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International Journal of Physical Education and Applied Exercise Sciences

Online Advertisement and Purchase Intentions of Sports Equipments

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Abstract

The objective of this paper is to identify the relationship between online advertisement and purchase intentions of consumers of sports equipments in Raipur City. Online advertisement has been considered as independent variable whereas, purchase intentions was considered as dependent variable. Six antecedents of online advertisement have been considered in this study viz. informativeness, interactivity, entertainment, credibility, irritation, and accessibility. A survey-based exploratory and correlational research design was used. The data was collected from 101 customers using sports equipments of various telecom brands through structured questionnaires. Multiple regression analysis was used to determine the causal relationship between both the independent & dependent variables. Results depicted that the credibility, interactivity and irritation have significant and positive impact on purchase

Key Words: Online Advertisement, Purchase intentions, sports equipments, Informativeness, Interactivity, Entertainment, Credibility, Irritation, Accessibility

Introduction

In India advertising sector has magnificently changed in last few decades. Advertising spends in India are expected to grow around 10% year on year to Rs 61,204 crores, according to media buying agency GroupM. This is effectively a slowdown in growth from the 15.5% which it had predicted last year, and later ended up being a growth of 11.9%. (Pahwa, 2017).

Today customers became more techno savvy; almost everything is now a click/touch away. There are various electronic devices and gadgets are available to the customers from desktop to smart phones. The electronic stores or e-commerce is the best example that has revolutionized the way humans used to shop. It has changed the entire system of buying and selling a product and also affected the buying pattern of the customers. In today's hectic and fast moving world, people don't have time to go for shopping. A today online store provides customer various alternatives at discounted rates that they cannot get from their traditional store. All this has led to tremendous growth of the online retail industry throughout the world (Hairong Li, 1999)

Electronic commerce is changing in a rapid way; consumers shop and buy goods and services. Consumers started to learn how to behave in an ever-changing electronic market environment in today's scenario, shopping and buying online have become part of their daily lives for many consumers, whereas others may consider it risky.

In India, the online retail industry has shown a steady and rapid growth over the years. The Indian

online retail market is predicted to grow over 4-fold to touch \$ 14.5 billion (over Rs 88,000 crore) by 2018 on account of the rapid expansion of e-commerce in the country (Economic Times). This study focuses on the impact of online advertising on the purchase intentions of sport equipments.

Review of Literature

- (Brahim, 2016) analyzed in this study that online advertising value depends positively on its informativeness, credibility and entertainment value. The study also reveals that credibility and online advertising value affect consumers' attitude towards advertising, and attitude plays a mediating role between perceived advertising value and purchase intent.
- (Naser Zourikalateh samad, 2015) evaluates the effect of online advertising on consumer purchase behavior in Malaysian organizations. Regression analysis was used to test the hypothesized relationships of the model. The study reveals that the cost saving factor, convenience factor and customized product or services had a positive impact on intention to continue seeking online advertising.
- (Seyed Rajab Nikhashemi, 2013), evaluates the effectiveness of E-advertisement on customer purchase intention. The study reveals that service quality; social network and brand recognition has greater influence on customers' perception toward web-based advertisement. Consumers who are more optimistic in web-based advertisement have most likely higher intention to online purchase. It was also found from the study that the demography factors cannot mediate the customer perception toward advertisement nor the effectiveness of E-advertisement toward customer purchase intention. Researcher on the basis of results suggests that, companies must focus on the intrinsic attributes of online advertisement to attract highly-involved consumers and must present a benevolent corporate image for consumers.
- (S, 2015) analyzed in the study the characteristics of online ads and its influence on intention to purchase and also to develop a conceptual model on feature of social media advertisements and purchase intention. The study reveals that, although online advertising is an effective tool to reach larger audiences, it is important that advertisers incorporate features to make it more effective.
- (Gitanjali, 2016) in this study evaluates the that how advertisers use social sites to make their products popular. Also analyze as to how consumers perceive the online advertisements and what are their parameters for purchasing stuff from the online sites. The study reveals that the respondents prefer rectangular banner and skyscraper advertisements that too designed in big picture and copy heavy layouts. They notice the online advertisements of ecommerce sites and mobile phones as compared to any other product and prefer those ads whose utility or functions are displayed.
- (Alkubise, 2012), analyzed the factors that contribute to the effectiveness of online advertisements and affect consumer purchasing intention from the perspective of developing countries. Based on a five dimensions theoretical model, this study empirically analyzes the effect of online advertisement on purchasing intention using data collected from 339 Jordanian university students. The study reveals that, Income, Internet skills, Internet usage per day, advertisement content and advertisement location are significant factors that affect the effectiveness of online advertisement. It was found that: first was the key significant role of website language and secondly and maybe most importantly is the impact of other people

