

## Effect of 6 weeks of online vinyasa training on explosive leg strength of school children during COVID-19 – A pilot study

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### Abstract:

Active participation in games and sports can aid with a variety of natural skills including jumping, running, and other powerful motions that are critical for improving performance. While sports performances mostly demands high lower limb fitness and strength, having strong legs can help correct muscle imbalances and accelerate the rate of recovery (Schlumberger, A., 2006). The purpose of this study was to determine the effects of 6 weeks of online vinyasa training on explosive leg strength of school children during COVID-19, using the AARPHAD youth fitness test item, the standing broad jump (SBJ). The study included 30 students (ages 12 to 14) from public schools in North Delhi who had never received structured training before. The participants were subsequently subdivided and assigned to either an experimental (vinyasa) or a control group at random. The health-related fitness variable chosen for the study was explosive leg strength. The online vinyasa training session was given to the experimental group for six weeks as 30 min pieces of training for five days a week, while the control group continued only their prior active lifestyle routine. Further to assess the findings, data was collected twice during the pre and post-test before and after training. When the data was evaluated, it was discovered that the six-week online vinyasa training showed statistically significant impacts in the post-tests for explosive leg strength performances when compared to the pre-test results (P0.05). Furthermore, as compared to the control group's post-test results, the experimental group's explosive leg strength performances in the post-test were statistically significant in terms of more improvement (P0.05). The significant difference between the experimental and control groups was discovered by ANCOVA. ANCOVA revealed a significant difference in the experimental group after six weeks when compared to its baseline. The study showed that online vinyasa training programmes may be effective for improving health-related fitness via variable explosive leg strength.

**Key Words:** vinyasa, explosive leg strength, standing broad jump (SBJ), health related fitness, ANCOVA

### Introduction

In the year 2019, the globe was hit by a massive biological disaster, the COVID-19 pandemic. There was no sector of life that was left undisturbed. From the prospect of a researcher, recalling a quote 'modern problems require modern solution' the deteriorating health aspect of individuals needed an urgent see through. The implementation of rule of lockdown, home quarantine, self-isolation etc. had become a part of daily normal life all over the globe in the past two years. The strong effort to minimise the spread the disease eventually is seen to lead to decrease in physical fitness level of individuals drastically. Therefore, this study attempts to bring about a modern solution that is; the online vinyasa form of yoga training is enforced. The online system of education, work from home, courses and meeting etc. all on successfully possible on virtual platform is what has triggered this study.

Further analysing, a strong body permits the efficient and free movement of the body spending least energy (Cronkleton, 2019). That said, also includes an inculcation of a stable, confident, efficient, functioning body. Overall strong or strength of the body can be grossly classified into upper and lower body strength. Furthermore, this study chooses to emphasise its study on the lower body strength for its study.

The ability of the neuromuscular system to show strain in the shortest feasible time is defined as explosive strength (Verhoanski, 1979). Zatziorsky (1995) established the concept of reversible strength in his definition of explosive strength, which consists of two phases: eccentric (stretch) and concentric (shortening). As quickly as feasible after the muscle extension phase, the concentric phase should begin. With increase in age, the human body undergo skeletal structural and functional changes, resulting in a loss of muscle mass and strength occurs (Porter, 1998; Lexell, 2008). A home-based exercise programme can help to increase

involvement, especially for frail elderly and youngsters' persons who may not have access to a gym or fitness centre. (Aagaard, 2008). In sports, the ability to generate high-power performance is frequently a determining factor in athletic success (Stone, 1993). Resistance or power training approaches combined with explosive workout components in training may aid athletes in producing more power. The ability of an athlete to create high rates of acceleration at near-maximal or near-maximal explosive power in intensities is the focus of explosive activities (Schmidtbleicher, 1993).

Introducing yoga at this stage of study, the yoga is one of the most natural and convenient form of exercise practiced all over the world in some form or the other by people of every gender, age, physical abilities, etc. Many research studies have revealed that yoga practice helps improve various physical and psychological domains. The word yoga is derived from the Sanskrit word 'Yuj', which implies individual and universal consciousness unity. The literal definition of yoga is to be aware of your own reality, your life's reality, your existence's purpose, and your life's purpose (Singh, 2018). One of the forms of yoga is the vinyasa yoga, Maehle (2007) defined vinyasa as the sequential movement that interlinks postures to form a continuous flow. Systematic vinyasa yoga is a powerful style centred on a quick flow through the sun salutation. It is a form of hatha yoga that emphasises primarily movement linked with breath (Tsopanidou, 2020). Sun salutations boost heart rate into cardiovascular endurance zones, as proven by research indicating that runners and yogis have similar cardiovascular fitness profiles and that sun salutations elevate heart rate into cardiovascular endurance zones. Furthermore, yoga has been used as a supplemental therapy to treat depression, anxiety, and insomnia (Choi, 2018), and consistent vinyasa yoga practise can increase cardio fitness and promote overall wellness (Tsopanidou, 2020). Previous studies have shown the positive result of yoga intervention on balance, flexibility, and strength in adolescent girls (Fillmore, 2010), improvement in abdominal strength (Kalimuthu, 2011), improvements in cardio-respiratory fitness, and improvements in body composition (Boraczyński, 2020). Although studies have found positive results, there is a scarcity of data on the short-term (6-week) effects of vinyasa training. Furthermore, research on the impact of a vinyasa training programme on health-related fitness variables such explosive power is sparse.

