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An analysis of fours belly breathing exercise affects on athletes' aerobic capacity

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Abstract
Background: A growing corpus of research has focused on the function of breathing exercises and how they affect a variety of orthopaedic and sports rehabilitation-related features, however there is little evidence about how breathing exercises affect sport physical therapy.
Objective: To analyze the impact of the all-fours belly breathing exercise on athletes' performance during the shuttle run.
Material and Method: Twenty individuals took part in the study as a whole. Athletic group in group 1 (n = 20). A pre-shuttle run test (SRT) was conducted, and all participants received an explanation of the study's informed consent process. The subjects had a four-week exercise in belly breathing on all fours after the evaluation, and the results of post-SRT were evaluated.
Results: Prior to completing four weeks of belly breathing exercises, the mean SRT score was 3.305. Standard deviation: (1.46 Maximum and minimum scores were 8.182 and 1.143, respectively. As opposed to that, the average SRT score following the four weeks of all-fours belly breathing exercise was 3.95 (standard deviation = 1.36). 2.5 was the lowest and 8.364 was the highest possible score. By utilising the student t test, the mean difference between the SRT score before 3.31 (1.47) and the SRT score after 3.95 (1.37) is statistically significant (p 0.001). Also, the mean difference between the anticipated VO2max before 23.78 (4.90) and the predicted VO2max after 25.87 (4.74) is statistically significant (p0.001).
Conclusion: This study's findings suggest that all-fours belly breathing is helpful in enhancing the performance of the shuttle run in healthy people.

Keywords: Shuttle run, belly breathing, breathing drills, and the quad position

Introduction
Exercise increases the peak ventilation demand, which strengthens the brain signal to the breathing muscles. As a result, the muscles will get additional mechanical power. The muscle's power is always determined by how quickly it shortens and how much pressure it creates when it contracts. During exercise, the diaphragm primarily serves as a "flow generator". Hence, the diaphragm muscle generates mechanical power that is mostly expressed as shortening velocity rather than pressure. The muscles that move the rib cage and abdomen, on the other hand, serve primarily as "pressure generators," or rather, they supply the pressures required to move them [1].
Expiratory muscles actively participate in breathing during activity. They work closely with the inspiratory muscles throughout every single breath. The abdominal muscles progressively relax as the rib cage muscles gradually tighten during inspiration, and vice versa during expiration. This process has numerous effects:
1. The diaphragm is unloaded and can serve as a flow generator;
2. It also avoids rib cage deformation.
3. The volume of the abdomen is lower than it is at rest [1, 2].

End-expiratory lung capacity decreases as a result, and breathing mechanics are improved for a variety of reasons during exercise. Tidal volume occurs at the most elastic region of the respiratory system; the diaphragm is stretched and thus functions close to its ideal length; and with each breath, a portion of the necessary inspiratory activity is stored as elastic energy from the previous expiration [3]. It is commonly recognised that exercise therapists should give the abdomen and diaphragm muscles substantial attention based on their function and physiology.

Similar to how it was said previously, the diaphragm, a part of the core, helps maintain trunk stability by regulating intra-abdominal pressure and relieving strain on the spine by working in tandem with the abdominal and pelvic floor muscles [4, 5].

Methodology

Participants were assessed to ensure they met the inclusion requirements for normal individuals before being included in the study, which had 20 participants (8 men and 12 women with a mean age of 20.10). All participants were initially evaluated using the shuttle run on the first day of the first week. Thereafter, individuals trained while lying on all fours and belly breathing was used. Finally, at the conclusion of the fourth week, all participants were once again evaluated using the shuttle run.

Shuttle Run Test

The 20-meter shuttle run test (SRT), sometimes referred to as the beep or bleep test, measures a person's maximal running aerobic fitness. There are a total of twenty-one levels, with varying quantities of shuttles dependent on speed per each level. Throughout the course of the study, this test must be repeated twice. The first SRT was administered as a pretest once the individuals had been chosen. After four weeks of performing the all-fours belly breathing exercise, a final Shuttle Run Test (posttest) was performed.

Procedure

a. 10m running track was pre-measured and examined to ensure that the surface and surrounding conditions were appropriate for running before the test began.
b. Marking cones were placed to serve as landmarks for the beginning and finishing sites, making it evident to participants where and when to begin and turn while running.
c. To avoid harm, each subject was required to do a quick warm-up for 5 minutes.
d. The subject was instructed to cross two lines between set times while listening to recorded beeps.
e. The subject first stopped behind the starting line and started to run to the second line before turning around as directed by the audio.
f. The subject had to keep moving between the two lines while turning when the recording signalled because the beginning speed was relatively slow. The most widely used form of the shuttle run test was chosen for this study from among the several variations. It started off moving at 8.5 km/hr, and each minute it picked up 0.5 km/hr.
g. After about a minute, there was a sound that suggested an increase in speed, and it repeated every minute after that (level).
h. If the subject reached the line before the beep sounds, a warning was provided and the subject had to continue running to the line, and tried to keep up with the pace within two more "beeps," instead of waiting and continuing until the beep sounds were heard.
i. Ignoring a warning or the subject's intention to stop, the subject failed to reach the line twice in a row (within two metres) and the test was called off.
j. They had to calm down for around five minutes once the exam was over. For prevention of delayed onset muscle soreness, the researcher recommended slow walking and some stretching exercises (DOMS).

