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**K Kathiravan**

Ph.D. Research Scholar  
Department of Physical  
Education Annamalai  
University, Annamalai Nagar,  
Tamil Nadu, India

**Dr. S Vijay**

Assistant Professor/Director of  
Physical Education  
Department of Physical  
Education, Annamalai  
University, on Deput. Govt.  
Polytechnic College,  
Tiruvannamalai, Tamil Nadu,  
India

## Impact of isolated and combined dexterity and sinistrality physical training on reaction speed among school handball players

**K Kathiravan and Dr. S Vijay**

### Abstract

Handedness is an attribute of humans defined by their unequal distribution of fine motor skill between the left and right hands. Dexterous refers to the skill and grace in physical movement, especially in the use of the hands, adroitness. An individual who is more dexterous with the right hand is called right-handed (dextralists), and one who is more skilled with the left is said to be left-handed (sinistrality). The purpose of the study was to find out the effect of isolated and combined physical training on reaction speed among school handball players. For the propose 30 right hand dominance boy students from Nagappatinam district, Tamilnadu, India were selected as subjects at random and their age range between 12-14 years, the selected subjects were divided in to three equal groups of ten subjects each namely dextrality physical training group (n=10), sinistrality physical training group (n=10), and combined dextrality and sinistrality physical training group (n=10). The physical training group underwent training for fifteen weeks, four days per week and sixty minutes per day including warming up and cooling down exercises. The reaction speed (ruller drop test) was selected as dependent variable and tested before and after the experimental period for both the groups. The collected data were analyzed by using ANCOVA. Further, independent 't' was calculated to find out the difference between left and right hand and the percentage was also calculated to find out the level of improvement on dexterous. Level of confidence was fixed at 0.05. The result of the study shows that the physical training improved the selected speed parameters (Transferring speed and reaction speed) compared to control group. The difference between right and left hand on speed is insignificant. However, the percentage of improvement for the variable was in-favor of left hand compared to right. Hence, it was concluded that physical training may be given to improve the dexterous (use of hands) level and quality.

**Keywords:** physical training, reaction speed, dextrality, sinistrality

### Introduction

Physical training, targeting mostly intrinsic hand muscles, lead to an improved balance in the force-generating abilities between the extrinsic and intrinsic muscles. The muscular design of the hand allows variation in the involvement of the intrinsic and extrinsic muscles in maximal pressing force and sub maximal accurate force production tasks by varying the point of force application along the fingers, at the fingertips and at the proximal phalanges (Danion F, 2000) [3]. The motor ability imbalance between hand muscle groups may contribute to the impaired ability to stabilize the total force and total moment of force in multi-finger tasks as well as to the decrease in dexterity (Shim JK, 2004) [10]. The adaptive response by the physiological system of the body to physical training, including the neuromuscular system are directly related to the training stimulus. The physical training involves prolonged muscular work increases physical capacity such as speed, strength, endurance, flexibility, co-ordination and so on Fine motor skills, are skills that involve a refined use of the small muscles controlling the hand, fingers, and thumb. Being right or left-handed that matters, but the strength of preference for one hand over the other. The controversial idea, people are not either left-handed or right-handed but "strong-handed" or "mixed-handed" (Guiard, Y. 1987) [7]. Speed on handedness has been referred by how the hand can react firstly for the stimuli, in other words it's known as reaction time, and the reaction time is the time it takes to make a movement in response to a sensory stimulus.

**Corresponding Author:**

**K Kathiravan**

Ph.D. Research Scholar  
Department of Physical  
Education Annamalai  
University, Annamalai Nagar,  
Tamil Nadu, India

And try to respond as fast as possible in each situation, the reaction time is quite different. The difference occurs because of the different amount of time it takes for the central nervous system to process the sensory signals and to choose the appropriate course of action. Improving reaction time to train the fast muscle twitch fibers and increasing the speed at which your neurons fire and communicate. (Geraldine Klimovitch Lefthus, 1981)<sup>[4, 5]</sup>.

Handedness in sports plays vital role on performing skills. In handball the entire play was in dominance with hand movement and the motor control over neuromuscular coordination with the arm and hand.

Handedness is an attribute of humans defined by their unequal distribution of fine motor skill between the left and right hands. An individual who is more dexterous with the right hand is called right-handed (sinistralists), and one who is more skilled with the left is said to be left-handed (dextralists). Minorities of people are equally skilled with both hands, and are termed ambidextrous (Kabbash, P, 1994)<sup>[8]</sup>.

## Methodology

For the propose 30 right hand dominance handball players from Nagappatinam district, Tamilnadu, India were selected as subjects at random and their age range between 12-14 years, the selected subjects were divided in to three equal groups of ten subjects each namely dextrality physical training group (n=10), sinistrality physical training group (n=10), and combined dextrality and sinistrality physical training group (n=10). The physical training group underwent training for fifteen weeks, four days per week and sixty minutes per day including warming up and cooling down exercises. The reaction speed (ruller drop test) was selected as dependent variable and tested before and after the experimental period for both the groups. The collected data were analyzed by using ANCOVA. Further, independent 't' was calculated to find out the difference between left and right hand and the percentage was also calculated to find out the level of improvement on dexterous. Level of confidence was fixed at 0.05.

