Volume : 2 | Issue : 4 | Apr 2013 • ISSN No 2277 - 8179

Research Paper

Relationship of Visual and Nonvisual Kinesthesis to the Performance of Perceptual Motor Skills

Physical Education

KEYWORDS : Kinesthesis, visual, non visual, Fisher motor performance test, perceptual motor skills

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ABSTRACT

Kinesthesis is the sense of position, location, orientation, weight, movement of the body and its parts are perceived. The Aim of present study was to investigate whether the visual (V_) and non-visual (NV_) kinesthesis related to perceptual motor skills (PMS) and to know the difference between relationship of V_ and NV_ kinesthesis and PMS. Two hundred male children from class 5-8th standard, age ranging from 10 -14 years were randomly selected as subject for the study. Subjects were randomly divided into four groups. Fisher motor performance test (FMPT) was used as a criterion measure. To find out the relationship of V_ and NV_ kinesthesis to the performance of PMS, Motor performance skill test - Distance Perception Jump test (V_DPJT and NV_DPJT), Shuffleboard Distance Perception test (V_SDPT and NV_SDPT), Kinesthetic Obstacle test (V_KOT and NV_KOT) and Bass Kinesthetic skill test (Lengthwise) (V_BKST and NV_BKST) were administered and the score obtained was recorded as per the standard literatures available. The relationship of FMPT with V_ and NV_ Kinesthesis to the performance of PMS was studied by using the Pearson's correlation coefficients Matrix reveals that all the correlation coefficient of V_ kinesthesis tests with NV_ kinesthesis tests values are found statistically highly correlated at p-value < .01. When compared, the result reveals that there is a statistically positive significant difference found between visual and non-visual test for BKST (10.21), SDPT (3.30) and DPT (14.74), however KOT was found to be statistically negative significant at p-value < .01. We found that participants could accurately estimate kinaesthetic sense for V_ and NV_ performance when reaching to targets. Result also revealed that Individual's ability to predict position during movement without the use of the eyes is more related to the performance of PMS than with open eyes. Our results suggest that although vision can override kinesthesia to recalibrate motor commands, it does not recalibrate the kinesthetic sense of body.

Introduction

Human rely on multiple sources of sensory information, such as Kinesthesis, vision and haptic sensation for better movement and motor performance when deducing the shape or contour of an object or guiding their hand to a target. Kinesthesis is the sense of position, location, orientation, weight, movement of the body and its parts are perceived. It has been one of the hardest of the senses to study because it is entirely an internal sense, and much of the effect is in the form of reflex responses (Scott, 1970). Kinesthesia is the sense that detects bodily position, weight, or movement of the muscles, tendons and joints. It is a vital component of proprioception, and its disturbance markedly impairs voluntary movement (Cole 1995; Rothwell et al. 1982). However, understanding the mechanisms that mediate this ability has long been controversial (McCloskey 1978). For more than 100 years, opinion swayed between an important role for central signals associated with the command to move (Helmholtz 1867; von Holst 1954) and peripheral feedback from sensory receptors (Sherrington 1900).

During the latter half of the 20th century, the balance tipped toward a peripheral origin, at least for perception of limb movements, and the focus then shifted to identification of which sensory receptor predominated. Arguments for receptors located in muscle (Goodwin et al. 1972; Matthews 1977; McCloskey et al. 1983), joints (Boyd and Roberts 1953; Ferrell et al. 1987; Gelfan and Carter 1967), and the skin (Edin and Abbs 1991; Gandevia and McCloskey 1976; Provins 1958) have been advanced, but during the last 30 years, a consensus has developed that feedback from muscle spindle receptors is the most important source of proprioceptive information (e.g., Gandevia 1996; Kandel et al. 2000; Smetacek and Mechsner 2004). Kinesthetic perception can be improved through practice (Johnson and nelson, 1998). Skaters, Dancers, and tumblers are taught to use the visual focus as a means of improving balance and also as a cue on space orientation (Scott, 1970).

Balancing under static conditions was strongly associated with the ability to perceive and process visual information, which is important for feedback-based control of balance (Hatzitaki V. et. al, 2002). Haptic sensation is based on both tactile and proprioceptive inputs from sensors in the muscles, tendons, joints, and skin. Although the two sensory modalities process and organize their inputs differently, humans still perform better when they have information from more than one modality (Desmurget et al. 1995; van Beers et al. 1996).

For instance, participants reach more accurately to targets when they can see and feel their hand (Rossetti et al. 1995; van Beers et al. 1996). This enhanced performance is likely due to the participants optimally combining these sensory signals, giving more weight to the more reliable modality in a given task and movement direction (Jacobs 1999; van Beers et al. 1999, 2002). Although studies have found that vision is less precise than proprioception when used to localize hand position in depth direction (van Beers et al. 1999, 2002), in many cases, vision proves to be a more reliable source of information for inferring shapes, positions, sizes (Proteau and Isabelle 2002), and movement directions along the azimuth direction (van Beers et al. 1999, 2002). When proprioception and vision provide contradictory information, the brain will rely more on vision than on other cues (Mon-Williams et al. 1997; Rock and Victor 1964).

