil.A¹; Srinivasan M²; Shanmuganath.E³

1 UG Scholar, Academic Department of Physiotherapy, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth (deemed to be University, Puducherry, India.

2 Associate Professor, Academic Department of Physiotherapy, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth (deemed to be University, Puducherry, India.

3 Professor and Head, Academic Department of Physiotherapy, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth (deemed to be University, Puducherry, India.

Corresponding Author: Srinivasan.M,

Associate professor, Academic Department of Physiotherapy, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry India.

Phone No: 7708583086 Mail ID: hayagreeve@gmail.com

Keywords:

coastal life, Plyometric exercise, MAT exercise, BMI, obesity.

Abstract:

Background: Coastal living may benefit young people who are obese by encouraging regular physical activity through outdoor recreation such as surfing, swimming, as well as beach walks. Still the incidence is going up. In abdominal obesity, as they carry much of their fat in abdomen, close to the organs such as stomach, liver and kidney and results the following health risk impairment of cardiac dysfunction, hypertension and stroke, diabetes and renal disease, abnormal plasma lipid. So, this study aimed to find out the effectiveness of effect of plyometric exercise vs mat exercise in reducing abdominal obesity among young population.

Methodology: 20 college going students with obesity from MGMCRI and community based is recruited as participant for this study. After the selection process the selected participant are allocated into 2 groups, Group A (Plyometric exercise) (n=10) and group B (MAT exercise) (n=10). Result Both the exercise protocol is followed for 5 days, one session per day for a duration of 45 minutes, both the exercise protocol is given for a period of 6 weeks These values conclude by using the Wilcoxon signed ranks test. This demonstrates that when compared to post mean value of waist circumference and body mass index of Group B to Group A, there is a substantial decrease..

Conclusion: Hence this work concludes that the MAT exercises as methods of unique learning are more effective in reducing the abdominal obesity than the plyometric exercise.

1. Introduction:

Coastal living may benefit young people who are obese by encouraging regular physical activity through outdoor recreation such as surfing, swimming, as well as beach walks. Still the incidence is going up. Obesity is a chronic disease with a growing prevalence that has been termed a global epidemic. Epidemiologic studies have found a link connecting a high BMI and a wide range of chronic disorders, including Non-Alcoholic Fatty Liver (NAFL) and cardiovascular illness. Diabetes, various cancers, musculoskeletal ailments, chronic renal disease, and mental disorders; all have a detrimental impact on people' quality of life and increase healthcare expenses. [1-9]. The World Health Organization (WHO) defines obesity as having a BMI >30 kg/m² and defines overweight as having a BMI >25 kg/m². Both disorders are characterized as abnormal or excessive fat accumulation that is associated with an increased risk to one's health. BMI is the most widely used starting point for determining the degree of overweight or obesity, despite not being the most precise measure of excess fat [10]. In abdominal obesity, as they carry much of their fat in abdomen, close to the organs such as stomach, liver and kidney and results the following health risk impairment of cardiac dysfunction, hypertension and stroke, diabetes and renal disease, abnormal plasma lipid. Health risk due to obesity can be better indicated by patterning of adipose tissue distribution [i.e., waist – to – hip ratio] than the independent total body weight in relation to the height [i.e., BMI] [11].

Obesity also impairs functional abilities such as balance, which may interfere with routine activities and weaken life quality. Obesity alters body movements greatly due to alterations in anthropometry [12]. As a result, the body's ability to conduct motions and receive reflexes changes. Restricted Range of Motion (ROM) develops as a result of postural deviation caused by increasing body mass. Obesity and overweight impair muscle strength and fatigue resistance. All of the aforementioned variables contribute to poor postural control. [13].

Plyometric training uses the excess energy that was stored during the stretching phase to allow muscles to rapidly lengthen and then immediately shorten (stretch-shortening contraction). A great cardio workout and method to burn calories is plyometric training [14]. Thus, it is a great workout component for weight loss. In

reality, muscle strength and endurance abilities are improved. It increases metabolism and helps in caloric burn. Indeed, this workout will help you lose weight. [14] These exercises encourage muscle activation, enhance muscle strength, and endurance, optimise posture and balance, weight loss, and reduce the chance of injury. Previous research has employed plyometric exercise to improve physical fitness in otherwise healthy persons and athletes. [15].

