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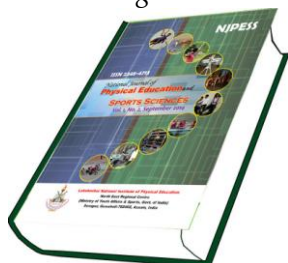### (NJPESS-2017)

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Editorial

Epicenter Voyage of a Myth Institute-Lakshmibai National Institute of Physical Education North East Regional Center

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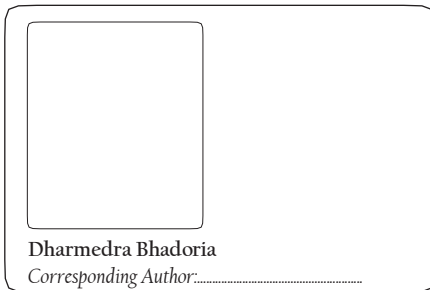
N J P E S S

Contents

Comparative Effect of Kapalbhati, Bhastrika and Agnisar on Negative Breath Holding Capacity of over Fat Male Subjects of Gwalior District

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Abstract
To compare the effect of Kapalbhati, Bhastrika and Agnisar on Negative Breath Holding Capacity of over Fat male subjects of Gwalior. Methods: Eighty over fat male was randomly selected randomly as subjects and training programme was administered for 12 weeks. Results: Significant difference was found between control group and Kapalbhati, Bhastrika and Agnisar. Conclusion: Kapalbhati, Bhastrika and Agnisar are equally effective to improve Negative Breath Holding Capacity.
Keywords: *Breath holding capacity, Kapalbhati, Bhastrika*

INTRODUCTION

Pranayama is more important because it produces deeper effects as far as the physique is concerned. The effects of asanas are superficial in nature whereas the Pranayama is deeper as far as the outcomes are concerned. In simple words it could be said that asanas are more linked with muscular system, whereas the Pranayama is concerned with nervous system of the body. Svatmarma Suri (1983) mentioned in his famous Hatha-Pradipika, eight varieties of Pranayama. The established varieties of Pranayama are Ujjayi, Bhastrika, Sooryabhedan, Shitali, Sitakari, Bharamari, Moorchha, Plavini. By the practice of Pranayama, the purification of the Nadis, the brightening of the gastric fire, hearing distinctly of spiritual sounds and good health result. When the nervous centers have become purified through the regular practice of Pranayama, the air easily forces its way up through the mouth of the Sushumna, which is in the middle. By the contraction of the muscles of the neck and by the contraction of the one below, viz., Apana, the Prana goes into the Sushumna, which is in the middle, from the west Nadi. Sushumna Nadi is between Ida and Pingala. The Prana which alternates ordinarily between Ida and Pingala, is restrained by long Kumbhaka; then along with the soul, its attendant, it will enter the Sushumna, the central Nadi, at one of three places where it yields space for entrance through such restraint of breath, and in the navel, by the Sarasvati Nadi, on the west. After such entry it is that the Yogi becomes dead to the world, being in that state called Samadhi. Drawing up the Apana and forcing down the Prana from the throat, the Yogi free from old age, becomes a youth of sixteen. Through the practice of Pranayama chronic diseases, those defy Allopathic, Homeopathic, Ayurvedic and Unani doctors will be rooted out. When the Nadis have become purified, certain external signs appear on the body of the Yogi. They are lightness of the body, brilliancy in complexion, increase of the gastric fire, leanness of the body, and along with these, the absence of restlessness in the body. They are all signs of purification.

METHODS

Eighty over fat male was randomly selected randomly as subjects. The age group of the subjects range between 35-50 years. Pretest-post test Randomized-Group Design (Thomas and Nelson, 2001) was used for the present study. Breath holding was measured by manual method and the score was recorded in second.

Table 1: Classification of Subjects

Gender	Group	Training
	Experimental Group-I	Kapalbhati
Male	Experimental Group-II	Bhastrika Pranayama
	Experimental Group-III	Agnisar
	Control Group-I	No Training

Table 2: Experimental Design

		Pre Test		Post Test
	R	O1	T1 (Kapalbhati)	O2
Male	R	O3	T2 (Bhastrika)	O4
	R	O5	T3 (Agnisar)	O6
	R	O7	Control Group	O8

PROCEDURE

To measure the Negative Breath Holding Capacity, the subjects were instructed to place the nose clip tightly. They were asked to exhale through the mouth to the maximum capacity. As soon as the subjects exhaled and closed the lips, the stopwatch was started. As soon as the subjects opened their lips to inhale, the stopwatch was stopped. Score: The time given by the stopwatch was recorded as the score for the Negative Breath Holding Capacity. Statistical Analysis: To compare the effect of Kapalbhati, Bhastrika and Agnisar on Negative Breath Holding Capacity, Mean, Standard Deviation and Analysis of Co-variance was used at .05 level of significance.

Results

The result of the study was presented in below tables.

Table 3: Analysis of Co-variance of the Means of Three Experimental Groups and one Control Group in Positive Breath Holding Capacity

Tests	Mean				SOV	SOS	df	MSS	F-ratio	η^2
	Kabalbhati	Bhastrika	Agnisar	Control						
Pre	28.80 (4.85)	29.15 (5.34)	27.10 (4.00)	27.90 (4.39)	A	51.14	3	17.05	0.78 (0.51)	2.99
					W	1659.35	76	21.83		
					Total	1710.49	79			
Post	76.20 (2.69)	75.55 (2.35)	75.65 (2.50)	31.10 (5.68)	A	29976.25	3	9992.08	779.27 (0.00)	96.85
					W	974.50	76	12.82		
					Total	30950.75	79			
Adju. Post test	76.27	75.66	75.52	31.06	A	29992.43	3	9997.48	788.15 (0.00)	8.22
					W	951.36	75	12.68		
					Total	365062.00	80			

SOV–Source of variance, SoS–sum of square, df–degree of freedom, MSS–mean sum of square, η^2- effect size *Significant at 0.05 level of significance, A = Among Means variance, W = Within Group variance, F = Ratio needed for significance at 0.05 level of significance = df (3,76) =2.72, df (3, 75) = 2.72

In pre test a statistically insignificant difference was found among the four type of training on the Negative Breath Holding Capacity pre test F (3, 76) = 0.78, *p* = 0.51 with an effect size of 2.99. Table shows that the mean score in Negative Breath Holding Capacity was 28.80 for Kabalbhati Group, 29.15 for Bhastrika Group, 27.10 for Agnisar Group and 27.90 in control groups. This shows that at initial level the groups were similar in nature. Likewise, in post test there were significant mean differences on the mean score of Negative Breath Holding Capacity between the groups, F (3, 76) =779.27, p = 0.00 with an effect size of 96.85%. Further, there was a significant difference of type of training on the adjusted mean score of Negative Breath Holding

Capacity of the subjects after controlling the effect of pretest score, F (3,75) =788.15, p = 0.00 with an effect size of 8.22%.

Table 4: Pair wise Comparison of the Means of Three Experimental Groups and One Control Group in Positive Breath Holding Capacity

(I) Groups	(J) Groups	Mean Difference (I-J)	Sig.b
Kapalbhati Group	Bhastrika Group	.609	.591
	Agnisar Group	.751	.511
	Control Group	45.206*	.000
Bhastrika Group	Agnisar Group	.142	.901
	Control Group	44.598*	.000
Agnisar Group	Control Group	44.456*	.000

*Significant at 0.05 level of significance.

The above table shows that there was a significant difference in the mean score of Kapalbhati and control group, Bhastrika and control group & Agnisar and Control Group. Kapalbhati, bhasrika and Agnisar were equally effective for Negative Breath Holding Capacity.

DISCUSSION OF FINDINGS

The present study reveals that the Kapalbhati, Bhastrika and Agnisar were equally effective to improve the negative Breath Holding Capacity of the obese Male of Gwalior District. As defined by Moses breath holding time is the duration of time through which one can hold his breath without inhaling or exhaling. Breath holding could be positive or negative. It is referred to be positive when breath held after forcefully inhaling the air, similarly it is termed negative when the breath is held after exhaling the air forcefully. Schell, Allolio, & Schonecke, (1994) revealed that significant differences could also be observed concerning coping with stress and the mood at the end of the experiment. Birkel and Edgren (2000) onducted a study on the topic "Hatha yoga: improved vital capacity of college students" and their findings are consistent with other research studies reporting the positive effect of yoga on the vital capacity of the lungs. Raju, Madhavi, Prasad, Reddy, Reddy, Sahay, and Murthy (1994) sowed that subjects who practised pranayama could achieve higher work rates with reduced oxygen consumption per unit work and without increase in blood lactate levels. The blood lactate levels were significantly low at rest. Madanmohan, Thombre, Balakumar, Nambinarayanan, Thakur, Krishnamurthy and Chandrabose (1992) conducted a study on the topic "Effect of yoga training on reaction time, respiratory endurance and muscle strength" and results show that yoga practice for 12 weeks results in significant reduction in visual and auditory RTs and significant increase in respiratory pressures, breath holding times and HGS. Hagins, Moore, and Rundle (2007) showed that Yoga practice incorporating sun salutation postures exceeding the minimum bout of 10 minutes may contribute some portion of sufficiently intense physical activity to improve cardio-respiratory fitness in unfit or sedentary individuals. The measurement of energy expenditure across yoga sessions is highly reliable. Pramanik, Sharma, Mishra, Prajapati, and Singh (2009) conducted a study on the topic

"Immediate effect of slow pace bhastrika pranayama on blood pressure and heart rate" to evaluate the immediate effect of slow pace bhastrika pranayama (respiratory rate 6/min) for 5 minutes on heart rate and blood pressure and the effect of the same breathing exercise for the same duration of time (5 minutes) following oral intake of hyoscine-N-butyl bromide (Buscopan), a parasympathetic blocker drug Pranayama increases frequency and duration of inhibitory neural impulses by activating pulmonary stretch receptors during above tidal volume inhalation as in Hering Bruer reflex, which bring about withdrawal of sympathetic tone in the skeletal muscle blood vessels, leading to widespread vasodilatation, thus causing decrease in peripheral resistance and thus decreasing the diastolic blood pressure. Thus, the above findings shows that there is huge benefit of yoga and pranayama to overcome different diseases and disorders. In conclusion if Kapalbhati, bhastrika and Agnisar are equally effective to improve breathing holding capacity.