Scoring

Before the subject became unable to keep up with the recording, the level and quantity of shuttles (20m) reached were recorded.

On a beep recording sheet that had been prepared, the last level completed was noted. Following a 4-week breathing exercise programme, individuals' aerobic fitness was assessed using the Shuttle Run Test. A Beep Test VO2max Calculator created by Pend Sports used the tables in a published publication to predict VO2max in order to strengthen the validity of the study's findings.

The calculator will produce the findings (predicted VO2max) based on the user's age, gender, level, and number of shuttles done.

Training Protocol

Training in all-fours belly breathing has been done with each participant for four weeks. The next day following the pre-SRT session, the training began right away. The breathing method was taught and observed one-on-one by the researcher throughout the first training week. During the initial three weeks of training, the twenty participants were split into four groups for group therapy. Muscles must be overloaded to produce a training response. Overloading can be achieved by adjusting duration, intensity, or frequency. Training should occur once or twice day, daily, or at least three times per week for the respiratory muscles of a healthy person. The recommended intensity ranges from 50 to 70% (usually results in failure within 30 breaths), which translates to durations of 2 to 3 minutes each session [6]. To reduce inaccuracy, the study's parameters were standardised as follows:

Standard Parameters

a. Intensity = 50-70%
b. Duration = 30 breaths
c. Frequency = 3 times/week; twice/day

In front of the mirror, a mat was placed up for all-fours belly breathing. The individuals may receive feedback on their breathing technique performance by practising in front of a mirror, allowing them to make any necessary corrections right away. Together with explaining the steps to the individuals in order to reduce mistake, the researcher also showed the proper breathing technique.

1. Start off in a quadruped position with a small posterior pelvic tilt. Spread your arms out to the sides, keeping your knees at hip-width distance. It should be 90 degrees from the body or perpendicular to it. The subject's spine need to be in a neutral alignment.
2. Inhale deeply through your nose and attempt to picture the air rushing into your stomach as you feel your stomach explode with the air.
3. To produce a hump in the upper back, thrust the sternum up towards the ceiling while exhaling through the lips.
4. Concentrate on your breathing and picture air entering the constructed dome as you slowly and thoroughly exhale through your mouth.
5. Hold the pose for six breaths before getting back to your starting position.

6. After a one-minute break period, the subject was instructed to repeat the aforementioned steps five times.

Precautions

1. Subjects are not allowed to hold breath throughout the process.
2. One min resting interval is given to prevent hyperventilation.

Statistical Analysis

Data from the training shuttle run's pre- and post-exercise rest periods were analysed statistically using the Student t test.

Results and Discussion

The estimated oxygen intake rose from 23.78 to 25.87, while SRT increased from 3.31 to 3.95. Despite the fact that the projected Vo2 max indicates a substantial difference but the SRT score doesn't (Tables 1 & 2).

Table 1: Mean differences between SRT score before (pre) and SRT score after intervention (post).

	Paired samples mean (SD)	Mean difference (SD)	95% Confidence Interval	t	P value
SRT score before	3.31(-1.47)	-0.65			
(0.56)	-0.91_-0.39	-5.23*	<0.001		
SRT score after	3.95 (-1.37)				

Table 2: Mean differences between predicted VO_2max before (pre) and predicted VO_2 max after intervention (post).

	Paired samples mean (SD)	Mean difference (SD)	95% Confidence Interval	t	P value
Predicted VO_2 max before	23.78	-2.09			
(1.51)	-2.79_-1.38	-6.185*	<0.001		
Predicted VO_2max after	25.87				
(4.74)					

The purpose of this study was to determine how four weeks of belly breathing exercises on all fours affected the performance of normal volunteers during shuttle runs. A breathing method and corrective exercise known as "all fours belly breathing" is performed while on all fours in order to improve pelvic and ribcage control and to restore thoracic flexibility. With the simultaneous activation of the diaphragm and all four abdominal muscles (RA, IO, EO, and TA), this unique respiratory technique fills a void in breathing techniques. According to the length-tension relationship, muscle generated considerably less force at lengths that were either shorter or longer than its ideal length [7]. The neuromuscular efficiency of the entire human movement system is established by optimal length-tension relationships, recruitment patterns, and joint motions in the core muscles. This enables effective acceleration, deceleration, and stabilisation during dynamic movements as well as the prevention of potential injuries [8].

After 4 weeks of training, the SRT score improved according to the findings of our study. SRT is a field test that was created and is frequently used to track improvements in cardiorespiratory fitness. Cardiorespiratory fitness (CRF), which is often measured in metabolic equivalents (METs) or maximum oxygen uptake, is crucial for both health and fitness (VO2max). CRF and physical activity are closely related. Regular physical exercise can increase a person's CRF, according to studies [9-11].

The statistical significance of the outcome was demonstrated by the mean difference between the pre- and post-test scores (p 0.001). Exercises involving belly breathing on all fours and shuttle run performance are related. We may infer from the improvement in VO2max predicted from the SRT before and after training (p0.001) that individuals had improved in their CRF after 4 weeks of all-fours belly breathing exercises. The individual's VO2max may be determined using the SRT data.

Conclusion

The results of the current study show that all-fours belly breathing enhances shuttle run performance in healthy people.

Conflict of Interest: There is no conflict of interest.

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