Pilot studies of online training with school children examining training programmes (i.e., equipment, volume, frequency, intensity, and ability to participate) are required before large-scale studies can begin, and this study aimed to determine the effect of six weeks of a vinyasa programme on explosive leg strength and to determine the effect of six weeks of a vinyasa programme on explosive leg strength of school children during COVID-19 (health-related fitness). We hypothesized that using all of the scientific material provided above as motivation, there would be an effective benefit from vinyasa training intervention on explosive leg strength compared to the control group. We expected that the short-term online vinyasa training programme designed and implemented in this study would have a good impact on the above-mentioned components' performance.

#### **Study Purpose**

The goal of the study was to see if vinyasa training affected school-aged children's explosive leg strength.

#### **Methodology**

##### **Study participants**

Thirty persons consented to participate in the study. Schoolchildren aged 12 to 14 years old who had no prior experience with an organised vinyasa training programme or a history of systematic training took part in the study. One of the inclusion criteria for the subjects in this study was the absence of any previous training that could have influenced the training or data collecting. The subjects were split into two subgroups, one for the experimental group (vinyasa training) and the other for the control group (daily routine), each with an equal number of participants. They completed a written consent form after hearing about the approach and its risks during the intervention/data collection. The study was carried out in accordance with the Helsinki Declaration's ethical criteria for human research.

##### **Study organization**

Two sessions were held prior to the start of the vinyasa programme intervention to familiarise the subjects with the test methodologies. During familiarisation sessions, the individuals were informed about the data collection and training intervention procedures. The training intervention lasted six weeks and consisted of 30 30-minute training sessions. One micro-cycle lasted seven days and included five training sessions (Monday, Tuesday, Wednesday, Thursday, and Friday; Table 1), all of which were overseen and supervised by the researchers. The classes were 30 min in duration each and were conducted in the evening from 6:15 PM to 6:45 PM so as not to disturb their scheduled school programmes during COVID-19. A special appeal was made to the subjects so that they do not miss any of their classes. Nevertheless, some absences did occur.

The training intervention was created with the goal of increasing explosive leg strength with activities that were as enjoyable as possible.

The tests were done twice: once before training (0 weeks) and again after training (0 weeks) (6 weeks). The standing broad jump, an AARPHAD juvenile fitness test item, was used to assess the schoolchildren's explosive leg strength (SBJ).

*Standing Broad Jump.* The subjects' explosive strength was measured using the standing broad jump. The participants were told to stand a few inches behind the take-off line, flex their knees, and swing their arms

backwards, which would allow them to jump forward. The three most successful tests were documented and analysed. The measurements were taken in centimetres. Under the online supervision of the researcher, the test was conducted.

**Table-1.** Example of a training session during a micro cycle followed by the student intervention group

S.No.	Test Battery	Duration (In Seconds)	Rounds	Total Time (In Seconds)
1	Surya Namaskar (12 poses)	120	3	360
2	Standing Vinyasa Series (11 poses)	110	3	330
3	Plank Vinyasa Series (5 poses)	50	3	150
4	Prone Vinyasa Series (7 poses)	70	3	210
5	Supine Vinyasa Series (5 poses)	50	3	150

- **Note:** Each subject was allowed to relax in savasana for 3 min after performing every round of all the test batteries; 6 min (360 s)
- Each position: 10 s
- Asana Practice: 20min (1200s)
- Total training program schedule: 26min (1560 s)

**Method Applied for the Training Practice of Vinyasa**

Vinyasa was taught, and the practice sessions were conducted and supervised by the researcher himself along with his colleague to monitor the online class that was run on the Zoom cloud meeting app. For teaching purposes, each step was explained and demonstrated beforehand. The subjects performed the same, and the necessary corrections were made. The rest of the instructions were given in between the vinyasa online training programme.

The demographic information is as follows.

**Table-2.** Demographic information for the experimental and control groups of school children

GROUP	Gender	Subjects	No. of Participants	Percentage (%)
Experimental	Male	School Children	15	50
Control	Male	School Children	15	50
Total			30	100

**Statistical analysis**

The data were analysed with IBM SPSS software (version 20.0.0), and the study used an ANCOVA single pre-test and post-test group design. The analyses were conducted on two groups (experimental and control). The statistical significance level was set at 0.05. Furthermore, the standing broad jump was used as the study's instrument for data collection.