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Relationship of Selected Biomechanical Variables with the Performance of National Level Athletes in Crouch Start

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Abstract

The purpose of this study was to measure the relationship of selected biomechanical variables to the performance of National level Athletes in crouch start. The subjects for this study were 60 male athletes who had represented their respective states in national tournaments (12 subjects from each team). Their age ranged from nineteen to twenty five years. All the subjects were right handed throwers. The data was analyzed by use of Pearson's Product Moment Correlation. The level of significance chosen to test the hypothesis was .05. None of the selected angular biomechanical (kinematic) variables that is Ankle Joint (Right and Left), Knee Joint (Right and Left), Shoulder Joint (Right and Left), Elbow Joint (Right and Left) and Wrist (Right and Left), and Hip Joint (Left and Right) has significant relationship with the performance of Athletes in crouch start. In case of Linear A biomechanical (kinematic) variable that is height of center of gravity at moment contact does not have significant relationship with the performance of Athletes in crouch start.

Keywords: *Biomechanical, Kinematics, Crouch start.*

INTRODUCTION

Sprinting is running over a short distance in a limited period of time. It is used in many sports that incorporate running, typically as a way of quickly reaching a target or goal, or avoiding or catching an opponent. Human physiology dictates that a runner's near-top speed cannot be maintained for more than 30-35 seconds due to the depletion of phosphocreatine stores in muscles, and perhaps secondarily to excessive metabolic acidosis as a result of anaerobic glycolysis.

In athletics and track and field, sprints (or dashes) are races over short distances. They are among the oldest running competitions. The first 13 editions of the Ancient Olympic Games featured only one event—the stadium race, which was a race from one end of the stadium to the other. There are three sprinting events which are currently held at the Summer Olympics and outdoor World Championships: the 100 metres, 200 metres, and 400 metres. These events have their roots in races of imperial measurements which were later altered to metric: the 100 m evolved from the 100-yard dash, the 200 m distance came from the furlong (or 1⁄8 mile), [4] and the 400 m was the successor to the 440-yard dash or quarter-mile race.

At the professional level, sprinters begin the race by assuming a crouching position in the starting blocks before leaning forward and gradually moving into an upright position as the race progresses and momentum is gained. The set position differs depending on the start. Body alignment is of key importance in producing the optimal amount of force. Ideally the athlete should begin in a 4-point stance and push off using both legs for maximum force production. Athletes remain in the same lane on the running track throughout all sprinting events, with the sole exception of the 400 m indoors. Races up to 100 m are largely focused upon acceleration to an athlete's maximum speed. All sprints beyond this distance increasingly incorporate an element of endurance.

The role that sports biomechanics can play is becoming more widely understood in sports community and the demand for service increasing, researchers in sports biomechanics will have to consider carefully how much time they can devote to the provision of scientific services without impairing their performance as scholar researchers. To develop programmers of study for the training of techniques in sports biomechanics, technicians who can provide the kind of services sought by sporting bodies.

In order to analyze the techniques o sports and games, photographic methods is probably the most popular methods. Although this is not a recent development, photography was formally limited to the filming of few sports only. It is now being applied to many sports at an increasing rate.

Recently videotapes have begun to replace conventional motion pictures for teaching and coaching purpose. Since videotape is erasable reusable and does not require any developing. It is more economical than film. The relatively inexpensive recorders are simple to operate and permit immediate play back. Starting blocks are used for all competition sprint (up to and including 400 m) and relay events (first leg only, up to 4 × 400 m). The starting blocks consist of two adjustable footplates attached to a rigid frame. Races commence with the firing of the starter's gun. The starting commands are "On your marks" and "Set". Once all athletes are in the set position, the starter's gun is fired, officially starting the race. For the 100 m, all competitors are lined up side–by–side. For the 200 m, 300 m and 400 m, which involve curves, runners are staggered for the start.

In the rare event that there are technical issues with a start, a green card is shown to all the athletes. The green card carries no penalty. If an athlete is unhappy with track conditions after the "on your marks" command is given, the athlete must raise a hand before the "set" command and provide the Start referee with a reason. It is then up to the Start referee to decide if the reason is valid. In the event that the Start referee deems the reason invalid, a yellow card (warning) is issued to that particular athlete. In the event that the athlete is already on a warning the athlete is disqualified.

Biomechanics and Athletes in crouch start practices described by some of the authors are as follows: -

BIOMECHANICS

A branch of physics concerns with the description of the motion of objects without considering the forces that causes or result from the motions. It is a study of motion that aims to provide a description of the spatial position of points in moving bodies. For the purpose of this study Biomechanical variables were represented by the selected angles of the various joints of human body and height of center of gravity at moment contact.

KINEMATICS

Kinematics will be represented by the selected angles of the various joints of human body and height of center of gravity at selected moment.

CROUCH START

Crouch start (肩肩) is one of the traditional forty throws of Judo as developed by Kano Jigoro. Crouch start belongs to the third group of the traditional throwing list in the Gokyo no waza of the Kodokan Judo. It is also part of the current 67 Throws of Kodokan Judo. Because the technique is not a sweep nor a trip and requires tori to pull uke into a carry, it is categorized as a hand throwing technique (tewaza).

METHODOLOGY

The subjects for this study were 48 male Athletes who had represented there respective states in National Judo tournaments. Four teams were selected for this study namely: Uttar Pradesh, Uttarakhand, Delhi and Haryana (12 subjects from each team).There age ranged from Nineteen to Twenty Five years.

All the subjects were right handed Throwers.ollowing were the Kinematic variables which were constituted in the study: The selected kinematical variables were divided in two parts *i.e.*

1. Linear Kinematic Variable were:

    (a) Height of Center of Gravity at moment release.

2. Angular Kinematic Variables were represented by the angles at selected joints i.e.

    (a) Ankle joints

    (b) Knee joints

    (c) Hip joints

    (d) Shoulder joints

    (e) Elbow joints

    (f) Wrist joints

The scholar developed stick figures on the photographs, from which selected kinematical variables were calculated. The stick figures were developed by using Joint-point method. The center of gravity of each subject, at one selected moment.

Procedure for Location of Center of Gravity

The center of gravity of the body at moment release was determined by use of segmentation method.

ANALYSIS OF DATA AND RESULTS OF THE STUDY

The data was analyzed by use of Pearson's Product Moment Correlation. The level of significance chosen to test the hypothesis was .05 and are presented in Table-1, Table-2, Table-3, Table-1, Table-4.

Table 1: Relationship of Selected Angular Kinematical Variables at Moment Contact with the Performance of Uttar Pradesh Athletes in Crouch Start (N = 12)

S. No.	Variables	Coefficient of Correlation "r"
1.	Ankle Joint (Left)	0.189
2.	Ankle Joint (Right)	0.144
3.	Knee Joint (Left)	0.175
4.	Knee Joint (Right)	−0.123
5.	Hip Joint (Left)	0.118
6.	Hip Joint (Right)	0.305
7.	Shoulder Joint (Left)	0.420
8.	Shoulder Joint (Right)	−0.162
9.	Elbow Joint (Left)	0.137
10.	Elbow Joint (Right)	−0.036
11.	Wrist Joint (Left)	0.00
12.	Wrist Joint (Right)	−0.007

*Significant at 0.05 Level
r .05 (10) = 0.576

Table 2: Relationship of Selected Angular Kinematical Variables at Moment Contact with the Performance of Delhi Athletes in Crouch Start (N = 12)

S. No.	Variables	Coefficient of Correlation "r"
1.	Ankle Joint (Left)	−0.151
2.	Ankle Joint (Right)	−0.127
3.	Knee Joint (Left)	0.070
4.	Knee Joint (Right)	−0.069
5.	Hip Joint (Left)	0.195
6.	Hip Joint (Right)	0.287
7.	Shoulder Joint (Left)	−0.206
8.	Shoulder Joint (Right)	−0.126
9.	Elbow Joint (Left)	−0.100
10.	Elbow Joint (Right)	−0.053
11.	Wrist Joint (Left)	——
12.	Wrist Joint (Right)	−0.407

*Significant at 0.05 Level
r .05 (10) = 0.576

Table 3: Relationship of Selected Angular Kinematical Variables at Moment Contact with the Performance of Uttarakhand Athletes in Crouch Start (N = 12)