The popularity of Pilates as a form of exercise has increased significantly around the world, particularly among men. Within Pilates there are many disciplines, with Mat Pilates (MP) being the most widely used today, since its practice requires only economical materials and a limited space [16]. The body's weight serves as the main external load throughout a sequence of low-intensity exercises that strengthen the trunk through isometric contraction of the core muscles while prioritizing controlled breathing, flexibility, and posture. [17]. Mat are typical conventional exercises that primarily target the core muscles, such as the abdominals, back, hips, and shoulder girdle. To develop the core, the movements rely on precise body alignment relative to gravity as well as lever (limb) length changes. [18]. The outcome measure of this study involves BMI and the Waist to hip circumference. Indeed, the National Institutes of Health Clinical Guidelines recommend that obesity management favour the use of waist circumference to be a measure of abdominal obesity to predict disease risk in overweight and obese people. [body mass index (BMI; in kg/m²): 25.0–34.9].

2. Materials And Methodology:

It is a quasi-experimental study with comparative type, 20 college going students with obesity from MGMCRI and community based is recruited is participant for this study. The subjects that is included in this study is male who are aged between 18-25 with the BMI more than 30. Exclusion of this study include Female, low back pain participants who had abdominal surgery 6 months before to the trial, participants who had spinal surgery, people with any degenerative joint disorders, recent fracture and trauma, and subjects with any systemic diseases. After the selection process the selected participant are into 2 groups, Group A (Plyometric exercise) and group B (MAT exercise) through odd/even method. The plyometric exercise for 5 days, one session per day for a duration of 45 minutes. The

Journal of Coastal Life Medicine

MAT exercise is given for 5 days, one session per day for a duration of 45 minutes. Both the technique is

given for a period of 6 weeks so totally there are 30 sessions for each technique.

EXERCISE PROTOCOL:

PLYOMETRIC EXERCISE:

TRAINING WEEK	PLYOMETRIC DRILL	SETS×REPS
WEEK 1	Squat Jack	1×10
	One foot hop	1×10
	Two-foot hop	1×10
WEEK 2	Squat Jack	1×15
	High knee	1×15
	One foot hop	1×15
	Two-foot hop	1×15
WEEK 3	Squat Jack	2×15
	High knee	2×15
	Jumping side lunges	1×10
	One foot hop	2×15
	Two-foot hop	2×15
WEEK 4	Squat Jack	2×15
	High knee	2×15
	Jumping side lunges	2×15
	One foot hop	2×15
	Two-foot hop	2×15
WEEK 5	Squat Jack	3×15
	High knee	3×15
	Jumping side lunges	3×15
	Skater Jump	1×15
	Rockstar Jump	1×15
	One foot hop	3×15
	Two-foot hop	3×15
WEEK 6	Squat Jack	3×15
	High knee	3×15
	Jumping side lunges	3×15
	Skater Jump	2×15
	Rockstar Jump	2×15
	One foot hop	3×15
	Two-foot hop	3×15

MAT EXERCISE:

TRAINING WEEK	MAT EXERCISE DRILL	SETS×REPS
WEEK 1	Lunges	1×10
	Leg in and out	1×10
	Crunch exercise	1×10
WEEK 2	Lunges	1×15
	Leg in and out	1×15
	Crunch exercise	1×15
	V ups	1×10
WEEK 3	Lunges	2×15
	Leg in and out	2×15
	Crunch exercise	2×15
	V ups	2×15
	Oblique crunch exercise	1×15
WEEK 4	Lunges	2×15
	Leg in and out	2×15
	Crunch exercise	2×15
	V ups	2×15
	Oblique crunch exercise	2×15
	Scissor kicks	1×15
WEEK 5	Lunges	3×15
	Leg in and out	3×15
	Crunch exercise	3×15
	V ups	3×15
	Oblique crunch exercise	3×15
	Scissor kicks	2×15
	Plank with 5 sec hold	1×15
WEEK 6	Lunges	3×15
	Leg in and out	3×15
	Crunch exercise	3×15
	V ups	3×15
	Oblique crunch exercise	3×15
	Scissor kicks	3×15
	Plank with 5 sec holds	2×15



Jumping side lunges



Plank exercise

STATISTICAL ANALYSIS:

The data is analysed using Wilcoxon signed ranked test. The result is presented as mean and standard deviation and statistical significance is <0.05. The data analysis is mentioned in Table 1,2,3,4,5,6 and

comparison between pre and post intervention are mentioned in Graph 1,2,3,4,5,6.

