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A study on the effectiveness of interactive flashfit devices on improving sports performance in badminton players

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Abstract
Aim: To determine the effects of interactive Flashfit Devices on improving sports performance in badminton players.
Background and Purpose: Badminton players need to adapt training methods to perform better in sports such as reaction time, endurance, and agility. Modification in training is required to move, measure and motivate to complete the task for badminton players.
Method: This study has been done among the badminton players who have completed the inclusion and exclusion criteria. They were selected in the age group 3- 18 years. 10 badminton players were selected from MYNDZ Badminton Academy. They were involved in conventional fitness training with interactive FLASHFIT IFLOOR, PODS, IWALL, IPUNCH, ITRACK, IBALL, ICORE and IJUMP. The pre-and post-test study was conducted to identify the effectiveness of interactive Flash Fit devices for the selected badminton players.
Result: After the activity, the parent group reported that their players improved in reaction time, speed, and agility.
Conclusion: Interactive FLASHFIT device training along with conventional fitness training helps on improving overall sports performance such as flexibility, endurance, reaction time, attention span, processing speed, and coordination.

Keywords: Flashfit devices, badminton, sports performance, reaction time

Introduction
Badminton is a type of racquet sport that is either played by individuals or by a group [1]. It is one of the world's quickest racquet sports. The game, which in antiquity was also known as battledore and shuttlecock, involves striking a shuttlecock back and forth with a paddle, was already well-liked in a number of locations, including India, China, Japan, and Greece [2]. The players must demonstrate intensive rhythmic movements, speed, cardiovascular endurance, strength, response time, flexibility, power, balance, and coordination, all of which are fundamental skills in this highly competitive, dynamic, and explosive sprint sport.

Agility
"Rapid movement and direction change of limbs" and "body change of direction" are both considered to be characteristics of agility (Baechle, 1994; Draper & Lancaster, 1985) [20, 29]. This, however, ignores the reality that the majority of direction changes in sports take place in reaction to inputs unique to the respective discipline. In addition to the essential technical and physical skills, Sheppard and Young (2006a) [21] contend that a definition of agility should take into account the cognitive processes involved. To assess and educate agility, however, specific drills are frequently used, which ask for an athlete to go as swiftly as possible through a pre-planned course.
Today, it is believed that agility is more complex and includes both physiological and neuropsychological components, including response time, acceleration and maximum speed, change of direction speed, and mobility.

Neuropsychological components include anticipation, intuition, sensory processing, and decision-making. Nonetheless, depending on the context particular to the sport, these components interact with one another to varying degrees. It is now well-acknowledged that analyzing visual cues, anticipating events, and having quick reactions are all crucial for agility in team sports (Veale, Pearce, & Carlson, 2010) [22].

Hirtz (1985) [23] defined coordination skills as "complex, relatively independent prerequisites of performance regulation of movements, which are created and developed in motor activities based on dominant, inherited but influenceable neuro-physiological functional mechanisms." As a result, coordination skills can be improved through methodical training. Kirchem (1992) [24]. An individual's capacity for maintaining or regaining bodily equilibrium in the wake of a sudden or abrupt shift in body position is known as their capacity for balance (Hirtz, 1985) [23]. Balancing requires a variety of sensorimotor skills, including input from the vestibular, somatosensory, and visual systems (Bressel, Yonker, Kras, & Heath, 2007) [25]. The size of the weight-bearing surface, the body's centre of gravity, and the health of the vestibular and central nervous systems all play a role in this. Information.

It's critical to comprehend each component that goes into the making of a particular sport's performance. This necessitates the use of the best planning focus and content, the method of achieving this goal status, and specifics on planned adjustments to each performance aspect in accordance with changes in developmental processes associated with aging. Effective sports preparation necessitates the right application of training loads at their highest levels of volume, intensity, coordination complexity, and psychological demands, as well as a gradual and suitably progressive increase at each step of the long-term sports preparation.