S. No.	Variables	Coefficient of Correlation "r"
1.	Ankle Joint (Left)	−0.208
2.	Ankle Joint (Right)	−0.274
3.	Knee Joint (Left)	−0.384
4.	Knee Joint (Right)	−0.267
5.	Hip Joint (Left)	−0.323
6.	Hip Joint (Right)	−0.402
7.	Shoulder Joint (Left)	0.553
8.	Shoulder Joint (Right)	−0.318
9.	Elbow Joint (Left)	−0.437

S. No.	Variables	Coefficient of Correlation "r"
10.	Elbow Joint (Right)	−0.551
11.	Wrist Joint (Left)	——
12.	Wrist Joint (Right)	0.033

*Significant at 0.05 Level
r .05 (10) = 0.576

Table 4: Relationship of Selected Angular Kinematical Variables at Moment Release with the Performance of Haryana Athletes Team in Crouch Start (N = 12)

S. No.	Variables	Coefficient of Correlation "r"
1.	Ankle Joint (Left)	−0.542
2.	Ankle Joint (Right)	0.384
3.	Knee Joint (Left)	0.046
4.	Knee Joint (Right)	−0.284
5.	Hip Joint (Left)	0.113
6.	Hip Joint (Right)	−0.034
7.	Shoulder Joint (Left)	−0.847*
8.	Shoulder Joint (Right)	0.605*
9.	Elbow Joint (Left)	0.065
10.	Elbow Joint (Right)	0.555
11.	Wrist Joint (Left)	——
12.	Wrist Joint (Right)	0.056

*Significant at 0.05 Level
r .05 (10) = 0.576

As shown in Table– 1, 2, 3, that the values of coefficient of correlation in case of all the selected Kinematic variables with the (Uttar Pradesh Under, Delhi, Uttaranchal) Athletes were found insignificant at the selected level of significance of 0.05. Since the required value of coefficient of correlation for 10 degree of freedom is 0.576 and the obtained values of coefficient of correlation of selected variables less than the required value. The correlation could not be calculated with the left wrist joint because the variable was constant in case of every subject. The correlations might have been insignificant because of the independent calculation but they must have a cumulative effect on the performance.

As shown in Table–4 that the values of Coefficient of Correlation in case of all the selected Kinematic variables with the Haryana Athletes were found insignificant at the selected level of significance of 0.05. Since the required value of Coefficient of Correlation for 10 degree of freedom is 0.576 and the obtained values of coefficient of correlation of selected variables less than the required value, except in case of the both the shoulder joints of the subjects which showed significant relationship. As the judoka uses both his hands while executing the Crouch start and full extension of hands is required and the right hand is the bottom hand so as the angle would increase the shot would be better and vice versa the left shoulder joint angle is bound to decrease, so combination of both would produce a good Crouch start.

he correlation could not be calculated with the Left Wrist Joint because the variable was constant in case of every subject. The correlations might have been insignificant because of the independent calculation but they must have a cumulative effect on the performance.

The relationship of selected Linear Kinematic variables at the moment contact with the performance in Crouch start as presented in table–1.5, 1.6, 1.7, and 1.8.

Table 5: Relationship of Selected Linear Kinematic Variables at Moment Contact with the Performance of Uttar Pradesh Athletesin Crouch Start

S. No.	Variables	Coefficient of Correlation "r"
1.	Height of Centre of Gravity (Moment contact)	−0.172

*Significant at 0.05 Level
r .05 (10) = 0.576

Table 6: Relationship of Selected Linear Kinematic Variables at Moment Contact with the Performance of Delhi Athletesin Crouch Start

S. No.	Variables	Coefficient of Correlation "r"
1.	Height of Centre of Gravity (Moment contact)	0.304

*Significant at 0.05 Level
r .05 (10) = 0.576

Table 7: Relationship of Selected Linear Kinematic Variables at Moment Contact with the Performance of Uttaranchal Athletesin Crouch Start

S. No.	Variables	Coefficient of Correlation "r"
1.	Height of Centre of Gravity (Moment contact)	−0.161

*Significant at 0.05 Level
r .05 (10) = 0.576

Table 8: Relationship of Selected Linear Kinematical Variables at Moment Contact with the Performance of Haryana Athletes in Crouch Start

S. No.	Variables	Coefficient of Correlation "r"
1.	Height of Centre of Gravity (Moment contact)	0.019

*Significant at 0.05 Level
r .05 (10) = 0.576

As shown in Table–5, 7, 6, 8, that the values of coefficient of correlation in case of the selected Linear Kinematic variable (Height of Center of Gravity) with the (Uttar Pradesh, Delhi, Uttaranchal, Haryana) Under–19 Cricket teams was found insignificant at the selected level of significance of 0.05. Since the required value of coefficient of correlation for 10 degree

of freedom is 0.576 and the obtained values of coefficient of correlation of selected variables less than the required value. This trend does not mean that Height of Center of Gravity does not play any important role in executing the Crouch start but the low value of correlation must have been because of the small sample size and the low value of the Height of Center of Gravity at moment contact.

Table 9: Analysis of Variance of the Mean Difference of the Four Groups for Height of Centre of Gravity at Moment Contact

Source of Variance	df	Sum of Square	Mean Sum of Square	'F' Ratio
Between Groups	3	3731	1243.06	9.48*
Within Groups	44	6295.92	131.66	

*Significant at .05 level.
F.05 (3, 44) = 2.82

It is evident from Table 9 that variability exists among the four groups with respect to criterion variable namely Height of Centre of Gravity at moment contact. As each player has his own reach as per the flexibility of the groin muscle and leg length so the difference in the Centre of Gravity at moment contact must have been there.

Since there is significant difference in the result of 'One Way Analysis of Variance' therefore Post Hoc (LSD) test was applied to find out which of the mean difference amongst the group were statistically significant. The data relating to this is presented in Table –1.10.

Table 10: Least Significant Difference Post Hoc Test for Mean of the Four Groups for Height of Centre of Gravity at Moment Contact

Uttar Pradesh	Delhi	Uttaranchal	Haryana	M. D.	C. D.
	188.72		185.20	−3.52*	
		183.15	185.20	−2.05*	
166			185.20	−19.2*	0.2282
	188.72	183.15		−5.57*	
166		183.15		−17.15*	

*Significant at .05 level.

The above table 10 shows that there was significant difference between the means of Delhi and Haryana Under–19 teams in which as per the terms of means Delhi Athletes was found to be superior.

Significant difference was also found between the means of Uttaranchal and Haryana Athletes in which as per the terms of means Haryana Athletes was found to be superior. Significant difference was also found between the means of Uttar Pradesh and Haryana Athletes in which as per the terms of means Haryana Athletes was found to be superior. Table – 4.26 also reveals that difference was found between the means of Delhi and Uttaranchal Athletes as per the means

the Delhi Athletes was found to be superior. Significant difference was also found between the means of Uttar Pradesh and Uttaranchal Athletes in which as per the terms of means Uttaranchal Athletes was found to be superior. Difference between the means of four groups is shown in Fig. 1.
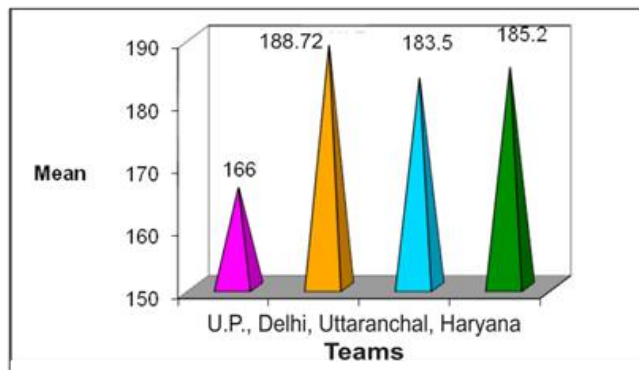

Fig. 1: Bar Diagram Representing Means for Four Athletes for Height of Centre of Gravity at Moment Contact

DISCUSSION OF FINDINGS

None of the selected Angular Kinematic variables that are Ankle Joint (Right and Left), Knee Joint (Right and Left), Shoulder Joint (Right and Left), Elbow Joint (Right and Left) and Wrist (Right and Left), and Hip Joint (Left and Right) showed relationship with the performance of Uttar Pradesh, Delhi, Uttaranchal, Haryana Athletes in Crouch start. This trend does not mean that these variables do not have any effect on the performance of the players but these variables' relationship was calculated independently but the variables must have a cumulative effect on the performance.

In case of Linear Kinematic variable Height of Center of Gravity at moment contact none of the teams showed relationship with the performance of the subjects in Crouch start. As the study was about the moment contact of the Crouch start and the higher the subject is elevated from the ground which is Height of Centre of Gravity the better would be his performance. So it can be concluded that better performance is achieved by higher elevation.

No variation was found between the groups in case of all the Athletes in terms of their performance in Crouch start but the mean of the performance of Haryana was a little high than the other teams. As the performance of the Athletes is more or less the same but in this age of cut throat competition even a little difference can win or lose matches but the skill tested was under controlled conditions and was also one in number so if a detailed study on each and every skill (Hook Shot, Pool Shot, Drive Shot etc.) may be done difference can found.