opinions on the effectiveness of online advertisement.,

Research Methodology

Research Objectives

Following Objectives are Formulated for the Purpose of this Study

- To determine the relationship between online advertisement as an independent variable and Purchase Intention with respect to sports equipments in Chhattisgarh.
- To determine the impact of online advertisement on purchase intention with respect to sports equipments in Chhattisgarh.

Research Model

The present study has online advertisement as an independent variable. This parameter has six antecedents- interactivity, Accessibility, entertainment, informativeness, irritative and credibility as shown below in the research model followed by the one dependent variable purchase intention.

Figure 1: Model of the Study



(Source: Authors' wn)

Research Hypothesis

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

- Research Hypothesis 1 (H1): Interactivity has a significant impact on purchase intention of consumers of sports equipments in Raipur City.
- Research Hypothesis 2 (H2): Accessibility has a significant impact on purchase intention of consumers of sports equipments in Raipur City.
- Research Hypothesis 3 (H3): Entertainment has a significant impact on purchase intention of consumers of sports equipments in Raipur City.
- Research Hypothesis 4 (H4): Informativeness has a significant impact on purchase intention of

consumers of sports equipments in Raipur City.

- Research Hypothesis 5 (H5): Irritation has a significant impact on purchase intention of consumers of sports equipments in Raipur City.
- Research Hypothesis 6 (H6): Credibility has a significant impact on purchase intention of consumers of sports equipments in Raipur City.

Research Variables

Table 1- Research Variables

Antecedents (IV)	Source	Dependent Variable
Interactivity	Duoffe(1996);Wang and Zhang(2006);Wang and Sun(2010);Mir(2012);Yaakop, Hemsley &Gilbert(2011)	Purchase Intention
Accessibility		
Entertainment		
Informative		
Irritative		
Credibility		

4.6. Research Procedure

The exploratory and correlational research design was adopted for the purpose of 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 through structured questionnaires from 100 consumers of sports equipments. The data was collected through The current study is emphasized on online advertisements of major sports equipment brands namely Puma, Adidas, Nike, BSNL, Reebok and Fila on the basis of their popularity and market share. Data was analyzed through descriptive Statistics i.e. mean values and standard deviation was calculated, whereas the data for final instrument was analyzed through multiple regression analysis through SPSS version 21, to determine the relationship between online advertisement and purchase intentions of sports equipments in Raipur City of Chhattisgarh.

DATA ANALYSIS AND INTERPRETATION

As the relationship is predicted between independent variable (online advertisement) and dependent variable (purchase intention), the regression method is used. Before analyzing the data assumptions of regression analysis were tested. These assumptions are based on the residuals and not on the data. The residuals are the difference between the observed value of the dependent variable and the predicted value (Stattek.com). These assumptions are as following-

- There should be no outliers
- Data point must be independent
- There should be constant variance in residual’s distribution
- Distribution of residuals should be normal i.e. mean =0 and SD=1

The Above Mentioned Assumptions are Tested in Following way –

- **There should be no outliers** The outliers are tested through case wise diagnostic method in regression. The standardized residual value determines the outliers. If the value lies between

