Investigation of Cognitive Abilities Of Indian Sport Women
印度女子運動選手的認知能力

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Abstract

At the elite level of participation of sports the brain has to be equally tuned with the brawn for attaining the peak level performance. Rather, it is higher cortical functioning of the athlete, which helps in judging, analyzing, estimating and calculating the information at the time of execution of highly précised movements during the competition. Taking in view these facts the emphasis of sports psychology researches in these days is shifting towards the cognitive assessment of the players in the laboratory conditions. A substantive probe has taken place in this respect in male athletes however the female athletic population is still awaiting scientific consideration. Taking cognizance of this situation the present study was conducted on 192 National level Female Athletes belonging to Athletics (Track & Field), Badminton, Basketball, Cycling, Football, Gymnastics, Handball and Hockey. These female athletes were assessed on the parameters of visual and auditory reaction time, visual perceptual accuracy and visual concentration. All the subjects were individually tested with the help of Electronic Chronoscope, Muller-Lyer Illusion test and Knox-Cube Imitation test. The standard procedure of testing was followed throughout the testing programme. The results revealed number of inter group differences in the cognitive abilities of female athletes. While comparing individual and team game female athletes differences were found only in reaction-ability.

摘　要

本文旨在探討印度女子運動選手的認知能力，192名印度女子國家隊選手接受測試，結果顯示，個人與隊際項目出現一些較明顯的差異。

Introduction

Socrates was the first to realize the importance of unity of body and mind, when he propounded. Even in the process of thinking, in which the use of body seems to be reduced to a minimum, it is matter of common knowledge that grave mistakes can often be traced to bad health. This wisdom was further attested by Sherrington (1940), when he postulated 'The muscle is the cradle of recognized mind'

However, knowingly or un-knowingly mind was ignored in the field of sports training/coaching and it was only after Mexico Olympics the need of turning of brain and brawn was realized and the concept of Psychological Preparation gained acceptance among coaches, trainers, selectors, scientists alike due to high standards of performance.

Physical fitness on one hand and the Psychological fitness on the other make athletes holistically prepared for the high level athletic endeavors. While considering Psychological preparedness it is customary to take the

cognizance of cognitive aspects of athletics activities as much of the athletic output is mentally controlled by the information processing (cognitive components) taking place in the central nervous system.

Way back, in 1975 Singer had stressed that the importance of cognitive aspects of task performance should never be minimized. Like wise Schubert (1981), Silva (1981) and Fujitha (1983) had found that cognitive abilities like concentration reaction time perception, intelligence, thinking memory imagination etc play an important role in attaining high level sports performance.

Realizing this fact Bhanot and Sidhu(1980), Khan (1984) Sharma(1986) and Khan et.al. (1986) tried to explore the cognitive characteristics of various categories of sports groups. Similar studies were conducted by Singh (1987) Khan et.al. (1988) Singh (1993) Khan (1993) and Singh (2005) to identify the cognitive characteristics of different categories of sports groups.

Summarisingly, most of the researchers concentrated on male athletic population ignoring female counter parts, who is equally important in the present realm. Thus the present study was planned and carried out to investigate the cognitive abilities of Indian female athletes.

Methodology

Objectives

The present study was conducted with the following objectives:

1. To find out the inter group differences in female athletes
2. To compare individual and team game female athletes.
3. To prepare cognitive profiles of national level female athletes
4. To suggest implications in selection and training of female athletes.

Hypotheses

The following hypotheses were being tested:

1. There will be inter-sport-discipline cognitive differences in female athletes.
2. Individual and team game athletes would differ from each other in their cognitive characteristics.
3. Sports-specific cognitive differences may emerge in the findings.

Sample

The subjects of the study were drawn from the female athletes attending national coaching camps for the preparation of international competitions being held at SAI, NS NIS Patiala. A total 192 national level female athletes belonging to sports disciplines of Athletics (T&F)(19), Badminton(20), Basketball(23), Cycling(22), Football(35), Gymnastics(19), Handball(22), and Hockey(32) were assessed for the collection of data. The subjects who actively engaged in competitive sports and falling between the age range of 20 to 30 only were included in the investigation.

Tools

The following tools were used to collect the information on different variables.

1. Electronic chronoscope – for measuring reaction ability in milliseconds.
2. Know-Cube Imitation test – for testing the concentrating ability.
3. Muller-Lyer Illusion test for the measurement of visual perception.

Lower the score in reaction ability and perceptual accuracy denotes better performance, whereas higher score in concentration reveals better performance.

Statistical Analysis

As per the requirement of the study ANOVA was applied to find out the inter-group differences among female athletes on different cognitive abilities. Posthoc T test was employed after finding the F ratios significant to ascertain the differences existing between various disciplines included in the study. Individual and team game female athletes were compared with the help of 'T' test. Means and SDs with the resultant F ratios of different sports groups are presented in Table 1.