**Results**

According to the post-tests, the online vinyasa training applied for 6 weeks had statistically significant effects on explosive leg strength performances compared to the pre-test (P0.05). Furthermore, when the experimental and control groups' post-test results were compared, the experimental group's explosive leg strength performances in the results of the post-tests were statistically significantly better (P0.05) than the results of the control group's post-tests. ANCOVA was used to find a significant difference between the experimental and control groups. ANCOVA revealed a significant difference between the experimental and control groups after 6 weeks. (Table4 and Table5).

**Table-3.** Descriptive statistics for the standing broad jump after training

Group	Mean	Std. Deviation	N
Experimental	156.14	9.85	15
Control	157.82	9.18	15
Total	156.98	9.39	30

Table-3 shows that the mean of the experimental group was 156.14, and the standard deviation was 9.85. However, for the control group, the mean was 157.82, and the standard deviation was 9.18.

**Table-4.** Adjusted means and standard errors for the standing broad jumps of the different groups

Groups	Mean	Std. Deviation	95% Confidence Interval	
			Lower bound	Upper bound
Control	155.122	0.49	154.117	156.126
Experimental	158.851	0.49	157.847	159.856

- a. Covariates appearing in the model were evaluated at the following values: Pre\_SBJ = 154.5100.
- b. Values were rounded.

The corrected means and standard errors of the criteria variable for the different treatment groups are shown in Table-4. After controlling for covariate, the mean of the criterion variable was calculated for all groups (before treatment). Note that these figures differ from the unadjusted figures in Table 3. The benefit of adopting the ANCOVA is that the differences in the post-test means were compensated for the variances in the initial scores. In other words, when assessing the effectiveness of treatments on the criterion variable, the effect of the covariate was excluded.

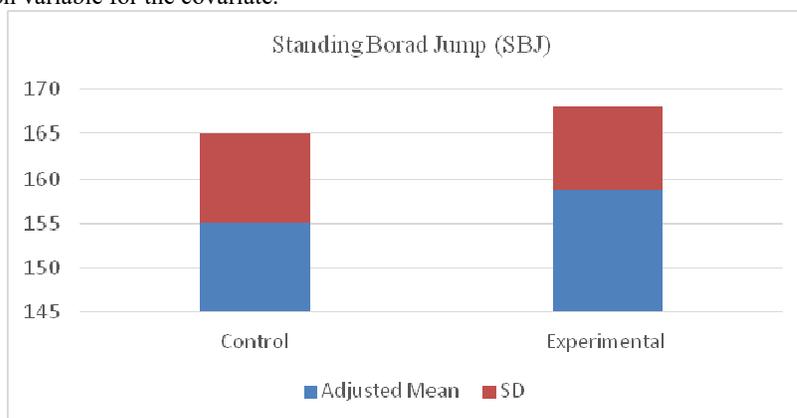
**Table -5.** ANCOVA analysis of the standing broad jump after training

Source	Type I Sum of Squares	Df	Mean Square	F	Sig.
Pre-test	2362.62	1	2362.62	661.421	.00
Groups	102.99	1	102.99	28.832	.00
Error	96.445	27	3.572		
Corrected Total	2562.055	29			

- a. R Squared = 0.962 (Adjusted R Squared = 0.960)
- b. Computed using alpha = 0.05

Table-5 indicates that the F-statistics for the standing broad jump were significant because the related p-value for the groups was 0.00, which was less than 0.05. As a result, at the 5% level, the null hypothesis of no difference between the groups may be rejected. As a result, at the 5% level, the null hypothesis of no difference between the adjusted averages for the data on the criterion variable (vinyasa training during treatment) in the groups could be rejected.

Of note, The Pre-Test (covariate) F-value was similarly significant. It reveals that the experimental and control groups had different starting conditions, which is why we used ANCOVA after correcting the the mean values of the criterion variable for the covariate.



**Fig. 1.** Graphical representation of the adjusted mean and standard deviation of the standing broad jump (SBJ) for the control and experimental groups.

**Discussion**

Childhood yoga programmes have been adopted in schools in recent years to boost children's development. Although yoga is an old practise that aims to bring the body, mind, and emotions into balance, and the literature underlines its benefits in terms of motor, physical, cognitive, and social elements, (Galantino, 2008; Woodyard, 2011; Bubela, 2014) its effects on child development is unknown.