Due to the need for ongoing enhancement of its components, top sports place increasing demands on sports preparation. Sports games are now understood in a very dynamic way.

Factors influencing agility performance

As per reports, a number of variables may have an impact on agility performance**.** According to studies, a number of variables may have an impact on agility performance**.**

Although cognitive and perceptual characteristics are thought to be differentiating variables when it comes to agility performance, the majority of studies have focused on the physical aspect (Paul, Gabbett, & Nassis, 2016) [27]. Cognitive and perceptual characteristics can separate high-level and low-level agility performances (Scanlan, Humphries, Tucker, & Dalbo, 2014) [28]. The majority of the time needed to complete an agility test is due to physical considerations. They consist of functional mobility, strength, and power attributes.

Flexibility

Flexibility is defined as both the length of the muscles that cross the joints and the total range of motion of a joint and group of joints. It is possible to observe individual variations in flexibility, particularly when it comes to the length of muscles with several joints. It is possible to increase the flexibility of some joints to some degree. Stretching is a common exercise that promotes flexibility maintenance or growth.

The quality of life is improved by maintaining and improving the joint range of motion. Badminton players move and change directions quickly, placing a lot of pressure on their muscles and joints**.** Less flexible players would be more likely to sustain an injury under this pressure**.** This suggests that badminton players need a high level of flexibility to deal with motions.

Reaction time

The amount of time it takes for a person to react to something is known as reaction time [7]. Research on badminton players revealed increased grey matter density, which may be related to the sport's emphasis on fine motor control, hand-eye coordination, and high-capacity visual-spatial processing [8].

Eye-hand coordination

A simple definition of eye-hand coordination is the control of eye movement with hand movement, the processing of visual data to guide reading and gripping, and the use of hands proprioception to direct the eyes. The Cerebellum, Cerebral Cortex, and an area of the optical lobe are the brain regions that are involved.

Eye-hand movement

The major sensory outpost of the brain and the peripheral organs of vision are the eyes (Magill, 2011) [30]. They function in a mutual and linked way, picking up light reflected from elements in the optic array. This is done using a transparent lens system that is sensitive and precisely adaptable and has evolved a structure made of protein molecules for capturing photons and deflecting light rays. Six striated, extrinsic muscles that are innervated by three cranial nerves stimulate each eyeball (Williams, Davids, and Williams, 2005) [31]. The eye can move and gather information because of the neuromuscular arrangement.

General tau theory

Gibson's (1966) [32] investigation of ecological invariants in visual flow fields led to the creation of the concept of tau. It goes without saying that being able to anticipate moving objects and gauge when they will arrive at their destination is essential in any circumstance, especially one involving sports. Hancock and Manser (2003) [26]. Such knowledge is essential in ballistic sports for planning an athlete's action and foreseeing their next move. (Kayed and Van der Meer) 2009. In racquet sports, for instance, striking a cork requires extensive physical preparation in order to generate accurate prospective control of interceptive movement. The global tau theory, often known as the prospective control hypothesis, has been connected to a number of anticipatory and developmental processes.

Interactive cognitive fitness training system

The flashfit devices is an interactive fitness training system that can be used for training purposes to improve performances among the sports population**.** The benefits of the FLASHFIT devices may be on improving reaction time, speed, agility, attention span, processing speed, movement skills, and body awareness**.**

Objective of the study

Agility, eye-hand coordination, and reaction time are some of the basic important factors which it increases performance among badminton players**.** The purpose of this study was to evaluate how well wireless interactive pods improved badminton players' athletic performance.

Study design
Experimental study
Study setting
MYNDZ Badminton Academy, Sembakkam, Chennai.

Sampling technique

Purposive Sampling Technique

Sample size
Total sample size is 10

Study duration
6 Weeks Duration

Source of data
- Data were collected from MYNDZ BADMINTON ACADEMY.
- Subjects were selected under the permission of the sports club owner.