No variation was found between the Athletes in terms of their Angular Kinematic Variables Ankle Joint (Right and Left), Knee Joint (Right and Left), Shoulder Joint (Right and Left), Elbow Joint (Right and Left) and Wrist (Left), and Hip Joint (Left and Right) apart from right wrist joint and Height of Centre of Gravity at moment contact which was the highest in case of Uttar Pradesh Under–19 state team. No significant difference was found between the means of Uttar Pradesh and Haryana, Delhi and Haryana, Uttaranchal and Haryana but the means of the Uttar Pradesh and Delhi, Delhi and Uttaranchal were found to be statistically significant as per the LSD test implemented which showed the mean difference 13.91 in case of Uttar Pradesh and Haryana, 8.08 in case of Delhi and Haryana and 8.41 in case of the means of Uttar Pradesh and Haryana, Delhi and Haryana, Uttaranchal which was higher than the tabulated value of 3.59. The analysis of data clearly reveals that the Uttar Pradesh and the Uttaranchal Under–19 State team are better in terms of right Wrist Angle. In case of Height of The Center of Gravity the following state teams differed Uttar Pradesh and the Delhi State team as the mean difference was 22.49, Uttar Pradesh and Uttaranchal Under–19 State team which was 15.34, Uttar Pradesh and Haryana was 16.62 which was higher than the tabulated value of 3.59 hence it could be said that Delhi and Uttaranchal Under–19 State team was better in terms of Height of Center of Gravity at moment contact.

CONCLUSION

None of the selected Angular Kinematic variables that are Ankle Joint (Right and Left), Knee Joint (Right and Left), Shoulder Joint (Right and Left), Elbow Joint (Right and Left) and Wrist (Right and Left), and Hip Joint (Left and Right) showed relationship with the performance of Uttar Pradesh, Delhi, Uttaranchal, Haryana Athletes in Crouch start.

In case of Linear Kinematic Variable Height of Center of Gravity at moment contact none of the teams showed relationship with the performance of the subjects in Crouch start.

No variation was found between the groups in case of all the National Teams in terms of their performance in Crouch start but the mean of the performance of Haryana was a little high than the other Athletes.

No variation was found between the Athletes in terms of their Angular Kinematic variables Ankle Joint (Right and Left), Knee Joint (Right and Left), Shoulder Joint (Right and Left), Elbow Joint (Right and Left) and Wrist (Left), and Hip Joint (Left and Right) apart from right wrist joint and Height of Centre of Gravity at moment contact which was

the highest in case of Uttar Pradesh Under–19 state team. No significant difference was found between the means of Uttar Pradesh and Haryana, Delhi and Haryana, Uttaranchal and Haryana but the means of the Uttar Pradesh and Delhi, Delhi and Uttaranchal were found to be statistically significant as per the LSD test implemented which showed the mean difference 13.91 in case of Uttar Pradesh and Haryana,8.08 in case of Delhi and Haryana and 8.41 in case of the means of Uttar Pradesh and Haryana, Delhi and Haryana, Uttaranchal which was higher than the tabulated value of 3.59.The analysis of data clearly reveals that the Uttar Pradesh and the Uttaranchal Under–19 State team are better in terms of Right Wrist angle. In case of Height of the Center of Gravity the following state teams differed Uttar Pradesh and the Delhi Under–19 State team as the mean difference was 22.49, Uttar Pradesh and Uttaranchal State team which was 15.34, Uttar Pradesh and Haryana was 16.62 which was higher than the tabulated value of 3.59 hence it could be said that Delhi and Uttaranchal Under–19 State team was better in terms of Height of Center of Gravity at moment contact.

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Mechanical Analysis of Side Kicking Technique of National Level Wushu Players

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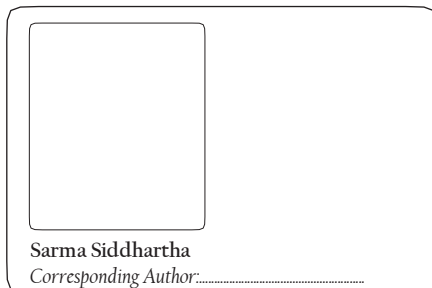
Abstract
The purpose of this study was to analyse the side kicking technique of National level Wushu players. For the study Three (N=03) National level Wushu players were selected. Their age ranges from 18-25 years. All the selected kinematic parameters were recorded using 'Go Pro Hero 5 Black' motion capturing camera and data was analyzed by using silicon coach pro software. It was observed that the knee height gradually increases with the increase of kick height, head position remains unchanged in all types of side kick, the vertical velocity of leg increases with the increase height of impact.
Keywords: *Wushu, Mechanical Analysis, Side Kick.*

INTRODUCTION

Wushu is one of the most important martial art among different types of self defence activities. There are many such forms of martial arts which turn in to systematic combative sport. These include Judo, Taekwondo, Karate, Kick boxing, Mix Martial Arts etc. All of them have their own history and background but the motive behind their existence was almost similar. In Wushu there are different types of techniques like kicking, punching, holding, throwing etc are used by players. A kick is a physical strike using the foot, leg, or knee. The side kick refers to a kick that is delivered sideways in relation to the body of the person kicking. It is one of the most adaptable kicks, useful as both an offensive move and as a defensive counter to a blitzing opponent. There are two areas that are commonly used as impact points in sidekicks: the heel of the foot or the outer edge of the foot. The heel is more suited to hard targets such as the ribs, stomach, jaw, temple and chest. However, when executing a side kick with the heel the toes should be pulled back so that they only make contact with the heel and not with the whole foot. If a person hits with the arch or the ball of the foot, the impact can injure the foot or break an ankle. A standard sidekick is performed by first chambering the kicking leg diagonally across the body, then extending the leg in a linear fashion toward the target, while flexing the abdominals. The "side kick" is one of the most important kicking techniques in Chinese martial arts (Liu, 1983). It is a flexible, powerful, very high speed, long-distance technique. It can be used for both defence and attack, and it is a primary means for gaining points in a Wushu Sanda competition.

MATERIAL AND METHODS

Subjects

For the purpose of the study Three (N=3) National players who represents Assam in National Competitions was selected as a subject. Their age ranges from 18-25 years.

Experimental Protocol

The experimental data was collected through 'Go Pro Hero 5 Black' motion capturing camera. The recorded data was analyzed by using silicon coach pro software. The wushu player was filmed only from one angles i,e sagittal plane. The camera was placed at a distance of 2.8 meters and the height of the camera (lenses) was fixed at a height of 1.15 meters from the ground level. Camera speed was set in 60 fps with 2.7K of resolution. The Side Kick was divided in three types, Low Kick (Kick below the Hip), Medium Kick (Kick below the shoulder level) and High Kick (Kick on face, jaw, head etc.).

Biomechanical Parameters

1. Max. Knee Height at Innominate phase
2. Height of the Head at contact phase
3. Height of the Kicking Leg at contact phase
4. Horizontal and Vertical velocity at contact

Data Extraction and Analysis

Data regarding the execution phase through in side kick of Wushu were extracted. Brief review methods were used to synthesize the data and descriptive analysis of the data was conducted.

Statistical Analysis of the Data

Descriptive statistic of mean was employed. The data was analysed with the help of MS Excel 2007.

Result and Discussion

After recording the movement the data were analysed by using the Silicon Coach Pro video analysis software. The Personal details of the subjects were recorded. The Height and weight of the subjects were recorded in the table 1.

Table 1: Personal Details of the Subject

Subject	Height (cm)	Weight (kg)
Subject 1	177	80.02
Subject 2	167	62.9
Subject 3	170	61.4
Mean	171.33	68.10
SD	±5.13	±10.34

The above table shows that the mean height was 171.33 ± 5.13 cm and the weight was 68.10 ± 10.34 kg for the subjects. Their age ranges from 18-25 years.

To achieve a certain knee height before kicking is necessary and the body also leans in the opposite direction of the kick. So the maximum knee height during innominate phase was recorded. The height of the head from ground during impact was noted down during different types of kick.

Table 2: Mean Value of Max. Height of the Knee, Head, Leg in Deferent Types of Side Kick

Type	Max. Knee Height (cm)	Height of the Head at contact (cm)	Height of the Kicking Leg at contact (cm)
Low	73.36	119.7	84.1
Medium	86.83	118.66	127.36
High	95.23	119.66	149.26

The table shows the performance of the mean value of deferent types of side kick. It seems that the mean value of maximum knee height was 73.36 cm during Low kick and increased to 95.23 cm at high kick. This indicates that the knee height increases with the increase of kicking height. The height of the head during impact of kick remains similar in all type of kicking.

The phenomenon has been shown in Fig. 1 where these changes can be seen through line graph. It clearly shows the change in positions like height of Knee, head and kicking leg of the kickers in deferent types of side kick.
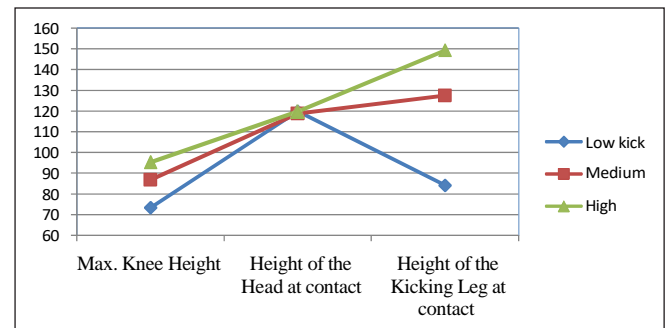

Fig. 1: Graphical Represent of Deferent Types of Side Kick

It seems that knee height should be gradually increased in low to high kick. It may be an indication that the low kick requires a lesser knee lift in the innominate phase. The height of the head remains in a same position in different types of side kick. With the increase of impact height the impact velocity might change. So, to observe the changes of velocity during impact, both Horizontal and vertical velocity were observed. Obtained data were tabulated and presented in the Table 3.