In this study, our statistical results revealed that 6 weeks of a vinyasa training programme was effective in improving the explosive leg strength of school children. The ‘ANCOVA’ test for dependent variables exhibited that there was a significant difference on explosive leg strength of the school children in the control and experimental training groups. Our findings are consistent with those of a previous study conducted under similar conditions (Singh, 2012) with a significant effect of six weeks of vinyasa practice on selected physiological and physical variables in female athletes who were 18 to 24 years old. Studies also showed a positive effect of vinyasa on balance and relative strength, even though the study was restricted to the relative strength of the back, static balance, and dynamic balance (Paalia, 2010).

In a previous study (Malipatil, 2017) The goal was to see how yoga and physical workouts affected leg explosive strength, so 300 students from diverse classes and ages 14-16 were chosen. They concluded that both yoga and physical workouts enhanced explosive leg strength and agility, with substantial increases in explosive strength in the physical exercise group when compared to the control group. The results of our study revealed that participants in an online vinyasa programme increased in explosive leg strength characteristics compared to the control group. This may be explained in part by the fact that the participants in our study were sedentary

schoolchildren who had no prior experience with structured training. The vinyasa programme, which ran five days a week, may have provided enough stimulus to improve the students' overall health-related abilities. Furthermore, a 6-week intervention was sufficient for developing explosive strength. Furthermore, the systematic vinyasa training programme may have aided students in improving their identity management, which encouraged their motivation to put in more effort (Petros, 2016). When a new stimulus, such as a training intervention, is used, it is well recognised that the maximum advantages can be obtained.

Previous research has also found a substantial gain in muscle strength, muscle endurance, functional activities, and flexibility over time ( $P = 0.001$ ). With effects from vinyasa sun salutation on the improvement of flexibility at the wrist (downward flexion), hip, knee, and ankle (planter flexion) joints, a vinyasa yoga group experienced a larger improvement in chest press endurance (Pal, 2009). In a study (Tekur, 2008) evaluated the effects of a short-term intense residential yoga programme with physical exercise (control) on pain and spinal flexibility in people with chronic low-back pain (CLBP). All of the research mentioned above found that the variables had a substantial impact. Vinyasa practise was also proven to improve leg strength and generate explosive leg strength in the current study. Furthermore, our findings are backed up by a recent study that found that 8 weeks of vinyasa yoga instruction had positive benefits on the cardiovascular system, psychological well-being, and physical fitness in inactive young adults. In addition, vinyasa yoga has been shown to reduce stress and promote mental health. As a result, these data may support the theory that sedentary people who practise vinyasa yoga have positive results in terms of general physical fitness, cardiovascular health, and psychological well-being (Choi, 2018). These findings support the recognition of vinyasa training as a type of yoga that may be employed as a tool for children's general physical development. It's also vital to note that yoga for kids should be developed in a fun way that encompasses all parts of a child's growth.

According to the findings in the current study, online vinyasa yoga training programme is helpful in generating positive improvements in explosive leg strength. Current study shows that the five-day-a-week online vinyasa yoga training may have provided enough stimulus to improve explosive leg strength of school children. It is worth mentioning that even a 6-week intervention was adequate to improve dynamic body balance. For school-going children, other future research areas should concentrate on the effects of vinyasa on physiological characteristics such as oxygen consumption variations, metabolic analyses, and energy expenditure at various vinyasa speeds and time intervals. Vinyasa can also be tested to see if it improves other skill and fitness-related physical components like static balance, which is equally important in children.

## Conclusion

Hence, the researcher can conclude that six-week vinyasa training programme is effective in improving explosive leg strength of school children. This pilot study further encourages researchers to perform a larger scale study on similar factors. Moreover, from the prospect of health-related physical fitness, it is well accepted that vinyasa, a form of yoga practice as a home-based exercise programme, resulted in significant improvements in explosive leg strength. In addition, the fact that it is simple and easy to follow may encourage a large section of society to participate and indulge in this form of exercise. The study also showed a very effective method of training in which one can stay indoors, requiring almost no equipment and only a small space to keep oneself fit and continue a healthy lifestyle even if a situation like a pandemic occurs. In the era of technology, staying healthy must be encouraged; this is the need of the hour, and thus, online training sessions scientifically proving its worth. Statistically, we conclude that after implementation of a "6-week online vinyasa training programme" the F value, i.e., 28.832, for the standing broad jump was significant because the p-value associated with it was 0.00, which is less than 0.05. According to the findings of the study, vinyasa yoga could be beneficial for improving health related fitness, specifically explosive leg strength.

Coaches and teachers could use vinyasa training in their online training programmes since it will contribute to the players' gross motor and skill development. Future research is needed to evaluate how effectively vinyasa yoga addresses the demands of other population subgroups (e.g., people with eating disorders, or obese, people with sedentary lifestyle and smokers). Future research should concentrate on different time periods, and researchers might employ similar studies to address different subgroups of population.

**Conflicts of interest** - There were no conflicts of interest declared by the authors.

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