Inclusion criteria
- Age Group: 11-21 years
- Gender: Both sex
- Badminton player
- Healthy subjects

Exclusion Criteria
- Below the age group of 11
- Subjects with medical complications
- Recent trauma or sports injury

Materials used
- FLASHFIT IFLOOR, PODS, IWALL, IPUNCH, ITRACK, IBALL, ICORE and IJUMP
- Bosu Ball
- Medicine Ball
- Cones
- Agility ladder

Research procedure
- Participants were selected based on the inclusion criteria and gave consent to participate in the study.
- Before starting the training, the subjects, current health status was checked and they are absent of any health issues or disabilities. Then sports performance (pre-test) was checked with the help of agility test (agility-test)
- The summer badminton training camp program for a total period of (6 weeks & 6 days per week and each session consists of 60 minutes per day)
- For the total participants in the group, intense training such as drills and agility training was implemented with visual stimuli using (FLASHFIT DEVICES) for improving agility, and reaction time was given during the training period.
- The measurement was completed. Post-test was taken after the period of 6 weeks. The results were tabulated for statistical analysis.

Sit and reach test
- This test involves sitting on the floor with legs stretched out straight ahead.
- Shoes and socks were removed and the soles of both feet are placed flat against the box and the pod is placed above the box.
- Both knees should be locked straight and pressed flat to the floor.
- With the palms facing downwards, and the hands-on top of each other or side by side, the subject reaches forward along the measuring line as far as possible. After some practice reaches, the subject reaches out and holds that position for at least one-two second while the distance is noted.

Vertical jump protocol procedure
Participants had to begin standing up, and the jump technique was explained before they began jumping. They were then placed in the appropriate pods. In order to reduce the inertial effects of arm movements, a counter-movement leap was utilized to measure the vertical jump height. After three trials for each subject, the highest vertical jump height was recorded. The individuals had to countermove with an arm swing before jumping vertically. An approaching step was not allowed before the jump. A 0.5 to 1-minute rest break was provided in between each experiment.

Shuttle run procedure: (10 Meters)
- Mark the running path by taking a 10-meter measurement of the distance (33 feet).
- Setting up a cone at the beginning and another at the 10-meter (33-foot) mark.
- Position the two blocks on the side away from the starting position.
- The pod is placed at the required distance.
- The participants were made aware of the test methods.
- The badminton player stands at the starting line facing the course with their feet just behind the line as soon as the signal "get set" is given.
- The badminton player begins to run when the signal "go" is given, moving in the direction of the opposing line. The badminton player grabs the first block of wood at the opposing cone, turns to race back to point A, where they set the block on the line, and then repeats with the second block of wood.
- The badminton player should sprint once more in the direction of point B to seize the second block and return it to the starting position. Four 10-meter (33-foot) sprints totaling 40 meters will have been completed by the participant (131 feet).
- Before repeating the runs, a short time of rest was given to allow for complete recovery.


INTERACTIVE FITNESS TRAINING

Standing broad jump procedure
- The participants stand with their feet slightly apart behind a line drawn on the ground.
- The pod is placed at the required distance.

- With a two-foot take-off and landing, the forward motion is produced by swinging the arms and bending the knees.
- The participant tries to leap as high as they can and land on both feet without falling backward.
- Three attempts are allowed.

Reaction time (30 SEC)

- 30 secs is the total time given for the participants.
- The subject should react as fast as possible and touch the pod when it gets lights up. The pods are placed above the cones.
- Same procedure done in a different direction and it is because of a manual change in pod settings and the results were noted.