Journal of Coastal Life Medicine

TABLE 1: ANALYSIS OF BMI AMONG GROUP A

BMI	No of sample	Mean	Standard deviation	Z value	P value
Pre test	10	31.900000	1.7139947	2.803	.005
Post test	10	30.160000	1.4431447		

TABLE 2: ANALYSIS OF BMI AMONG GROUP B

BMI	No of sample	Mean	Standard deviation	Z value	P value
Pre test	10	32.349000	3.0098005	2.805	.005
Post test	10	29.710000	3.0016477		

TABLE 3: ANALYSIS OF WHR IN GROUP A

WHR	No of sample	Mean	Standard deviation	Z value	P value
Pre test	10	0.954	0.00843	3.162	0.002
Post test	10	0.944	0.00843		

TABLE 4: ANALYSIS OF WHR AMONG GROUP B

WHR	No of sample	Mean	Standard deviation	Z value	P value
Pre test	10	0.949	0.00994	3.051	0.002
Post test	10	0.9380	0.00919		

TABLE 5: ANALYSIS OF POST BMI IN GROUPS A&B:

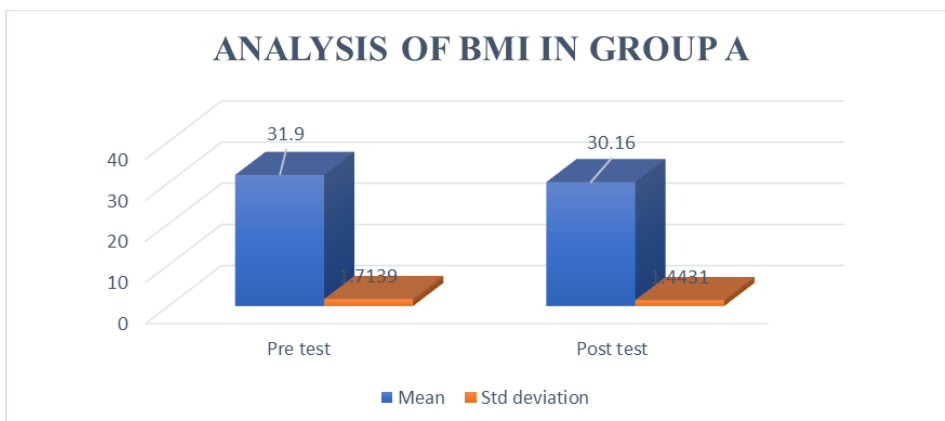
BMI (POST)	Mean	Standard deviation
GROUP A	30.1600	1.4431
GROUP B	29.7100	3.00164

TABLE 6: ANALYSIS OF POST WHR IN GROUP A&B:

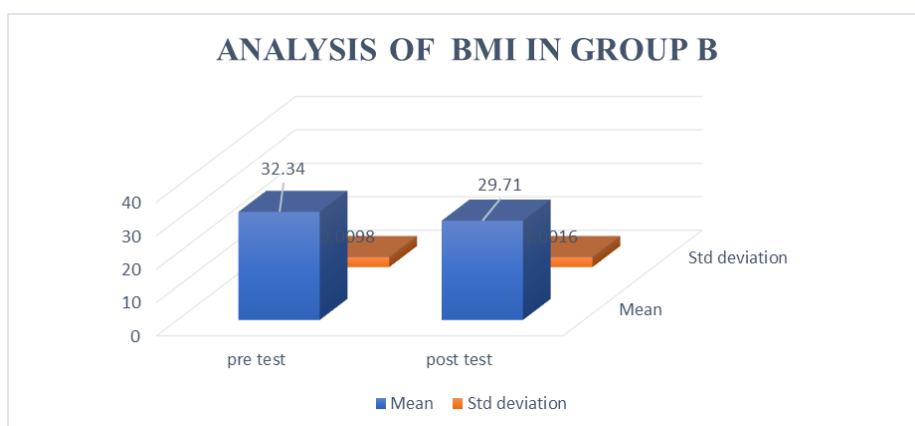
WHR(POST)	Mean	Standard deviation
GROUP A	0.9440	0.00843
GROUP B	0.9380	0.00919