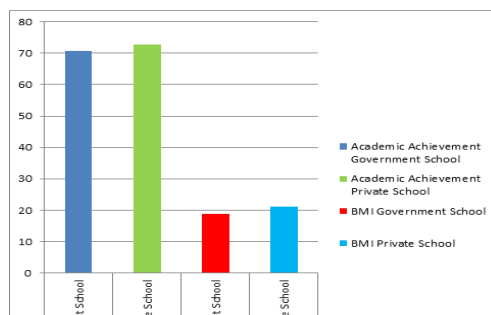
Table 2 Descriptive Statistics

Vari-ables	Mean	Standard Deviation	N
PI	41.46	5.403	101
ACC	11.82	2.300	101
INTE	15.34	2.787	101
ENT	14.59	2.268	101
INF	10.16	1.554	101
IRR	10.95	1.532	101
CRED	9.66	2.094	101

Table 5 indicates three model are established which are as following. This is apparent from the figure that all models are useful having p value as 0.000. Model 1 is indicating dependence of purchase intention on credibility parameter of online advertisement. Model 2 is depicting dependence of purchase intention on credibility as well as interactivity (INT). Third model indicates dependence of purchase intention on credibility, intention and irritation.

The PP Plots is also showing data distributed near one line which also indicates normal distribution of data.

Figure-2 PP Plots



5.2 Hypothesis Testing/ Results and Discussion

Table 4 indicates the descriptive statistics of the independent variable online advertisement which can be measured in six parameters as shown in table () and dependent variable i.e. purchase intention.

The table showing that out of the three models, model 1 is the best fit since the credibility alone as the parameter of independent variable (online advertisement) is explaining the dependent variable by 22 %. In model 2, the credibility and interactivity both are explaining dependent variable (purchase intention) by 15%. In table 3, credibility, interactivity and irritation all the three are explaining dependent variables by 12%. Hence Credibility is the parameter of online advertising which has maximum contribution in explaining purchase intention. Hence, credibility has strong, significant and positive relationship with purchase intention. Accessibility, entertainment and informativeness do not have significant impact on purchase intention having p values more than 0.05.

Table e 3 Coefficients

Model	B	Unstandardized Coefficients		Stan- dardized Coeffi- cients	t	Sig.
		Std. Error	Beta			
1	(Constant)	21.988	1.601		13.731	.000
	CRED	2.015	.162	.781	12.437	.000
	INTE	.694	.116	.358	5.970	.000
2	(Constant)	15.207	1.786		8.515	.000
	CRED	1.615	.155	.626	10.445	.000
	INTE	.694	.116	.358	5.970	.000
3	(Constant)	12.320	2.060		5.982	.000
	CRED	1.442	.164	.559	8.777	.000
	INTE	.438	.150	.226	2.930	.004
	IRR	.774	.297	.220	2.603	.011

a. Dependent Variable: PI

RESULTS AND DISCUSSION

The study was conducted to examine the impact of online advertisement on customer purchase intention of sports equipments. The study thoroughly examined the impact of each antecedent of online advertisement on purchase intention through research model. The result showed a significant positive impact of credibility, interactivity and irritation have significant relationship with purchase intention. Out of the six antecedent credibility (p- 0.000), interactivity (0.004) and irritation (0.011) have significant positive impact on purchase intention. Hence, the H1 was accepted. Hypothesis 1, 5 and 6 were accepted.

CONCLUSION

This study examined the impact of online advertisement of sports equipments on purchase intentions of consumers in Raipur city and found a significant impact and relationship of the same. Six antecedents of online advertisement were tested. Credibility, interactivity and irritation were found as important and significant antecedents of customer loyalty. Sometimes people found the online advertisement as a reliable source of information, sometimes irritative and sometimes interactive. It will provide insights to the marketers for focusing on these constructs of online advertisement by them regarding sports equipments. A proper understanding of requirement and affordability of sports consumers will help the marketer to originate a best advertising strategy to maintain a long lasting relationship with the sports consumers.