Table 1: The first week of the training program

Drills using flashfit devics	Intensity	Set/rep
Side-to-side ankle hops	Low	2 ×15
Standing jump and reach	Low	2×15
6 corner shadow drill	Low	5×6
Front cone hops	Low	5×6
Lateral cone hops	Low	5×6

Table 2: The second week of training program

Drills using flashfit devics	Intensity	Set/rep
Side-to-side ankle hops	Low	2×15
Standing jump hops	Low	2×15
Lateral jump	Low	2×15
Double leg hops	Low	5×6
6 corner shadow drills	Low	5×6

Table 3: The third week of the training program

Drills using flashfit devics	Intensity	Set/rep
Side-to-side ankle hops	Medium	2×12
Double Leg Hops	Medium	2×8
Hops with cone (Sideward)	Medium	3×8
6 corner shadow drill	Medium	4×3
Front cone hops	Medium	4×3

Table 4: The fourth week of a training program

Drills using flashfit devics	Intensity	Set/rep
Diagonal cone hops	Medium	2×12
Lateral cone hops	Medium	2×12
Lateral jump single leg	Medium	4×5
6 corner shadow drill	Medium	4×5

Table 5: The fifth week of training program

Drills using flashfit devics	Intensity	Set/rep
Diagonal cone hops	High	4×8
Lateral cone hops	High	4×8
Lateral jump on one leg standing	High	4×8
Hops with cone (180-degree)	High	2×12
6 corner shadow drill	High	2×12

Table 6: The sixth week of the training program

Drills using flashfit devics	Intensity	Set/rep
Hexagon drill	High	3×8
Lateral jump on one leg standing	High	4×6
Diagonal cone hops	High	2×12
6 corner shadow drill	High	2×12

Results

Pre and Post-test are measured by sit and reach test, reaction time 30 sec, shuttle run test (10 m), Vertical jump, and Standing Broad Jump test.

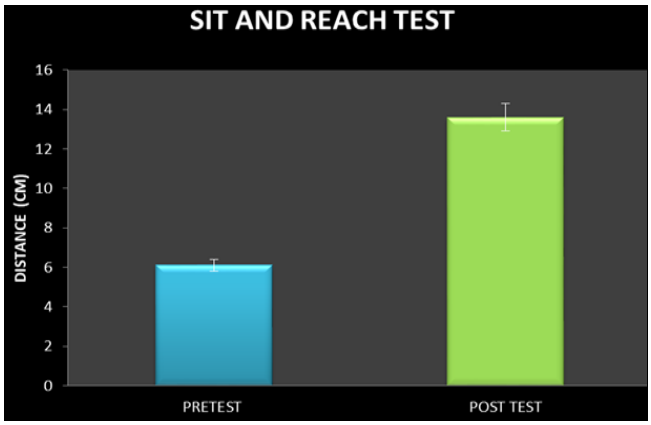

Fig 1: The graph represents the agility of the participants through sit and reach test using the Flashfit Devices

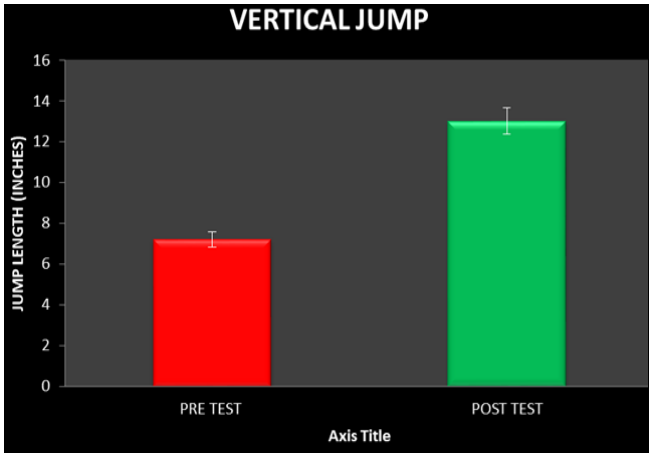

Fig 2: The graph represents the Endurance of the participants through the vertical jump test using the Flashfit Devices

Each bar represents the Mean ±SD of the pre and post-test where the significance $p<0.05$