Table 3: Mean Velocity at Contact in Deferent Types of Side Kick

Type	Horizontal Velocity (m/s)	Vertical Velocity (m/s)
Low	2.12	2.28
Medium	2.32	3.57
High	1.88	5.8

The tabulated data indicates that the mean value of horizontal velocity was 2.12 m/s, 2.32 m/s and 1.88 m/s from low to High kick respectively. The vertical velocity at contact was 2.28 m/s, 3.57 m/s and 5.8 m/s at different contact points of side kickers. It seems that the vertical velocity increased rapidly in comparison to Horizontal velocity from low to high kick.

It can be observed that the Vertical velocity was a determinant factor to gain the higher momentum of kick.

Correlation between average vertical velocity and the maximum knee height achieved during the innominate phase was calculated. The kicking leg height at impact was also correlated with the mean value of vertical velocity of the kickers. The calculated value has been tabulated in Table 4.

Table 4: Correlation of Knee Height and Kicking Leg Height with Vertical Velocity of Side Kick

Type	Max. Knee Height (cm)	Vertical Velocity (m/s)	Height of the Kicking Leg at contact (cm)	Vertical Velocity (m/s)
Correlation	0.95		0.94	

It can be observed that in both cases vertical velocity increases significantly with the change in other two variables.

CONCLUSIONS

On the basis of the discussion above following conclusions may be drawn;

1. Knee lifting at inominate phase increases with the increase of kicking height in side kick.
2. The head position remains unchanged in all types of side kick.
3. Maximum knee height is correlated with the vertical velocity of impact.
4. The vertical velocity of kicking leg increases with the height of impact.

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Effect of Yogic Exercise on Playing Ability of Football Players of Manipur

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Abstract
The purpose of the study was to find out the effects of Yogic exercise on the skill abilities of Football Players of Manipur. For this present study, forty (40) male football players from Manipur, who had participated state level of competition of Manipur were source of data for this study. Twenty (40) male football players from Manipur, were randomly selected as the subjects of this study. The ages of the subjects were ranged between the 18 to 25 years who had participated state level of competition of Manipur. To find out the effect of Yogic exercise on the skill ability of football players, the McDonald Soccer Skill Test was administered. To find out of yoga exercises on the skill abilities of football players the researcher collected data through administered of 'McDonald Soccer Skill Test' before and after the training programme of six weeks on selected variables. After the collection of data scores were calculated by employ pair t-test statistical technique for further analysis, the level of significance was set at 0.05. There were found the significant Effect of Yogic exercise on the Skill Ability of Football Players of Manipur after six weeks yogic exercise programme and the hypothesis are accepted.

Keywords: *Yogic Exercise, Football players, Mc Donald Soccer Skill Test.*

INTRODUCTION

The term exercise is often applied to asana but asana should never be confused with an exercise. The work exercise gives us an idea of quick and force movement of the body or its parts and repeated action which usually lead to an exertion, tension and fatigue. Exercises on the other hand are practice slowly and steadily which bring about physical and mental relaxation. The purpose of body building is absent in Exercises.

Yogic exercises are also becoming popular in the area of games and also in the curriculum of India schools, colleges and universities. Yoga the ancient science of India, is a conscious process for gaining mastery over the mind and thereby grow faster from the animal level to become normal human beings and reach height of greatness.

Yoga as a science of holistic living featured by peace and paisa, health and happiness, energy conservation and efficiency is being recognized by larger and larger section of the society rather than as a process of gaining siddhis if not as rope trick. Yoga with its usefulness to the modern man to relieve his stresses and tensions to the patients in prevention, treatment, rehabilitation and promotion to positive health, to the professional in increasing their skills and improve the quality of life etc. is attracting people from all sections of the society.

Football has become a very popular game in the world and is currently played in more than 260 countries are involved in FIFA. To make up the standard of the game further, there is a dire need of the professionals who thoroughly understand the game, are well familiar with the coaching process and are abreast with latest training means and methods.

Almost all the nations play the game for both enjoyment and competition. Modern soccer is very fast by its nature; the spectators and the players enjoy the game of soccer with a great amount of merriment. It is a game of constant action and requires continuous adaptation to changing situations by the team as a whole as well as by the individual players. Although it is a team game, there is ample room for players to display their brilliance through individual performance with the ball as well as through team play involving improvisation and tactical knowledge.

Football is a strenuous contact Olympic team sports that places emphasis on running, sprinting, throw in, blocking, kicking, dribbling. It's a team sports which require a high standard of preparation in order to complete ninety minutes of competitively play and to achieve success. In this game movement patterns are characterized as intermittent and change continuously in response to different offensive and defensive situation in which anthropometric characteristics and high levels of strength, muscle power, endurance capacity are the most important factors that give a clear advantage for successful participation in elite level of football competition.

Statement of the Problem: Researcher undertakes the problem "Effect of Yogic exercise on the Skill Ability of Football Players of Manipur".

Objectives of the Study: The main objective of the study was to find out the effects of Yogic exercise on the skill abilities of Football Players of Manipur.

Hypothesis: It was hypothesized that there will be significant effect of Yogic exercise on the skill abilities of football players of Manipur.

DELIMITATION OF THE STUDY

The study was delimitation to the following aspects:

1. The study was delimited to 40 (forty) male football players who had participated in the state level player of Manipur.
2. The subject was ages range in between 18-25 years.
3. The study was delimited to selected yoga exercise such as Pashimotanasan, Bhujangasan, Sarvangasan, Halasan,Dhanurasan,Chakrasan,ArdhMatsyendrasan, Naukasan, Shalbhasan Suryanamaskar.
4. The study was delimited to McDonald Soccer Skill Test was administered.

LIMITATIONS OF THE STUDY
The limitations of the study as under

1. Economical and Social status of the players was not considered.
2. There was no control over diet and daily routine work of football players.
3. No specific motivational technique was involved while collecting data which may affect the result.
4. The physical activity, coaching, and other training background of the subjects were not being considered.
5. Religious and environmental factors were no considered.

SIGNIFICANCE OF THE STUDY

1. The researcher has expected some significance contribution from this study in the field of physical education and sports sciences. This study may be certain help to players, coaches, physical education teachers for raising the level of performance and screening of the football players.

2. The present study may be helping the football players to know his actual potentialities.

3. The present study may helpful to know the coaches and players which is the effective exercise for better performance of football players.

4. The study also may helpful the physical education students to know most common and simple method on the performance of football players.

PROCEDURE

For this purpose of the study, sources of data, selection of subjects, criterion measures, test administration, training programme, data collection, and experimental design are described. So every research works done by proper method and procedures.

Source of Data: For this present study, forty (40) male football players from Manipur, who had participated state level of competition of Manipur were source of data for this study.

Selection of Subjects: Twenty (40) male football players from Manipur, were randomly selected as the subjects of this study. The ages of the subjects were ranged between the 18 to 25 years who had participated state level of competition of Manipur.

Criterion Measures: To find out the effect of Yogic exercise on the skill ability of football players, the McDonald Soccer Skill Test was administered.

EXPERIMENTAL DESIGN

The study was formulated as an experimental design of 6 weeks selected Yogic exercise such as Pashimotanasan, Bhujangasan, Sarvangasan, Halasan, Dhanurasan, Chakrasan, Ardh Matsyendrasan, Naukasan, Shalbhasan Suryanamaskar. The subject was selected twenty (40) male footballers were divided into two groups that was Experimental Group and Control Group each group consists of 20 (twenty) subjects. The Experimental Group were given selected Yogic exercise for improving the skill abilities of footballers and Control Group was no specific

selected Yogic exercise. The subjects of experimental group and control group before administering the training design to obtain the data of initial test pre-test (pre-training test score). The duration of the training period was of 6 weeks (45 days). The subjects of Experimental group and Control group after administering the 6 weeks training period to obtain the data of post test (post test training test score).

Collection of Data

To find out of yoga exercises on the skill abilities of football players the researcher collected data through administered of 'McDonald Soccer Skill Test' before and after the training programme of six weeks on selected variables. After the collection of data scores were calculated by employ pair t–test statistical technique for further analysis.

Analysis of Data

The researcher had conducted the pre-test and post-test at the football ground of Manipur University. The statistical analysis of experimental group was treated Yogic exercise (training programme) for effective skill abilities of the football players and control group were not involved in selected any training programme. For analysis of data for significant differences in Mc. Donald Soccer Test obtained at pre-test and post-test of football players of Manipur are presented in this chapter.

Level of Significance

The data collection was analyzed by using pair t–test for finding the difference between the two groups means, the level of significance was set at 0.05.