The Aim of present study was to investigate whether the V_ and NV_ kinesthesis is related to PMS as well as to know the difference between relationship of V_ kinesthesis and PMS and to study the relationship of NV_ kinesthesis and PMS. Despite not many scientific research and understanding about relationship of V_ and NV_ kinesthesis to the performance of PMS, kinesthetic sense is important factor in motor performance. We are not aware of any studies that have investigated the relationship of V_ and NV_ kinesthesis to the performance of PMS in India.

Method:

Two hundred male children from class 5-8th standard, age ranging from 10 -14 years were randomly selected as subjects for the study. Subjects were randomly divided into four groups. FMPT consists of 10 stations (Ball bounce, Balance beam, Tunnel crawl, Accuracy throw, Jump from height, Long jump, Stepping stones, Locomotor stepping, Side roll and Finish line) was used as a criterion measure. The test was employed initially for all subjects. To find out the relationship of V_ and NV_ kinesthesis to the performance of PMS, Motor performance skill test - Distance Perception Jump test (V_DPJT and NV_DPJT), Shuffleboard Distance Perception test (V_SDPT and NV_SDPT), Kinesthetic Obstacle test (V_KOT and NV_KOT) and Bass Kinesthetic skill test (Lengthwise) (V_BKST and NV_BKST) (Johnson and nelson, 1998) was administered and the score obtained was recorded as per the standard literatures available. At the beginning of the experimental session, participants were informed of the requirement and risks associated with the study and provided informed written consent. Subjects were required to refrain from any strenuous exercise, consuming caffeine 24

Volume : 2 | Issue : 4 | Apr 2013 • ISSN No 2277 - 8179

hours prior to testing. Before administration of the test, it was explained and clearly demonstrated to the subjects. All queries and confusions were completely solved.

Statistical analyses:
The statistical treatment of data comprised of the Pearson's Coefficient of correlation was used to study the relationship of FMPT with V_ and NV_ Kinesthesis to the performance of PMS. For determining the statistical significant mean difference between two correlation coefficient t-statistics was applied at .01 level of confidence.

Results:
The Pearson's correlation coefficients Matrix has been calculated to study the relationship of FMPT with V_ and NV_ Kinesthesis to the performance of PMS presented in table – 1. Table – 1 reveals that the correlation coefficient of FMPT with all V_ and NV_ kinesthesis test is found statistically highly correlated at p-value < .01. Table also reveals that the correlation coefficient of all the V_ and NV_ kinesthesis tests values are also found statistically highly correlated at p-value < .01.

Table-1

	FMPT	V_BKST	NV_BKST	V_SDPT	NV_SDPT	V_KOT	NV_KOT	V_DPT	NV_DPT
FMPT	1.000	.973**	.921**	.921**	.908**	.274**	.888**	.976**	.849**
V_BKST	.973**	1.000	.954**	.865**	.859**	.197**	.836**	.958**	.882**
NV_BKST	.921**	.954**	1.000	.841**	.845**	.251**	.818**	.900**	.921**
V_SDPT	921**	865**	.841**	1.000	.989**	.374**	988**	955**	.785**
NV_SDPT	908**	.859**	.845**	.989**	1.000	.407**	991**	949**	.791**
V_KOT	.274**	.197**	.251**	374**	.407**	1.000	371**	271**	.227**
NV_KOT	.888**	.836**	.818**	.988**	.991**	371**	1.000	936**	.768**
V_DPT	.976**	.958**	900**	.955**	.949**	.271**	.936**	1.000	.839**
NV_DPT	.849**	.882**	921**	.785**	.791**	.227**	.768**	.839**	1.000

** Correlation is significant at the 0.01 level (2-tailed).

To find out statistically mean significant difference between two correlation coefficients t-statistic was applied and the result reveals that there is a statistically positive significant difference found between visual and non-visual test for BKST (10.21), SDPT (3.30) and DPT (14.74), however KOT (-16.87) was found to be statistically negative significant at p-value < .01.