Journal of Coastal Life Medicine

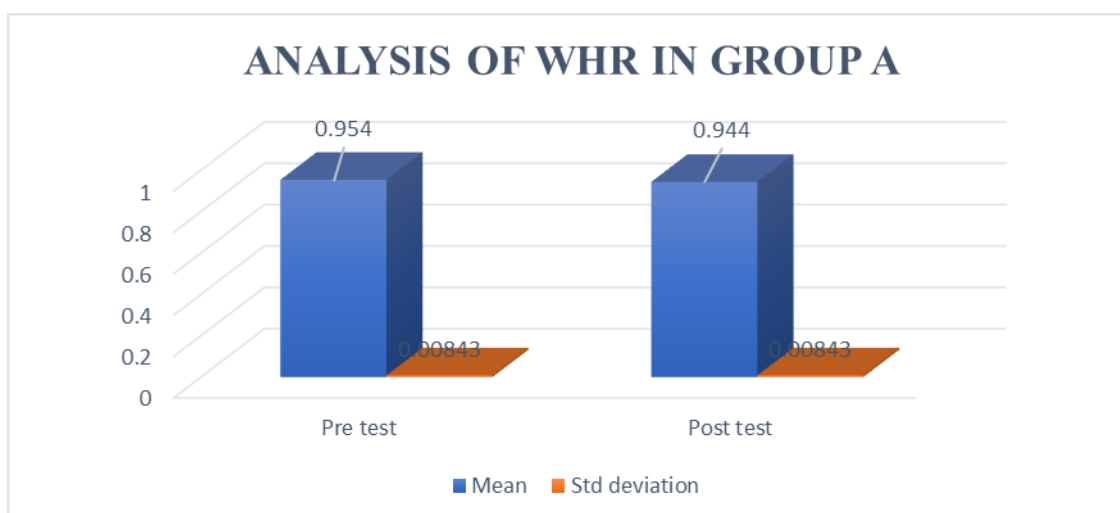
GRAPH 1: ANALYSIS OF BMI IN GROUP A



GRAPH 2: ANALYSIS OF BMI IN GROUP B

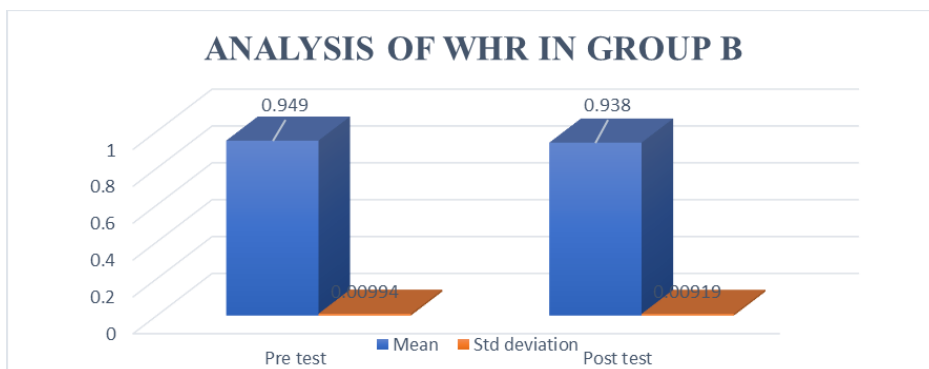


GRAPH 3: ANALYSIS OF WHR IN GROUP A

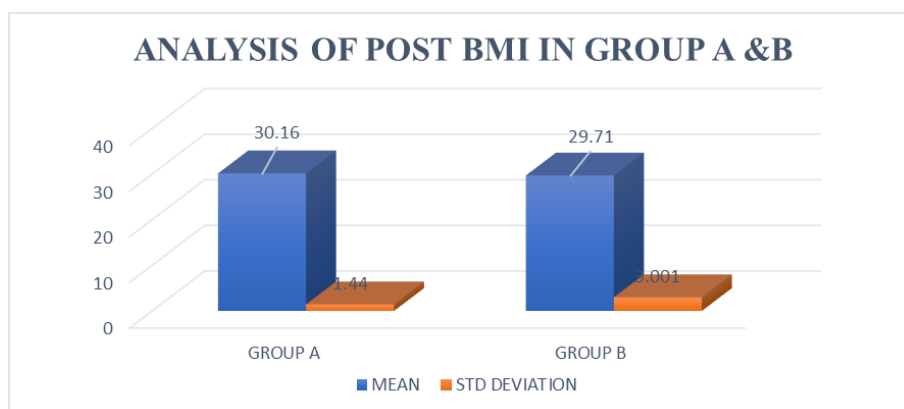


Journal of Coastal Life Medicine

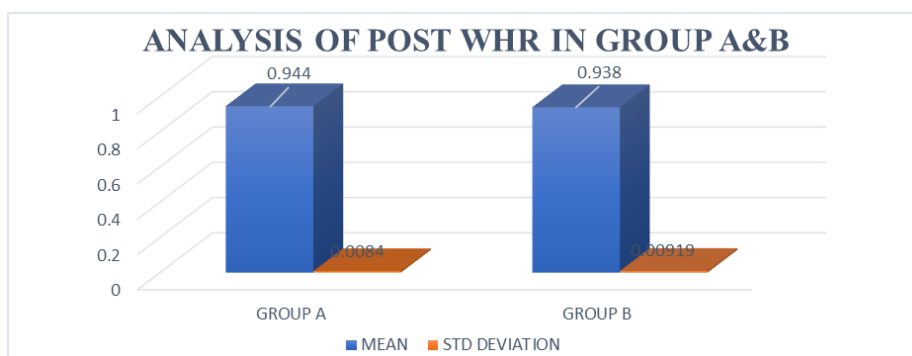
GRAPH 4: ANALYSIS OF WHR IN GROUP B



GRAPH 5: ANALYSIS OF POST BMI IN GROUP A & B



GRAPH 6: ANALYSIS OF POST WHR IN GROUP A & B



3. Results:

When the Mean values of Groups A and B on Body Mass Index (BMI) are compared, there is a significant decrease in the Post-test Mean values, but Plyometric Exercise in Group A shows a mean value of 30.16 at P is 0.05, When the Mean values of Groups A and B on Waist Circumference are compared, there is a significant decrease in the Post-test Mean values, but Plyometric Exercise in Group B has a mean value of 0.93 at P = 0.02 and is more effective than Plyometric

Exercise in Group A, which has a mean value of 0.94 at P = 0.002.

4. Discussion:

The descriptive analysis denotes the mean and standard deviation of both two groups of BMI and waist hip ratio for groups A and B. There is a 95% confidence interval of the Difference of each group. When comparing the post-test of two group dependent variables, it states that, when compared to group A, the mean and standard

deviation for group B has been reduced, and this indicates that MAT exercise is more effective when compared to Plyometric exercise. The result within group BMI and waist hip ratio shows that the Mean difference is significant, and the level of significance is 0.05. Overall, the result analysis of this study indicates that there was a significant difference within group in both BMI and waist hip ratio. This indicates the obese participant which perform the MAT exercise shows reduced BMI and waist hip ratio. According to the study in “Impact of resistance band and mat