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A Study of Sports Competitive Anxiety of Senior National Women Hockey Players

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Abstract

The purpose of the present study was to assess the level of sports competitive anxiety of senior national women hockey players. Sports Competitive Anxiety Test (SCAT) developed by Martens (1977) was administered to measure the sport competition anxiety. Descriptive statistics were computed to analyse the data at 0.05 level of significance. For the purpose of the study 50 senior national female hockey players were selected as a subject. Result revealed that the 20.85% women hockey players have low anxiety level, 68.02% hockey players have average or moderate anxiety level and 10.13% have high anxiety level. It was concluded that maximum senior national women hockey players had average level of sports competitive anxiety

Key Words: Anxiety, SCAT, Sports, Women players

Introduction

Sport psychology is one of the sub-branches of psychology and is affiliated to both psychology and sport sciences. One of the main topics considered in sport psychology that can affect the performance of athletes especially in championships is anxiety level before competition and its effect on athletes' moods and locomotor skills. Generally athletes are anxious for many and various reasons, such as the importance of sporting success, or the difference between their abilities and capabilities needed for their sport, and these factors can have a negative effect on their performance. Research findings show that excitement and arousal, or anxiety can affect athletic performance. Competitive anxiety is a kind of anxiety formed in competitive situations in sports. One of the major causes of competitive anxiety are social factors. Continual pressure on a young athlete resulting from expectations of parents, coaches, and teammates can generate much anxiety; coaches can have the main and most influential role in this respect in youth sports. Sedarati has shown, in his study, that competitive anxiety is caused due to unrealistic beliefs, employing someone who thinks he will have a poor performance, worrying that someone will guess they are anxious, performance experience below expected levels in his previous match, a person with mental challenges, catastrophic and previous problems, and individual beliefs related to the implementation of sport skills. Athletes who have high sport performance anxiety seem to be especially more sensitive to fears of failure resulting in negative social- and self-evaluation. Generally, the relationship between anxiety and athletic performance is expressed by stimulation theory and the hypothesis of reverse or (u) theory.

Anxiety affects psychological and physiological working of the organism in numerous ways. For instance, anxious individuals are said to have reduced attention control. During heightened activity

(anxiety inclusive) attention cannot remain one-pointed, it is distributed to various aspects of the organismic activity which is chaotic and intense. There is numbing effect on the individual's judgement. Anxiety often results in narrowing of the field of attention as relevant cues are excluded. Competitive Anxiety in Sport concludes with a theory of competitive anxiety based on an interaction between uncertainty about the outcome and the importance assigned to that outcome. Anxiety before or during athletic competitions can hinder performance of an athlete. The coordinated movement required by athletic events becomes increasingly difficult when your body is in a tense state. A certain level of physical arousal is helpful and prepares us for competition. But when the physical symptoms of anxiety are too great, they may seriously interfere with your ability to compete. Similarly, a certain amount of worry about how you perform can be helpful in competition, but severe cognitive symptoms of anxiety such as negative thought patterns and expectations of failure can bring about a self-fulfilling prophecy. If there is a substantial difference between how you perform during practice and how you do during competitions, anxiety may be affecting your performance.

The effect of anxiety on performance depends directly on the type of task considered. In most cases a heightened arousal state has been found to facilitate simple performances. On the other hand as anxiety reaches a certain level a breakdown of psychological and physiological integrative mechanism is often seen to occur resulting in less efficient performance in more complex tasks. Anxiety has a temporal relationship to performance. In general anxiety level increases prior to dangerous situation until they become relatively high just before it is encountered. During performance anxiety is often lessened. Since the individual must concentrate on his own actions rather than on his internalized fear.

Jones, Swain and Cole (1991) conducted study on university athletes and found that in case of cognitive anxiety males showed no changes across time through female showed a progressive increase the competition is neared. Males and females showed the same patterning in somatic anxiety with increase occurring only the day of competition. Self-confidence scores revealed an education in self-confidence scores revealed a reduction in self-confidence neared in both gender but there was greater decrease in females than males.

This is partially supported by research that has focused on the determinants of anxiety as well as gender. Among males, cognitive and somatic anxiety was more strongly affected by their perception of opponent's ability and probability of winning (Jones, Swain, & Cale, 1991). Female's cognitive anxiety and self-confidence is determined by readiness to perform and the importance they personally placed on doing well (Jones, Swain, & Cale, 1991).