## Results

**Table 1:** Independent 't' test between pretest and posttest data of reaction time among under – 14 boys

Group	Test	Mean	SD	df	't' Ration	P-Value	Magnitude of improvement in %
Dextrality	Pre	17.90	0.57	18	12.04*	0.00	20.67%
	Post	14.20	0.79				
Sinistrality	Pre	15.50	0.53	18	5.88*	0.00	14.19%
	Post	13.30	1.06				
Ambidexterity (Dextrality)	Pre	17.70	1.06	18	8.33*	0.00	22.03%
	Post	13.80	1.03				
Ambidexterity (Sinistrality)	Pre	18.60	0.97	18	7.61*	0.00	16.67%
	Post	15.50	0.85				

\*Significant at 0.05 levels.

The table value for df 18 is 1.73 at 0.05 level of confidence

**Table 2:** Analysis of covariance of pretest and post test data on isolated and combined dextrality reaction time among under – 14 handball players

Test		Isolated Dextrality Group	Combined Dextrality Group	SOV	SS	df	MS	'F' Ratio
Adjusted Post Test	Mean	14.25	13.75	B	1.22	1	0.22	1.73
				W	12.05	17	0.71	

\* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 1 and 17 is d 4.45 respectively).

**Table 3:** analysis of covariance of pretest and post test data on isolated and combined sinistrality reaction time among under – 14 handball players

Test		Isolated Sinistrality Group	Combined Sinistrality Group	SOV	SS	df	MS	'F' Ratio
Adjusted Post Test	Mean	13.37	15.43	B	3.96	1	3.96	4.02
				W	16.58	17	0.98	

\* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 1 and 17 is d 4.45 respectively).

The table II shows that there was no significant difference between the adjusted posttest means of isolated dextrality physical training group and combined dextrality physical training group on reaction speed. Therefore, the isolated and combined dextrality physical training indicates the similar advance. The table III shows that there was a significant difference between the adjusted posttest means of isolated sinistrality physical training group and combined sinistrality physical training group on reaction speed. Therefore, the isolated and combined sinistrality physical training indicates the different advance. To find out the improvement on dexterous level, independent 't' ratio was calculated with the

magnitude of improvement (%).

The result of the 't' shows, significant difference between pretest and posttest mean on reaction speed. The magnitude of improvement was higher for right hand when compared to left hand on reaction speed. Hence, it was concluded that the selected physical training improves the dexterous level.

## Discussion

The findings confirm that physical training has a significant impact on speed. The following findings of different researches were in conformity with this study. In Box and Block Test gross manual dexterity score was determined as

the maximum number of blocks transported individually from one compartment of a box to the other in one min (Mathiowetz V, 1985) <sup>[9]</sup>. The study on hand impairments and their relationship with manual ability in children. Sensory impairments were measured on both hands. Motor impairments included grip strength (Jamar dynamometer), gross manual dexterity (Box and Block Test) and fine finger dexterity (Purdue Pegboard Test). Gross manual dexterity on the dominant hand and grip strength on the non-dominant hand were the best independent predictors of the children's manual ability, predicting 58% of its variance (Carlyne Arnould, 2007) <sup>[2]</sup>.

The faster reaction time in aerobic exercisers as compared to controls in some of the groups is due to improved concentration, alertness, better muscular co-ordination and improved performance in the speed and accuracy task (Grim BY, L Hannertz, 1996) <sup>[6]</sup>. A decrease in reaction time indicates an improved sensory-motor performance, which can be explained on the basis of enhanced processing ability of central nervous system. This shortening of reaction time is of applied value in situations requiring faster reactivity such as sports, machine operation, race driving and specialised surgery. Reaction time has been reported to be altered in trainable mentally retarded children (Un N, Erbahceci F, 2001) <sup>[11]</sup>.

The study of reaction time spans more than a century and provides an indirect index of the processing capability of the central nervous system and also a simple means of determining sensorimotor performance (Geraldine Klimovitch Lefthus, 1981) <sup>[4, 5]</sup>. The right and left eyes have slightly different fields of vision. Each field is split in to a right and left side. When light rays reach the retinas, they are transposed and inverted. These rays travel down the optic nerves to the optic chiasma, where a cross over takes place. Both visual reaction time and auditory reaction time were significantly faster in hands (A. H. S. Chan, 2007) <sup>[1]</sup>.

### Conclusion

It was concluded that the physical training improves speed dexterous (Hands). Hence, the dominant hand shows better improvement on reaction speed. Hence, nondominant has improves speed when compared to base level.

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