activities on obesity among computer workers” shows a total of four weeks, five days of workouts each week were given to each group. On comparison of pre and post-test of group A shows a significant value whereas in comparing between group A and B shows not significant. This study demonstrates that mat workouts are found to be more successful in reducing abdominal fat than progressive resistive band activities.^[28]

Plyometric exercise also shown improvement in reducing BMI and waist hip ratio on obesity population. But when compared to Plyometric exercise protocol the reducing in weight has been achieved better in MAT exercise. So MAT exercise protocol has greater effect in weight reduction among young population. In this study “Effects of short-term plyometric training on physical fitness parameters in female futsal athletes” it concludes that by using plyometric exercise protocol it significantly improve in agility and jump but it also indicates that by using plyometric protocol it also reduce body fat in athletes.^[33] There was better weight loss over the course of the brief time period and small sample size. So, this study might be suggested for a high sample size over a lengthy period of time. It can demonstrate higher weight loss when combined with nutrition management

5. Conclusion:

Coastal living may benefit young people who are obese by encouraging regular physical activity through outdoor recreation such as surfing, swimming, as well as beach walks. Still the incidence is going up. The findings of our study revealed that a 6-week Plyometric and mat exercise programme as part of a unique learning programme reduced abdominal fat. When comparing the post-mean BMI and waist circumference of Group B to Group A, there is a significant reduction. Hence this study concludes that the MAT exercises are more effective in reducing the

abdominal obesity than the plyometric exercise in target coastal young population.