FINDINGS

The comparison between the pre–test and post–test stage of experimental and control group were statistically analyzed using pair't' test. The data pertaining to the experimental and control group of football players of Manipur are presented in table 1.

The comparison of Mc. Donald Soccer Test between pre-test and post-test scores for experimental and control group between footballs players are presented in table 1.

Table 1: Comparison of Pre-Test and Post-Test Scores for Experimental of Mc Donald Soccer Skill Test

Variable	Groups	N	Mean	Sd	Md	Se	'T'
Mc Donald Soccer Test	PRE-TEST	20	24.75	1.16	3.25	0.39	8.20*
	POST-TEST	20	28.00	1.34			

*Significant at.05 level
't'$_{.05}$(38) = 2.04

In the above table-1, the significance of difference between pretest and post-test mean scores of experimental group and control group with regard of Mc. Donald Soccer skill Test are shown. The pre-test mean value of experimental group was 24.75 and post-test mean value of experimental group was 28.00. The calculated 't' value of experimental group was found to be statistically significant as the value obtain was 8.20, whereas tabulated value was 2.04 with 38 degree of freedom at. 05 level of significance. The Mean Scores of pre-test and post-test on Mc. Donald Soccer Skill Test was depicted graphically in Fig. 1.

Mc Donald Soccer Skill Test

	1
Pre Test	24.75
Post Test	28

Fig. 1: Comparison of Pre-Test and Post-Test Scores for Experimental Group on Mc Donald Soccer Skill Test Among Football Players

Table 2: Comparison of Pre-Test and Post-Test Scores for Control Group of Mc Donald Soccer Skill Test

Variable	Groups	N	Mean	Sd	Md	Se	'T'
Mc Donald Soccer Test	PRE-TEST	20	18.15	1.90	0.40	0.52	0.76
	POST-TEST	20	17.75	1.40			

*Significant at. 05 level
't'$_{.05}$(38) = 2.04

In the above table-2, the significance of difference between pre-test and post-test mean scores of experimental group and control group with regard of Mc. Donald Soccer skill Test are shown. The pre-test mean of control group was 18.15, post-test mean value of control group was 17.75, and the't' value was 0.76, which is lower than the tabulated value i.e. 2.04 was not found to be statistically significant whereas tabulated value was 2.04 with 38 degree of freedom at. 05 level of significance. The Mean Scores of pre-test and

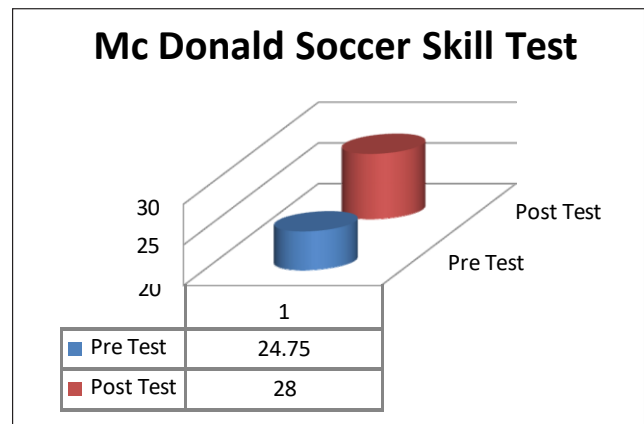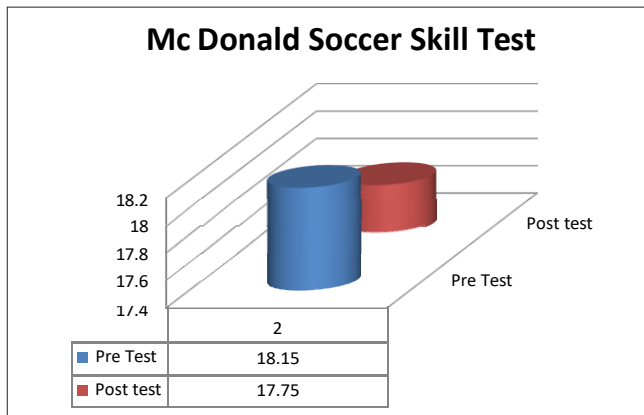post-test on Mc. Donald Soccer skill Test was depicted graphically in Fig. 2.

Mc Donald Soccer Skill Test

	2	
■ Pre Test	18.15	
■ Post test	17.75	

(axis values: 18.2, 18, 17.8, 17.6, 17.4; Post test, Pre Test)

Fig. 2: Comparison of Pre-Test and Post-Test Scores for Control Group on Mc Donald Soccer Skill Test Among Football Players

DISCUSSION OF THE FINDINGS

On the basis of the findings and it was concluded that selected Yogic exercise has produced significant superior effect on skill abilities of footballers such as kicking of goal shooting and kicking a rolling ball higher than the control group of state level of football players of Manipur. Selected Yogic exercise highly influence on kicking of goal shooting skill abilities performance except kicking a rolling ball of state level football players of Manipur. This might be due to the fact that selected Yogic exercise may be increases the neuromuscular skill ability of state level football players of Manipur. It might be reason that prescribed yoga exercises has got superior significant influence on muscle contraction and relaxation ability and neuromuscular co-ordination might be properly functioned. To find out the effect of Yoga exercises on the skill abilities of football players the researcher collected data through administered of McDonald Soccer test. After the collection of data the researcher were examined by employed Analysis of pair 't' test to find out whether any significance difference between the means of pre and post test score of the two groups. There were found the significant Effect of Yogic exercise on the Skill Ability of Football Players of Manipur after six weeks yogic exercise programme and the hypothesis are accepted.

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What Makes an Athlete Loyal Towards a Brand?
A Study on Sports Apparels

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Abstract
This study intended to examine the brand loyalty of the athletes towards branded sports apparels. Data is collected from 120 students of two state level University's Physical Education department in Capital City Raipur of Chhattisgarh State. Brand commitment is studied by two antecedents - brand loyalty and purchase intentions. From the personal interview with the respondents five most preferred brands were selected for the study. The purpose of the study is to examine the factors influencing the brand loyalty of the athletes towards branded sportswear and to identify the purchase intention for the same. The eight P's were taken as antecedents of brand loyalty:-1. Product name or Brand name, 2. Product Quality, 3. Product Price, 4. Product Style, 5. Product Promotion, 6. Product Service Quality, 7. Product Store Environment (Lau et al., 2006). Product name or Brand name has shown strong correlation with brand loyalty. In order to increase customer satisfaction and drive them to be brand loyalists, marketers are encouraged to develop aggressive marketing programs. Descriptive analysis, percentage method, multiple response analysis and Pearson Correlation were used as a statistical tool in this study. The research results showed that there is positive and significant relationship between factors of brand loyalty (Product name or Brand name, Product Quality, Product Price, Product Style, Product Promotion, Product Service quality, Product Store environment) with sports apparel customer loyalty. The results revealed that except price all the seven factors have positive correlation with brand loyalty. Brand name and product quality have positive and strong correlation with brand loyalty.
Keywords: *Brand Commitment, Brand Loyalty, Purchase Intention, Sports Apparel, Athletes*

INTRODUCTION

In the present globalized scenario, brand is not only one of the catchphrases which influence the psychology of a customer but also one of the strong marketing weapons used by marketers to retain the customers. Sports are one of the fields that have occupied a separate segment in the market which is *lucrative* place for the marketers to invest. Sports segment consists of comparatively lesser number of players (marketers) than fashion apparels. The field of sports becomes an attractive source of offbeat careers for the students nowadays. Government's initiatives for the players in the form of monetary rewards, jobs, and scholarships are some motivational sources which foster the inclinations of the students towards building career in sports field. Apart from outdoor and indoor games, athletics is also one of the magnetism for various players. Increasing personal income,

purchasing power, education, internet is some of the major sources which augmented the tendency of the sports persons to go for branded apparels. Branded sports apparels have become popular and common for a non-sports person as well as sports person, as it gives a more relaxed lifestyle and a great comfort. In western countries brand loyalty is known as an advantage where customer are agreeable to pay for their brand, because of which it has become more important for a marketer to acquire more knowledge about customers (Wernerfelt, 1991). Brand loyalty has been proclaimed to be the ultimate goal of marketing (Reichheld and Sasser, 1990). Customer loyalty is a crucial goal and result of successful marketing programs, the consumer perceives that the brand offers the right product features, image or level of quality at the right price. On the basis of popularity and preference five brands are selected for the study as: Adidas, Woodland,

Nike, Reebok and Puma. These are the best global brands that are trying to build a strapping brand image and reinforce a brand loyalty to their customers to keep them in the race of becoming the best sportswear brand.

There is variety of athletic sports apparel brands available in the market. Plenty of research has been conducted on brand loyalty towards fashion apparels but least attention has been given towards sports apparels and specifically athlete's sports apparels. These sports apparels are lesser focused, lesser promoted and exhausted by the marketers. In this circumstance what actually influences athletes to become brand loyal towards sports apparel was studied through this research. Athletic sportswear brands accommodate to professional athletes, amateur athletes, and any other consumers interested in sports or fitness-related activities. Athletic sports apparels focused towards only clothes and not sports wears. In the last few decades there is tremendous growth in sports fields; hence, sport companies have been focusing on consumers' pattern of sports apparel consumption (Sporting Goods Manufacturers Association, 2006). The current age of sports especially in India, is concentrated in games like Cricket. Even national games like Hockey lost its magnitude in the luster of Cricket. Indian pop culture icon, mainstream interest in yoga, rise of social media, rising income and discretionary expenditure etc. are some of the factors responsible for fuelling (Euromonster, 2017).