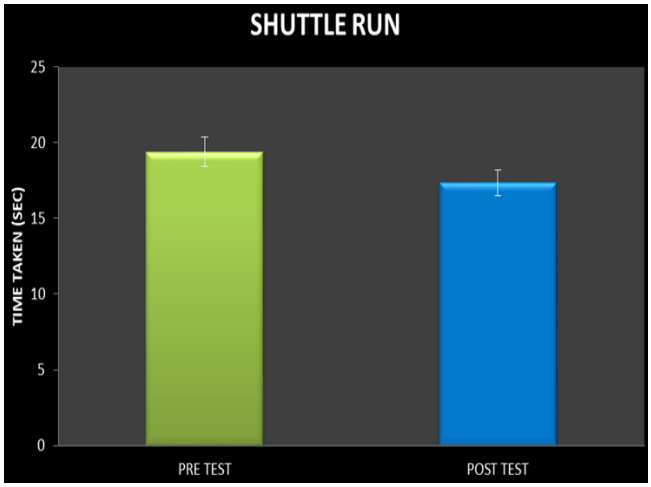

Fig 3: The graph represents the Agility and motor co-ordination of the participants through shuttle run using the Flashfit Devices

Each bar represents the Mean ± SD of the pre and post-test where the significance $p<0.05$.

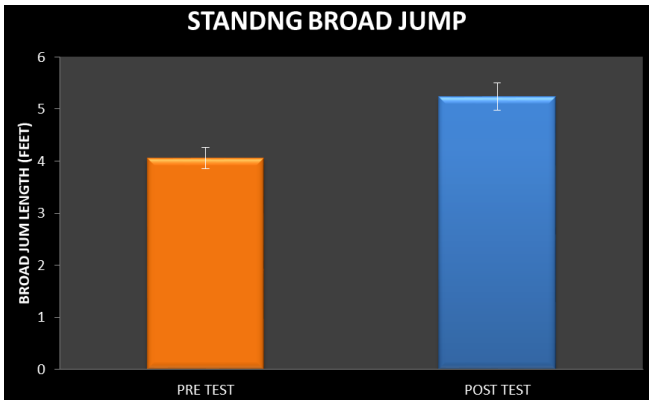

Fig 4: The graph represents the motor co-ordination of the participants through standing broad jump test using the Flashfit Devices

Each bar represents the Mean ±SD of the pre and post-test where the significance $p<0.05$.

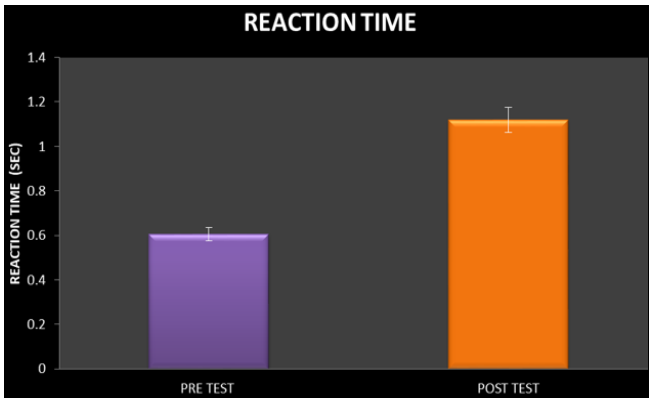

Fig 5: The graph represents the Reaction time of the participants using the Flashfit Devices

Results and Discussion

The study focuses on determining the effectiveness of FLASHFIT interactive devices in improving the overall sports performance of individual healthy volunteers who were selected for the six weeks training program using FLASHFIT Interactive devices which challenges and motivates the user to workout effectively and helps to assess the realm of healthcare which can also be used in rehabilitation and sensory integration such as improving range of motion, coordination, balance, and strength vision thus it increases the anticipation. Flashfit Interactive Fitness training along with conventional training methods has shown significant improvement in overall sports performance such as flexibility, muscle power, reaction time, and agility. Thus the Flashfit Interactive devices can also be used for other training purposes in neurological rehabilitation, and other sports.

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