Abbreviations Used in The Investigation

Variables		Sports groups	
Auditory reaction time	- ART	Athletics	- ATH
Visual reaction time	- VRT	Badminton	- BDN
Concentration	- CON	Cycling	- CYC
Visual perceptual Accuracy	- VPA	Gymnastics	- GYM
		Basketball	- BB
		Football	- FB
		Handball	- HB
		Hockey	- HKY

Table 1. Game Wise Means and SDs and the Resultant F Ratios based on Cognitive Scores.

S. no	SPORT	ART	VRT	CON	VPA
	GROUP	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
	Athletics	160.72 (27.61)	254.81 (58.96)	8.42 (1.61)	3.01 (1.71)
	Badminton	157.16 (23.63)	208.87 (37.46)	8.70 (1.56)	3.76 (0.85)
	Cycling	154.46 (19.63)	193.05 (25.71)	8.82 (1.26)	3.78 (1.07)
	Gymnastics	196.44 (43.71)	263.36 (55.41)	9.26 (1.91)	2.82 (1.07)
	Basketball	146.49 (14.74)	195.12 (35.86)	9.13 (1.46)	2.54 (1.65)
	Football	167.58 (29.71)	233.91 (31.55)	7.46 (1.78)	2.99 (1.12)
	Handball	146.33 (15.70)	213.61 (30.18)	9.27 (1.16)	3.59 (0.72)
	Hockey	152.71 (16.45)	196.07 (28.13)	8.50 (1.32)	3.46 (0.97)
	F Ratio	8.987*	3.969*	4.484*	3.828*

Notes: S.Ds are given in parentheses

*=Significant at .01 level.

Table 1 revealed significant differences among various sports groups on all the cognitive abilities like auditory reaction time, visual reaction time, concentration and visio-perceptual accuracy as their F ratios 8.987, 3.969, 4.484, and 3.828 respectively were found to be significant.

On finding F ratio significant in case of reaction ability, concentration and Visio – perceptual accuracy the post-hoc T test was applied to find out the differences among various sports groups included in investigation. The post-hoc results in the form of 't' matrices have been presented in the Tables 2 to 5. Further the comparison of individual and team game athletes is presented in Table 4.

Table 2. 'T' Matrix of Auditory Reaction Time.

Group	ATH	BDN	CYC	GYM	BB	FB	HB	HKY
ATH (19)	---	.433	.845	3.01**	2.13*	.83	.209*	1.30
BDN (20)		---	.405	3.50**	1.80	1.34	1.77	.80
CYC (22)			---	4.06**	1.54	1.83	1.52	.36
GYM (19)				---	5.15**	2.88**	5.02**	5.11**
BB (23)					---	3.15**	.35	1.44
FB (35)						---	3.09**	2.50*
HB (22)							---	1.43
HKY (32)								---

*=Significant at .05 level

**=Significant at .01 level

Table 2 depicts the inter-group differences on the variable of auditory reaction time, in which gymnastics group has been found to be possessing poor auditory reaction time and differed with all the sports groups. On the other hand Basketball and Handball groups showed better auditory reaction time and differed with athletics, gymnastics and Football groups respectively. Badminton and cycling groups differed only with gymnastics by possessing better auditory reaction time. Contrary to above findings Singh (1987) had found male athletes of these sports groups differing form each other but not females. Further studies in this respect can help to reach at the decisive conclusions.

Table 3. 'T' Matrix of Visual Reaction Time.

Group	ATH	BDN	CYC	GYM	BB	FB	HB	HKY
ATH (19)	---	2.92**	4.45**	.46	4.04**	1.70	2.87**	4.81**
BDN (20)		---	1.61	3.61**	1.23	2.65*	.45	1.40
CYC (22)			---	5.33**	2.2	5.10**	2.43*	.40
GYM (19)				---	4.82**	2.50*	3.64**	5.76**
BB (23)					---	4.34**	1.87	.11
FB (35)						---	2.40*	5.16**
HB (22)							---	2.19*
HKY (32)								---

*=Significant at .05 level

**=Significant at .01 level

'T' matrix presented in table III indicated the differences of the scores of visual reaction time prevailing among different sports disciplines. Like auditory reaction time gymnasts again proved to be poor on visual-reaction time and differed significantly with all the groups except athletics. Cyclists and hockey female players showed better visual-reaction time and differed with athletes, gymnasts, footballers and hand ballers respectively. Badminton and basketball female athletes differed from athletes, gymnasts and football female players by showing better visual-reaction time. Khan (1993) had also found gymnasts to be poor in visual-reaction time.

Table 4. 'T' Matrix of Concentration.

Group	ATH	BDN	CYC	GYM	BB	FB	HB	HKY
ATH (19)	---	0.99	.78	1.83	1.498	1.96	1.96	.193
BDN (20)		---	.28	1.26	.93	2.60*	1.35	.496
CYC (22)			---	1.14	.76	3.12**	1.23	.89
GYM (19)				---	.312	3.95**	.027	2.07*
BB (23)					---	3.75**	.356	1.67
FB (35)						---	4.24**	2.28*
HB (22)							---	2.21*
HKY (32)								---

*=Significant at .05 level

**=Significant at .01 level

Inter sports discipline differences on the variable of concentration presented in 't' matrix (Table 4) revealed that footballers possess poor level of concentration and differed significantly with almost all the groups. Handballers showed better concentration among all the groups by differing significantly with footballers and hockey female players. Similar findings were reported by Khan (1993) while comparing different sports disciplines on the variable of concentration.