SG – concept, design. SM – data collection

SE – supervision and writing

Conflict of interest – Nil

No external funding

IHEC approval – Yes

References

- [1] Singh GM, Danaei G, Farzadfar F, Stevens GA, Woodward M, Wormser D, et al. The age-specific quantitative effects of metabolic risk factors on cardiovascular diseases and diabetes: a pooled analysis. *PLoS One* 2013;8. <https://doi.org/10.1371/JOURNAL.PONE.0065174>.
- [2] Wormser D, Kaptoge S, Di Angelantonio E, Wood AM, Pennells L, Thompson A, et al. Separate and combined associations of body-mass index and abdominal adiposity with cardiovascular disease: collaborative analysis of 58 prospective studies. *Lancet* 2011;377:1085.
- [3] Lauby-Secretan B, Scoccianti C, Loomis D, Grosse Y, Bianchini F, Straif K. Body fatness and cancer — viewpoint of the IARC working group. *N Engl J Med* 2016; 375:794.
- [4] Barb D, Pazaitou-Panayiotou KMC. Adiponectin: a link between obesity and cancer. *Expert Opin Investig Drugs* 2006;15:91731 .
- [5] Jiang L, Tian W, Wang Y, Rong J, Bao C, Liu Y, et al. Body mass index and susceptibility to knee osteoarthritis: a systematic review and meta-analysis. *Jt Bone Spine* 2012;79:291–7.
- [6] Jiang L, Rong J, Wang Y, Hu F, Bao C, Li X, et al. The relationship between body mass index and hip osteoarthritis: a systematic review and meta-analysis. *Jt Bone Spine* 2011;78:150–5.
- [7] Anstey KJ, Cherbuin N, Budge M, Young J. Body mass index in midlife and late-life as a risk factor for dementia: a meta-analysis of prospective studies. *Obes Rev* 2011; 12.