Methodology:

Subjects:

For the purpose of the study 50 national female hockey players taken from 5th Senior National Hockey Tournament-2015 (from dated 20th April to 3rd May 2015) held at Mananiya Chandagi Ram Sports Stadium, Saifai, Etawah (UP).

Sports Competitive Anxiety Test (SCAT) developed by Martens (1977) was administered to measure the sport competition anxiety. After obtaining approval for the human subjects protocol from the tournament organizer, prospective team coaches were contact by phone about the taken the data. Data collected occurred at coaches' convenience at a team meeting or practice session.

Statistics:

Descriptive statistics were computed to analyse the data at 0.05 level of significance.

Result:

Table 1 Descriptive Analysis of Age, Body Weight and BMI (N=50)

Variable	Mean	SD
Age	21.13	±3.37
Body Weight	43.87	±3.53
BMI	22.7	±0.93

Table 2 Sports Competitive Anxiety of Senior National Women Hockey Players

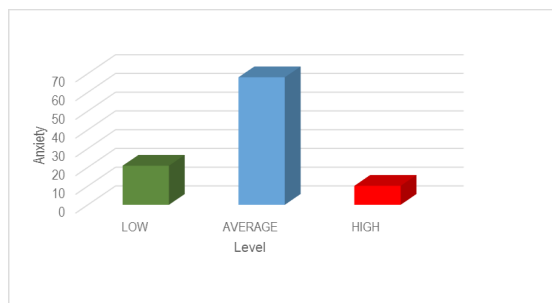
Percentage of Players	Classifications	
	Scores of Anxiety	Level of Anxiety
20.85	Less than 17	LOW
68.02	17-24	AVERAGE
10.13	More than 24	HIGH

Discussion on Findings

Table 1 showed that the 20.85% women hockey players have low anxiety level, 68.02% hockey players have average anxiety level and 10.13% have high anxiety level. Some other studies have supported the present study i.e. Bawa and Kalpana (2001) who also found that high level of performance group have moderate level of anxiety than low level of performance. Duffy (1963) concluded that where proficiency and quality of movement is required, like in gymnastics a high anxiety may tend to reduce the quality of performance. Spencer and Spencer (1966), Misner (1973) and O'Conner (1977) had confirmed that high anxious players would do more poorly than low and medium anxious players. Most psychologists believe that the highest level of competitive anxiety will deteriorate athletes' performance in sport (Martens et al., 1990; Weinberg & Gould, 1999; Ortiz, 2006). On the contrary, a lower level of anxiety was found to have enhanced the performance of athletes (Martens et al., 1990; Krane & Williams, 1994). Clearly, anxiety exerts a variety of effects on athletic performance. These effects vary based on sport, gender and level of experience. In order to facilitate peak performances by athletes, sport Table 1 showed that the 20.85% women hockey players have low anxiety level, 68.02% hockey players have average anxiety level and 10.13% have high anxiety level. Some other studies have supported the present study i.e. Bawa and Kalpana (2001) who also found that high level of performance group have moderate level of anxiety than low level of performance. Duffy (1963) concluded that where proficiency and quality of movement is required, like in gymnastics a high anxiety may tend to reduce the quality of performance. Spencer and Spencer (1966), Misner (1973) and O'Conner (1977) had confirmed that high anxious players would do more poorly than low and medium anxious players. Most psychologists believe that the

highest level of competitive anxiety will deteriorate athletes' performance in sport (Martens et al., 1990; Weinberg & Gould, 1999; Ortiz, 2006). On the contrary, a lower level of anxiety was found to have enhanced the performance of athletes (Martens et al., 1990; Krane & Williams, 1994). Clearly,

Figure 1 Percentage of Anxiety Level of National Level Women Hockey Players



Conclusion:

It was concluded that maximum senior national women hockey players had average level of sports competitive anxiety. As far as overall competitive state anxiety was concerned has shown a positive relationship with the hockey performance probably on account of positive relationship of somatic anxiety and self-confidence with the performance of hockey she could have very well diluted the effect of somatic anxiety. It is recommended to conduct a similar study on sportswomen at different level of competition with different years of training exercises.