PURPOSE OF THE STUDY

Recently, Indian branded apparel market is facing cut throat competition. This competition bounded marketers to offer a wide range of augmented services and amenities to customers with the products. Aggressive marketing, heavy promotion, brand endorsement through celebrities, offers etc. are some of the factors adapted by every marketers nowadays. In this situation it is hard to take decisions by the customers to opt a particular brand. Hence, loyalty is one of the factors which may play lead role in retention of customers for the marketers which is the biggest challenge. Hence, an attempt has been made to focus on athletics and athletes which are less noticed to explore the facts of brand loyalty. This study will be helpful to the marketers to frame the strategies to capture a larger segment of market by understanding the interests of athletes about sports apparels which is an unrevealed aspect in the research field.

SPORTS APPAREL INDUSTRY IN INDIA

The mounting popularity of cricket along with soccer, tennis, etc. in world as well as India has transformed the set-up of sportswear market in India. This growing popularity of sports produced privileged circumstances for sports players who presented themselves in heroic way among the public and created the space of reputation of sports apparel in Indian apparel market. The men segment always governs the sports apparel market. The anticipated revenue of global sports apparel market is $184.6 billion by 2020 (Garner). Opening of sports club, increasing propensity towards fitness of young generation of India, and rising sports culture exerts a pull on marketers to develop fashion apparel market. In Indian sports apparel market there are many competitors but Puma is the leading brand with 4 % of the market share in segmented sportswear category in India followed by Adidas and Nike with 3% of share of each. The Indian sportswear market grew from 22 % from 2015 to 2016 and expected to grow 10% additionally by 2020. It is expected to reach the sale of $ 8 billion (Euromonitor, 2017). The numbers of gyms are likely to be increase 7 percent year-on-year till 2020(ibid.).

REVIEW OF LITERATURE

The review of literature is a foundation based upon a variety of theories and the relevant literature related with the present study conducted by researchers, scholars and academicians. It is indispensable to conduct a sound research and it provides an insight and direction to conduct the research in a prescribed manner. It consists of speculative and notional foundations of brand loyalty. It also includes empirical studies discussing the various factors influencing the athletes to become brand loyal and the relationship of these factors with brand loyalty.

Brand Loyalty

"Brand loyalty as a concept has its origins in the 1920s" (Bennett 2001, p. 3) and Werbel (1973) recognized at earliest that loyal customers as those who go for repurchase of the brand, considered only that brand and did not involve in any queries in seeking other brand-related information. Egan (2004) defined Loyalty as "an unspecified number of repeat purchases from the same supplier over a specified period". There was an early attempt to identify behaviour, psychological commitment and composite indices as the three classifications of brand loyalty given by Jacoby and Chestnut (1978). Dick and Basu (1994) highlighted on relative attitude which is confined to strong evaluation of customer towards one brand when it dominates other brand. They classified the loyalty into three categories named as spurious, latent and sustainable categories. Beaty *et al.* (1988) coupled commitment with loyalty and developed a scale to measure the commitment.

Brand loyalty can be distinct in numerous meanings, but mostly brand loyalty exists when the consumers became committed to their favorite brand and replicate their purchases over time. Consumer behavior exhibits brand loyalty and often by consumer's preferences affects brand loyalty. Brand loyalty could also be defined as the strength of preference for a brand compared to other available options that is similar, which is often measured in terms of repeated purchase or price.

Philip Kotler (1994), defined the four stages of brand loyalty, which are:

1. Hard-Core Loyals–Loyal customers who buy the specific brand all the time.

2. Split Loyals–'Loyal' customers that buys two or three brands.

3. Shifting Loyals–Customers that is moving from one brand to another.

4. Switchers–Customers with no loyalty.

Oliver (1999) identified four stages of loyalty. These stages are cognitive loyalty, affective loyalty, conative and action loyalty. Cognitive loyalty was identified by Gremler and Brown (1996); Sirohi et al (1998).They explained under cognitive loyalty that, the customer search and hence, want rational information about the service and assessed the benefits before the purchase was made. The second stage of affective loyalty comes or occurs after repeat purchase. The third stage of conative loyalty comes after reaping the benefits of the service over a period of time. At this stage customer forms an emotional attachment with the service provider and thus he wants to continue the relationship. At the last stage of action customer is not influenced by any offerings given by competitors. Literature review shows that customer loyalty has three diverse approaches. Behavioral loyalty approach (Grahn 1969); attitudinal loyalty approach (Bennett and Rundle-Thiele 2002; Jacoby 1971; Jacoby and Chestnut 1978) and combination of attitudinal and behavioral loyalty approach (Dick and Basu, 1994; Jacoby 1971; Jacoby and Chestnut 1978; Oliver 1997).

Some sophisticated analysis suggested that brand loyalty reduces further marketing efforts and cost. Statistics show that it costs 6 times less (for customer retention) than attracting and/or acquiring new customers (Rosenberg & Czepiel, 1984). These types of findings enhance the value of brand loyalty. Loyal customers are less engaged in decision making.

Ishak and Ghani described that when consumer perceive that brand offers right product features, images and level of quality at right price, then the loyalty takes place after preference and then repurchasing the brand. Trust developed and attachment after using the product for long time may also create loyalty (ibid.).

Brand Loyalty Towards Sports Apparel

Lim Renaldo Wijaya and Aprianingsih Atik (2015) studied factors influencing brand loyalty towards sportswear in Bandung. The purpose of this study was to examine the factors that make a customer loyal toward a sportswear brand. This research undertook 7 main factors building the brand loyalty toward a sportswear brands, such as Product Quality, Style, Brand Name, Store Environment, Service Quality, Sales Promotion, Price with the Brand Loyalty. Correlation of these factors was seen with brand loyalty and it was found that except service quality all the factors have positive correlation with brand loyalty. Yee Wong Foong and Sidek Yahyah (2008) studied the influence of brand loyalty on consumer sportswear in Malaysian environment. The study is intended towards identifying how the consumers are influenced by the factors of brand loyalty towards sportswear brands. Results indicated that all the factors have positive correlation with sportswear brand loyalty. Kinuthia et al. (2012) focuses on the factors influencing the brand loyalty of swimwear among Kenyan University students. The paper also sought to identify the most used brands among the sports students. The results indicate Price and Variety; Attractiveness; and Size and Brand Reputation as factors with a significant relationship with brand loyalty (Lau et al., 2006). Rahil Khoei (2014) studied brand loyalty and brand personality behavior on sportswear and examines key brand loyalty factors include of brand name, product quality, price, style, store environment, promotion, and service quality in Iran. The study was conducted by measuring the perceptions of hard core customers and switchers towards these factors. Results shows hard-core loyal consumers and brand switchers have different perceptions towards these factors and brand price, brand style, store environment and service quality have significant impact on making consumers loyal to these sportswear brands.

## RESEARCH METHODOLOGY

Research Objectives

Following objectives are formulated for the purpose of this study

1. To determine the most preferred brand of sports apparel by athletes.

2. To determine the correlation between various factors of brand loyalty and brand loyalty in sportswear.

3. To determine the factor having highest influence on brand loyalty.

RESEARCH MODEL
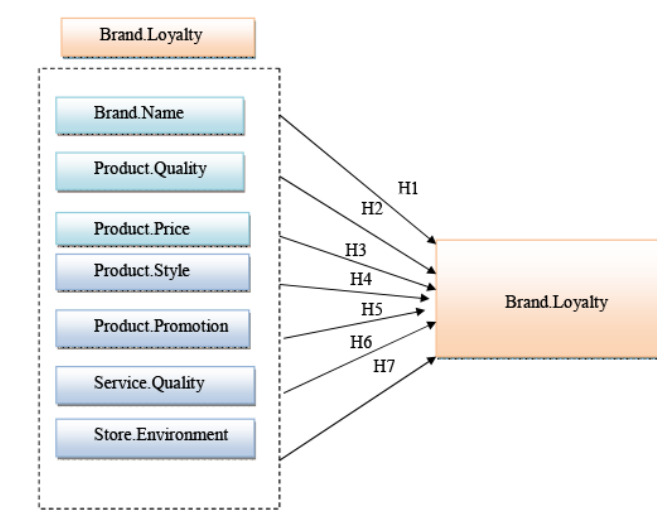
(*Source*: Authors' own)

Fig. 1: Model of the Study

Research Hypothesis

On the basis of the independent and dependent variables under study following hypothesis were formulated-

Research Hypothesis 1 (H$_1$): Product name or brand name has a significant relationship with brand loyalty.

Research Hypothesis 2 (H$_2$): Product quality has a significant relationship with brand loyalty.

Research Hypothesis 3 (H$_3$): Product price has a significant relationship with brand loyalty.

Research Hypothesis 4 (H$_4$): Product style has a significant relationship with brand loyalty.

Research Hypothesis 5 (H$_5$): Product promotion has a significant relationship with brand loyalty.

Research Hypothesis 6 (H$_6$): Service quality has a significant relationship with brand loyalty.

Research Hypothesis 7 (H$_7$): Store environment has a significant relationship with brand loyalty.