Table 5. 'T' Matrix of Visio-Perceptual Accuracy.

Group	ATH	BDN	CYC	GYM	BB	FB	HB	HKY
ATH (19)	---	3.18**	2.20*	.495	1.04	.062	1.94	1.48
BDN (20)		---	0.1	3.01**	2.95**	2.63*	.66	1.099
CYC (22)			---	2.87**	2.98**	2.64*	.69	1.142
GYM (19)				---	.64	.54	2.75**	2.19*
BB (23)					---	1.24	2.75**	2.597*
FB (35)						---	2.24*	1.83
HB (22)							---	.54
HKY (32)								---

*=Significant at .05 level

**=Significant at .01 level

The inter-group differences shown in Table 5 ('T'matrix) revealed that basketball female players had better visio-perceptual accuracy and differed with badminton, cycling, handball and hockey female athletes. On the other hand, cycling group was found to be poor in visio-perceptual accuracy and differed with athletics, gymnastics, basketball and football groups.

Table 6. Comparison of Individual and Team-game Female Athletes.

Variable	Individual		Team		't'
	Mean	S.D.	Mean	S.D.	Value
ART	166.60	33.43	154.02	24.95	2.985**
VRT	228.39	53.62	211.15	32.24	2.687**
CON	8.8	1.41	8.44	1.65	1.454
VPA	3.36	1.11	3.15	1.20	1.134

**=Significant at .01 level

The comparison of individual and team game female athletes presented in Table 6 revealed that individual and team game athletes significantly differed in auditory and visual-reaction time only. In reaction ability team game female athletes were found to be processing better reaction time as compared to their individual event counterparts. Singh (1987) had reported similar findings while comparing individual and team games male athletes. No differences were found on the variables of concentration and visual perceptual accuracy.

Conclusions

The following conclusions were drawn from this study:

1. National level female athletes belonging to various sport groups assessed in the present investigation differed from each other on cognitive variables.
2. Gymnastics group showed poor auditory reaction time when compared to other sport groups.
3. Athletes have poor visual reaction time when compared to the ball game players.
4. Gymnasts have also exhibited poor visual reaction ability in comparison to the ball game players.
5. Athletes and gymnasts have similar visual reaction time.
6. Football players showed poor concentration when compared to all other groups, except athletics.
7. Basketball female players were found to be having better Visio-perceptual accuracy in comparison to badminton, cycling, handball and hockey female players.
8. Individual and team game female athletes differed from each other only in reaction ability. Individual game athletes have poorer Auditory and visual reaction time.

References

Bhanot, J.L., & Sidhu, L.S. (1980). A comparative study of reaction time in Indian sportsmen specializing in hockey, volleyball, weightlifting and gymnastics. *Journal of Sports Medicine, 20,* 113-118.

Fujitha, A. (1993). Mental preparation during training: A descriptive appraisal. *International Journal of Sports Psychology, 14*(3), 198-202.

Khan, H.A. (1984) Utility of psychological assessment in selection of top-level sportsmen and women. *SNIPES 7* (3) 21-25.

Khan, H.A., Singh, B. Gupta, R.K., & Khan, M. (1986) *Basic cognitive characteristics of top level Indian Ball game players*. Abstracts, first National conference of Sports Psychology Gwalior.

Khan, H.A., Singh, B.Kahn,M., & Sher,V. (1988). *A comparative study of cognitive abilities of Volleyball players*. Abstracts third National conference of sports psychology, Gwalior.

Khan, M. (1993). A comparative study of cognitive abilities of high and low level Indian Athletes. *Unpublished Ph.D. thesis*. Punjabi University Patiala.

Schubert, F. (1981). The role of ability of anticipation in athlete's action control. *International Journal of Sports Psychology, 12*(2), 117-130.

Sharma, V., Khan H.A, & Butchiramariah, C. (1986). A comparative study of reaction time and concentration among recreational and competitive volley ball players. *SNIPES*, 9(4) 40-46.

Sherrington, C. (1940). *Man on his nature*. Cambridge University Press.

Silva, J.(1981). Behavioral and situational factors affecting concentration and skill performance. *Journal of Sports Psychology, 1*(3)221-227.

Singer, R.N. (1975). *Motor learning and human performance*. New York: Mac Millan, Publishing.

Singh, A. (1987). Disjunctive reaction time of top level Indian sports men in relation to their extraversion, neuroticism and competitive anxiety. *Unpublished Ph.D. thesis*. Punjabi University Patiala.

Singh, B. (2005). Exploration selected cognitive characteristics of National Handball players. *Journal of sports and sports sciences 28*(4).

Singh, P. (1993) A correlation study of psychomotor profiles and sports performance of athletes. *Unpublished Ph.D. thesis*. Punjabi University Patiala.

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