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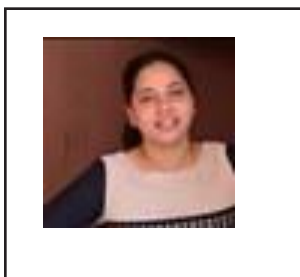
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Relationship of Body Composition with Academic Achievements Among School Children

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Abstract

The current study aims to analyze the relationship of body composition with academic achievement in Indian scenario. For the purpose of the study the researcher purposively selected 434 (N=434) participants from government and private schools of Meerut region (Hapur, G.B. Nagar, Bulandshahr, Bagpat, Ghaziabad and Meerut). The mean age of the participants was 15.83±1.19 and ranged between 13 to 18 years. The mean height of the participants was 167.24±9.83 centimetre and mean weight was 56.15±12.69 kg. To assess the body composition Body Mass Index was calculated and to find the academic achievement last three years final examination percentage was traced. To find the relationship between composition and academic achievement Pearson product moment correlation coefficient was used by means of SPSS software. It was found that, “There is no any significant relationship between body composition and academic achievement”.

Key Words: Body composition, BMI and Academic

Introduction:

Braddock said, “Involvement in sports appears to enhance a student’s academic aspirations, investments and achievements” whereas Smith and Lounsbery said “When time is allocated for quality physical education, there is no detriment to academic achievement”.

People know that most students are innately curious and physically active (Fernie, 2009). Physical movements of the body are vital for normal brain development (Wolfsont, 2002). Attention has recently increased on the important role that schools play for physical activity and physical fitness surveillance. It develops a wide variety of school-based physical activity contexts which are to be associated with various measures of academic performance. Various studies have been carried out to find the link between physical activities with academic performance. Of these studies, a small number employing objective measures of student fitness have identified a relationship with academic achievements. However, even among these studies, the fitness-academic link has not been conclusively recognized or regularly assessed with regards to academic behaviors.

One of the widely used methods to analyze general fitness is to test BMI or body mass index. This test is very feasible and easy to conduct. Though numerous studies have been performed to find the link between physical fitness and academic achievement, it has not been conclusively established. Therefore the researcher intends to delimit the study and is interested in finding the link between

body composition and academic achievement in Indian context.

Methods:

For the purpose of this study 434 (N=434) boys and girls from government and private schools of Meerut region (Hapur, G.B. Nagar, Bulandshahr, Bagpat, Ghaziabad and Meerut) were purposively selected as the participants. Among the participants, 339 participants were boys and rest 95 participants were girls. The mean age of the participants was 15.83±1.19 and ranged between 13 to 18 years. The mean height of the participants was 167.24±9.83 centimetre and mean weight was 56.15±12.69 kg. Among the participants, the boys were having mean age 15.78±1.23 years whereas the girls were having 16.01±1.03 years the mean height of the boys was 169.22±9.66 centimetre and mean height of the girls was 160.18±6.74 centimetre. The mean weight of the boy participants was 57.65±12.87 kg years whereas the girl participant’s mean weight was 50.77±10.46 kg.

To measure the height of the students standard stadiometer was used and the height was measured in the unit centimetre. On the other hand to measure the weight of the students standard weighing machine was used and the unit of measurement was kg.

The body compositions of the students were calculated using the standard BMI formula. The formula is as follows:

$$BMI = (\text{Weight in kg}) / (\text{Height in metre})^2$$

To find the relationship between body composition and academic achievement Pearson product moment correlation coefficient was used by means of SPSS software.

Results:

The data collected was analyzed by using descriptive statistics and scores of academic achievements & body composition of school children is presented in Table-1.

Table 1 Descriptive Statistics of Academic Achievement and BMI

	Mean	Std. Deviation
Academic achievement	71.62	8.80
Body mass index	20.03	3.91

Table-1 indicates that mean and standard deviation of academic achievements of school children. Academic achievements mean score is 71.62 and standard deviation is 8.80. Whereas body mass index mean score is 20.03 and standard deviation is 3.9 Pearson product moment correlation coefficient was used to find the relationship between body composition and academic achievements and result is presented in Table-2.