Table 1: Research Variables

S. No.	Antecedents of Independent Variables	Sources	Dependent Variables
1	Brand name	Foster, (2000) & D. A. Aaker, (1996) & chestnut, (1978)	Brand Loyalty
2	Product quality	Frings, (2005) & Garvin, (1988) & Scorpio, (2000)	
3	Product price	Foster, (2000)	
4	Product style	Littrell, (1995) & May, (1971)	
5	Product promotions	Evans, (1996) & (Mliliman, 1982)	
6	Service quality	Mittal, (1996)	
7	Store environment	Evans, (1996) & Mliliman, (1982)	
8	Propensity to be loyal	Bennett, Rebekah and Rundle-Thiele, Sharyn (2002) (the original source were unknown)	

Table 2: Research Instrument

Variables	Antecedent	Scale	Source
Brand Loyalty	Brand name	Reputation of the brand	Foster, (2000) & D.A. Aaker, (1996) & Chestnut, (1978)
		Prestige and attractiveness of brand name	
		Selection of brand name regardless of price	
		Reflection of personality from brand	
	Product quality	The fitness of the sportswear	Frings, (2005) & Garvin, (1988) & Scorpio, (2000)
		Comfort ability of the material	
		Sufficient choices of colours	
		Good functional quality (e.g. Breathable, waterproof, odor-resistant, light weight).	
	Price	The increased price would not hinder purchase intention.	Foster, (2000)
		The brand provides good value for money.	
	Style	Availability of wide variety of styles	Littrell, (1995) & May, (1971)
		Suitability of the styles of the sportswear	
		Distinctive features of Styles of sportswear.	
		Trendiness and fashion ability of the sportswear.	
	Store Environment	Good store locations	Evans, (1996) & Mliliman, (1982)
		sufficient outlets	
		Attractive interior display	
		Attractive and comfortable color and music	

Variables	Antecedent	Scale	Source
Brand Loyalty	Promotions	Attractive advertisements	Evans, (1996) & May, 1971 & Maloney, (1999)
		Attract to purchase more frequently	
		Attractive window displays of the stores	
	Service quality	Trained and knowledgeable Salespersons.	Mittal, (1996)
		Willingness of the Salespersons to help	
		Friendliness of the salespersons	(Lau, *et al.*, winter 2006).
		Neat appearance of the Salespersons	

Variable	Scale	Source
Brand Loyalty (Customer Loyalty)	Intention of using current brands in future	Harsandaldeep Kaur and Harmeen Soch (2012)
	More payment for the existing brands	
	Encouraging others the brands to the others	
	Positive word of mouth for existing brand	
	Recommendation of this brand provider to others	

Research Procedure

The correlational research design was taken up for the study. The sampling design was non-probabilistic convenience sampling technique. Data was collect through primary and secondary data collection techniques. Primary data was collected online through structured questionnaires from 120 athletes of a University. The current study is emphasized on five major brands of sports apparel namely Adidas, Nike, Puma, Reebok and Woodland on the basis of their popularity and market share. Data was analyzed through descriptive Statistics i.e. mean values and standard deviation was calculated. The data for instrument was analyzed through Karl Pearson's Correlation Method through SPSS version 21, to evaluate the relationship between various factors of brand loyalty with brand loyalty.

DATA ANALYSIS AND INTERPRETATION

Reliability Statistics

Table 3: Preference of Apparel Brand by Athletes

Case Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
$combineda	115	94.3%	7	5.7%	122	100.0%
a. Dichotomy group tabulated at value 1.						

$combined Frequencies

		Responses		Percent of Cases
		N	Percent	
sports apparel brand preferencea	puma	73	25.8%	63.5%
	nike	70	24.7%	60.9%
	adidas	48	17.0%	41.7%
	reebok	46	16.3%	40.0%
	others	46	16.3%	40.0%
Total		283	100.0%	246.1%
a. Dichotomy group tabulated at value 1.				

It is showing in table 3 that most of the athletes prefer the Nike brand, followed by Reebok. This result is in contrary to the data presented in the literature review.

Table 4: Descriptive Statistics

Variables	Samples	Items	Mean	SD	Cronbach's Alpha
Brand Name	120	4	4.54	0.61	0.854
Product Quality	120	4	3.75	1.05	0.810
Product Price	120	2	3.93	0.93	0.857
Product Style	120	4	3.82	1.06	0.881
Store Environment	120	4	4.2	0.79	0.862
Promotions	120	3	3.21	1.03	0.843
Service quality	120	4	3.57	0.97	0.839

Table 5: Correlation Matrix

Variable	Brand Name	Product Quality	Price	Style	Store Environment	Promotion	Service Quality	Brand loyalty
Brand Name	–							
Product Quality	0.017	–						
Price	0.043	−0.041	–					
Style	0.074	0.188	0.273	–				
Store Environment	−0.106	−0.174	0.003	0.110	–			
Promotion	0.085	0.174	0.029	0.038	−0.127	–		
Service Quality	0.090	−0.000	0.106	−0.033	0.052	−0.006	–	
Brand loyalty	0.740	0.773	−0.233	0.128	0.328	0.204	0.488	–

RESULTS AND DISCUSSION

Table 6.3 is showing the correlation matrix. This table is showing the relationship among various factors of brand loyalty as well as the relationship between these factors and brand loyalty itself. Product quality and Brand name are showing strong and positive correlation with brand loyalty. This result indicates that the brand name is single sufficient factor which can influence the decision making power of an athlete to purchase and make them loyal along with the quality of the product. It can be concluded that athletes do not compromise with their comfort and fitness of the sports apparel. They always want a good functional quality of apparel which helps them in free body movements. The research findings showed that price and brand loyalty had a negative relationship. This result is a contrary of outcomes of Rahil Khoei (2014). Price is one of the primary and vital considerations for the average consumer. All the athletes may not necessarily belong to upper class of the society and having high purchasing power. However, this results shows that athletes with high brand loyalty are less-price sensitive. The result suggested that as long as the athletes are satisfied with a particular brand, they would go for the repeat purchase of the sports apparels with the same brand name even if it was highly priced. However, the findings showed that there was weak relationship between product style and brand loyalty. It means that athletes do not adhere with a brand due to its copious styles. It reveals that athletes are least interested in wide range of varieties available and trends of sportswear. There was also a weak correlation between store environment and brand loyalty. It means physical environment or ambience of the store does not affect the choice of the athletes. Promotion and service quality of the store do not any positive correlation with brand loyalty. This result does not support the study of Rahil Khoei (2014). The aggressive advertisements, brand endorsements do not have an effect on brand loyalty. Hence, allover all the factors except price have positive correlation with the brand loyalty.

HYPOTHESIS TESTING

Hypothesis 1 (H$_1$): Product name or brand name has a significant relationship with brand loyalty.

Correlation statistics in table 5 shows that correlation value R is 0.740, which depicts that there is strong relationship between Brand Name and Brand Loyalty. Hence, first Hypothesis is accepted.

2 (H$_2$): Product quality has a significant relationship with brand loyalty.

Correlation statistics in table 5 shows that correlation value R is 0.773, which depicts that there is strong relationship between Product Quality and Brand Loyalty. Hence, second Hypothesis is accepted.

Hypothesis 3 (H$_3$): Product price has a significant relationship with brand loyalty.

Correlation statistics in table 5 shows that correlation value R is −0.233, which depicts that there is negative relationship between price and Brand Loyalty. Hence, hypothesis 3 is rejected.

Hypothesis 4 (H$_4$): Product Style has a significant relationship with brand loyalty.

Correlation statistics in table 5 shows that correlation value R is 0.128, which depicts that there is weak and positive relationship between style and Brand Loyalty. Hence, hypothesis 4 is accepted.

Hypothesis 5 (H$_5$): Product promotion has a significant relationship with brand loyalty.

Correlation statistics in table 5 shows that correlation value R is 0.328, which depicts that there is weak and positive relationship between Product promotion and Brand Loyalty. Hence, hypothesis 5 is accepted.

Hypothesis 6 (H$_6$): Service quality has a significant relationship with brand loyalty.

Correlation statistics in table 5 shows that correlation value R is 0.204, which depicts that there is weak and positive relationship between Service quality and Brand Loyalty. Hence, hypothesis 6 is accepted.

Hypothesis 7 (H$_7$): Store environment has a significant relationship with brand loyalty.

Correlation statistics in table 5 shows that correlation value R is 0.488, which depicts that there is moderate relationship between Store environment and brand loyalty. Hence, hypothesis 7 is accepted.

CONCLUSION

The rationale of this research is to inspect how the athletes are influenced by factors of brand loyalty towards sports apparel brands. Brand loyalty is imperative for an organization to ensure the customer retention and prevention of switching of the customers to other brands. The study is conducted by taking into consideration seven factors of brand loyalty that can influence an athlete towards purchase, repeat purchase and then make them loyal. Out of the seven factors brand name influence most to become brand loyal. When the relationship of these factors was measured with brand loyalty

then it is found that six factors except product price have positive correlation with brand loyalty. However brand name and product quality have strong and positive correlation with brand loyalty. It is also revealed that majority of the athletes prefer Nike brand for purchasing sports apparels. The finding is consistent with the findings of Yee and Sidek (2008) of Hong Kong and Khoei (2014).

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