Journal of Coastal Life Medicine

- [8] Alford S, Patel D, Perakakis N, Mantzoros CS. Obesity as a risk factor for Alzheimer's disease: weighing the evidence. *Obes Rev* 2018;19:269–80. <https://doi.org/10.1111/OBR.12629>.
- [9] Vityala Y, Tagaev T, Zhumabekova A, Mamatov S. Evaluation of metabolic syndrome, insulin secretion and insulin resistance in adolescents with overweight and obesity. *MetabClin Exp* 2022; 128:155011. <https://doi.org/10.1016/J.METABOL.2021.155011>.
- [10] Woolcott OO, Seuring T. Prevalence trends in obesity defined by the relative fat mass (RFM) index among adults in the United States: 1999–2018. *MetabClin Exp* 2022;128:155027.
- [11] Tukaram Gadekar et al, Correlation of visceral body fat with waist–hip ratio, waist circumference and body mass index in healthy adults: A cross sectional study, *Medical Journal Armed Forces India* , Volume 76, Issue 1, January 2020, Pages 41-46
- [12] Joanna Cieślińska-Świder et al , The effect of body mass reduction on functional stability in young obese women *Scientific Reports* | (2022) 12:8876,
- [13] D. J. Tomlinson et al , The impact of obesity on skeletal muscle strength and structure through adolescence to old age , *Biogerontology* (2016) 17:467–483 ,
- [14] Su Reid- St. John (2015). Blast fat with plyometric. Make your body a jiggle –free zone with these fun fat blasting moves. (4); 4422-4438.
- [15] Faigenbaum, A.D., McFarland, J.E., Keiper, F.B., Tevlin, W., Ratamass, N.A., Kang, J.I, Ivrag, N., James, B. & Frank, D. Effect of short-term plyometric and resistance training program on fitness performance in boys age 12 to 15 years. *Journal of Sports Science and Medicine*. 2007; 6(4): 519-525.
- [16] Alexei Wong, et al, The Effects of Mat Pilates Training on Vascular Function and Body Fatness in Obese Young Women with Elevated Blood Pressure. *American Journal of Hypertension* 33(6) June 2020, <https://doi.org/10.1093/ajh/hpaa026>
- [17] June Kloubec et al , Pilates: how does it work and who needs it? , *Muscles, Ligaments and Tendons Journal* 2011; 1 (2) 61-66 .
- [18] Cozen, D.M., Use of pilates in foot and ankle rehabilitation. *Sports Med. Arthrosc.*, 2000;8(Suppl 4): 395-403.
- [19] Ross, R., Neeland, I.J., Yamashita, S. et al. Waist circumference as a vital sign in clinical practice: a Consensus Statement from the IAS and ICCR Working Group on Visceral Obesity. *Nat Rev Endocrinol* 16, 177–189 (2020).
- [20] Abdelaal M, le Roux CW, Docherty NG. Morbidity and mortality associated with obesity. *Ann Transl Med*. 2017;5(7):1–12.
- [21] Del Porto HC, Pechak CM, Smith DR, Reed-Jones RJ. Biomechanical Effects of Obesity on Balance. *Int J Exerc Sci*. 2012;5(4):301–20.
- [22] Nobre, Gabriela G., et al. “Twelve Weeks of Plyometric Training Improves Motor Performance of 7- to 9-Year-Old Boys Who Were Overweight/Obese: A Randomized Controlled Intervention.” *Journal of Strength and Conditioning Research*, vol. 31, no. 8, Ovid Technologies (Wolters Kluwer Health), Aug. 2017, pp. 2091–99.
- [23] Paul, Jibi, and T. Bhuvanewari, et al., “Plyometric Versus High Intensity Aerobic Exercise Among Over Weight College Students.” *International Journal Medical and Exercise Science*, vol. 6, no. 3, IJMAES Publisher, Sept. 2020, pp. 811–24.
- [24] GÓIS LEANDRO, Carol, et al. “Post-exercise Hypotension Effects in Response to Plyometric Training of 7- to 9-year-old Boys with Overweight/Obesity: A Randomized Controlled Study.” *The Journal of Sports Medicine and Physical Fitness*, vol. 61, no. 9, Edizioni Minerva Medica, Oct. 2021
- [25] Joshi, R., et al. (2017). Effect of mat exercises and resistance band exercises on obesity among computer professionals –a comparative study. *World Journal of Pharmaceutical Research*, 1222–1229.
- [26] Aarti Welling., et al. Comparative Study Between Mat Swiss Ball and Theraband Exercise on Abdominal Girth *International Journal of Physiotherapy and Research*, *Int J Physiother Res* 2015, Vol 3(4):1142
- [27] Hatem H. Allam., et al. Effects of Plyometric Exercises versus Flatfoot Corrective Exercises on Postural Control and Foot Posture in Obese Children with a Flexible Flatfoot. *Hindawi Applied Bionics and Biomechanics* Volume 2021, Article ID 3635660
- [28] Sandipkumar Parekh., et al, Effect of Plyometric VS. Pilates Exercises on the Muscular Ability and

Journal of Coastal Life Medicine

Components of Jumping in Volleyball Players. International Journal of Physiotherapy and Research, Int J Physiother Res 2014, Vol 2(6):793-9

- [29] Pires DC, Sá CKC. Pilates: notassobreaspectoshistóricos, princípios, técnicas e aplicações. Rev Digit 2005; 10:17-35.
- [30] Chmielewski, T.L., Myer, G.D., Kaufman, D. & Tillman, S.M. Plyometric exercise in the rehabilitation of Athletes: Physiologic Responses and clinical Application. Journal of Orthopaedic and Sports Physical Therapy. 2006; 36(5): 308-319.
- [31] Global Burden of Disease Study 2019 (GBD 2019). Covariates 1980-2019 | GHDx. n.d, <https://ghdx.healthdata.org/record/global-burden-disease-study-2019-gbd-2019-covariates-1980-2019>. [Accessed 28 April 2022].
- [32] Murali Venkatrao, Prevalence of Obesity in India and Its Neurological Implications: A Multifactor Analysis of a Nationwide Cross-Sectional Study,
- [33] Vinícius Fonseca Neves da Silva et al Effects of short-term plyometric training on physical fitness parameters in female futsal athletes 2017 <https://doi.org/10.1589%2Fjpts.29.783>