Table 2 Pearson Correlation Coefficient

		Body Mass Index
Academic	Pearson Correlation	0.069
Achievements	Sig. (2- tailed)	0.152

The Table-2 describes the correlation coefficient between Body mass index and Academic achievement. The result fails to exhibit a significant correlation between the two variables. Since the p value (significant value, $p = 0.152$) is greater than the level of significant ($p > 0.05$); the correlation coefficient can't be considered as statistically significant.

The researcher also tried to analyze the relationship separately for boys and girls but could not find any significant relationship. The graphical representation of mean scores of academic achievements and body mass index of male and female school children are presented in Figure-1.

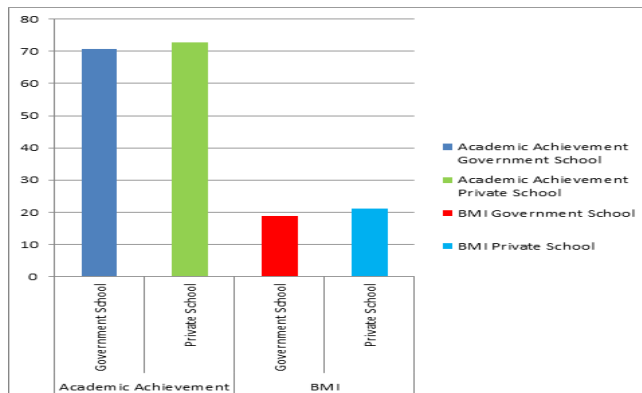


Figure-1:-

Graphical Comparison of Mean Scores of Academic Achievements and Body Mass Index of Male and Female School Children

The descriptive statistics result of the government and private school students are exhibited in the Figure 2:

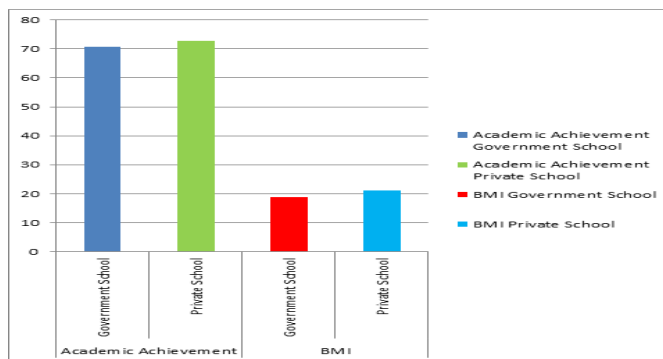


Figure-2:- Graphical Comparison of mean scores of academic achievements and body mass index of government and private school children

Discussion and Conclusion:

It is found that the researcher fails to establish a significant relationship between body composition and academic achievement. Baxter et al. (2013) also got a similar kind of result when he tried to investigate the relationship between academic achievement and body mass index among fourth grade, predominantly African children. In contrast Morita et al. (2016) suggested that physical fitness in boys and obesity status in girls could be an important factor for academic achievement. In another study Hagman et al. (2017) came into the conclusion that obesity in childhood had been associated with low educational level in early childhood. It is seen that the results of the previous studies are contraindicated with the result of the present study. Hence the researcher concludes that though the result of the study exhibits insignificant correlation between body composition and academic achievement, further research is necessary to investigate the relationship in Indian context. The insignificant result is occurred; maybe it is because of the extra care Indian parents have towards Indian student's study and their future career.

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Assessment of Nutritional Status of Tribal Students in Tripura

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Abstract

To know the current nutritional status of tribal students of Tripura, the present study was carried out on 480 male tribal students belonging to Tripura and falling in the age range of 9 to 14 years. Stature, body mass and BMI were taken to the standard procedure. Participants body mass was measured without shoes and with light clothing to the nearest 0.1 kg, using a digital weighing machine. Their stature was measured to the nearest 0.1 cm using a stadiometer. BMI were measured by weight (kg)/height (cm.) X height (cm). Body mass index was calculated by using the BMI charts for children. Data on anthropometry revealed that out of total tribal students screened (N=480), mean height and weight in all the age group was significantly increasing due to the amount of body fat changes with