Table-2

S. No.	Variables used	Correlation Coefficient	t (df= N-3)
1.	FMPT and V_BKST	0.9725	10.2196
	FMPT and NV_BKST	0.9213	
2.	FMPT and V_SDPT	0.9214	3.3097
	FMPT and NV_SDPT	0.9076	
3.	FMPT and V_KOT	0.2744	- 16.8747
	FMPT and NV_KOT	0.8883	
4.	FMPT and V_DPT	0.9756	14.7446
	FMPT and NV_DPT	0.8495	

p-value < .01

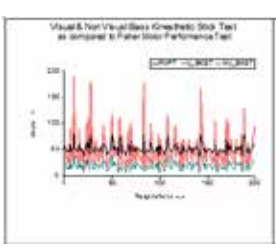


Figure-1

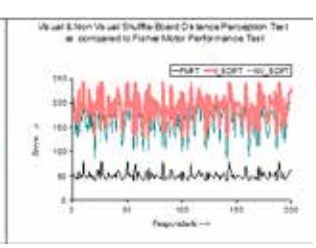


Figure-2

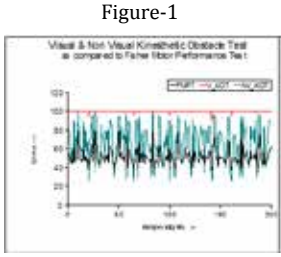


Figure-3

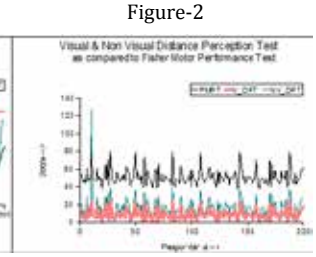


Figure-4

Discussion:
The findings of the present study was that kinesthetic ability to maintain balance on a small narrow surface with the use of the eyes and without the use of eyes is highly related to motor performance of an Individual (Hatzitaki V. et al., 2002). Present study showed that kinesthetic ability to perceive distance of concentrating on the effort involved in pushing a disc with the use of eyes as well as without the use of the eyes is having strong association with PMS. The result proved that this kinesthetic ability is helpful in the sports activities which repeatedly required the ability to perceive distance by concentrating on the effort like basketball shooting. Finding of the present study showed that ability to predict position during movement both with and without the use of the eyes strongly associated with the performance of perceptual motor skills (Nagar et al., 2010). Result was also shown that the visual and non visual ability to perceive distance by concentrating on the effort involving in a jump is highly related to the performance of perceptual motor skills.

In Table 2, the relationship of PMS with V_ and NV_ kinesthesis was compared. The relationship value between FMPT and V_BKST is 0.9725 which is greater than the relationship between FMPT and NV_BKST. It revealed that the kinesthetic ability to maintain balance on a small narrow surface with open eyes as visual kinesthesis is highly associated with perceptual motor performance such as laterality, directionality, balance, eye-hand coordination, locomotor skills and problem solving ability than the relation of non-visual kinesthetic ability to maintain balance on a small narrow surface (Katazan 1980). Table 2 was referred back to the result section it could be seen from the table that the relationship between FMPT and V_SDPT is greater than the relationship between FMPT and NV_SDPT. It means the ability to perceive distance by concentrating on the effort by involving in pushing the object with open eyes is more related to performance of PMS than the NV_ ability shown (Scheidt R.A.et al., 2005). In the present study individual used his both eyes while throwing disc towards target these muscle contraction, muscle memory and hand-eye coordination helped him to achieve target than non-visual effort.

In the present study it found that the relationship between NV_ KOT and FMPT is greater than the relationship between V_KOT and FMPT. Individual ability to predict position during movement without the use of the eyes is more related to be performance of perceptual motor skills than with open eyes. Tactile-kinesthetic sensation enables the individual to differentiate his own body from the surrounding environment. Its non-visual kinesthesis that allows individual to walk in complete dark-

ness without striking the things. During the learning of new movement skills, sport or art it is usually necessary to become familiar. It is non-visual kinesthetic ability to predict position during movement which makes individual to drive an automobile and able to steer or use the foot pedals while looking at the road ahead. Player looking towards the opponent and dribbling the ball without a single glance on the movement it all possible through the better relationship between non-visual ability to predict position and motor skills(Andre J and Rojers S ,2006).

In present study it could be seen that the relationship of V_DPT and FMPT is greater than the relationship of NV_DPT and FMPT. The ability to perceive distance by concentrating on the effort with the use of the eyes in strongly related to performance of PMS than NV_ ability. The kinesthetic visual transfer is likely to be achieved via visuometer-kinesthetic matching that is involved in both motor and visual performance (Kioumourtzoglou E, et al., 1997).

Conclusion:

It is concluded that V_ and NV_ kinesthesis is having strong association with PMS. The result proved that this kinesthetic ability is helpful in the sports activities which repeatedly required the ability to perceive distance by concentrating on the effort. It is found that V_ kinesthesis ability to perceive distance by concentrating on the effort, maintaining balance on small narrow surface and to perceive distance by concentrating on the effort by involving in throwing the object is highly related to perceptual motor skills than respective NV_ kinesthesis ability. But it is also revealed that Individual's ability to predict position during movement without the use of the eyes is more related to the performance of perceptual motor skills than with open eyes.

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