Introduction

The tribal populations of Tripura being neglected for long period in nutritional and health issues, needs to be uplifted and so we required empirical evidence which can be achieved through this research. Nutritional status is the current body status of a person or a population group related to their state of nourishment (the consumption and utilization of nutrients). The nutritional status is determined by a complex interaction between internal/constitutional factors and external environmental factors: internal factors like age, sex, nutrition, behaviour, physical activity and diseases. External environmental factors like food safety, cultural, social and economic circumstances. Anthropometry is the measurement of body height, weight and proportions. It is an essential component of clinical examination of infants, children and pregnant women. To know the current nutritional status of tribal students, the present study was carried out on 480 male tribal students belonging to Tripura and falling in the age range of 9 to 14 years. For the study researcher has applied nutritional assessment by Anthropometric methods that is Body mass index for children. The criteria used to interpret the meaning of the BMI number for children and teens are different from those used for adults. For children and teens BMI age and sex specific percentiles are used for two reasons these are the amount of body fat changes with age and the amount of body fat differs between girls and boys. The purpose of the study is to find out the current nutritional status of tribal students of Tripura.

Objective of the Study

- To Find out the current nutritional status of tribal students of Tripura.
- The Study will assess the nutritional status of tribal students of Tripura.
-

Methodology

Selection of the Subjects

For the purpose of the study four hundred eighty (N=480) students were randomly selected from the south district of Tripura. 80 subjects from each class i.e. (80x6) = 480 nos. 20 schools from south district were selected and their aged range in between 9-14 years.

Selection of the Variables

Keeping in mind the feasibility criteria, availability of equipments and the purpose of the investigation the following variables were selected.

Nutritional Status:

- Nutritional status was measured by Anthropometric methods of tribal students.
- Age (date of birth)
- Height (cm.)
- Weight (kg.)
- The study was further delimited to the following indices to assess the nutritional status of tribal students of Tripura.
- BMI for Children.
- Body Mass index for age percentiles.

Selection of Tools

Weighing machine, calculator and stadiometer were used for the study.

Collection of Data

The data of the study was collected by using following method:-

Nutritional Status was determined by anthropometric methods that is BMI for children.

Procedure

The right BMI calculation requires getting the accurate height and weight measurements. Participants body weight was measured without shoes and with light clothing to the nearest 0.1 kg, using a digital weighing machine. Their stature or height was measured to the nearest 0.1 cm using a stadiometer.

Statistical Technique

For the purpose of the study to verify the current nutritional status of tribal students in Tripura, descriptive statistics and BMI index was employed.

Results and Discussion

Table: I

Mean Values of Nutritional Status of Tribal Students in Tripura

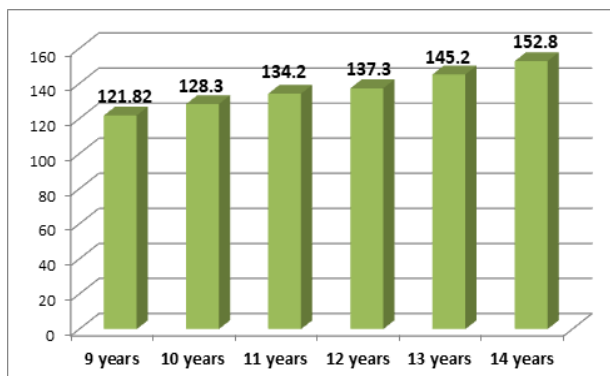
Mean		9 years	10 years	11 years	12 years	13 years	14 years
Age (Year)	N	80	80	80	80	80	80
Height (cm.)	Mean	121.82	128.3	134.2	137.3	145.2	152.8
	SD	6.12	5.93	6.01	6.72	8.58	8.31
Weight (kg.)	Mean	21.45	23.97	27.91	30.02	35.58	41.35
	SD	2.82	3.66	4.20	5.08	6.29	7.20
BMI	Level	14.69	14.70	15.59	16.05	16.94	17.90
	Status	Healthy Weight	Healthy Weight	Healthy Weight	Healthy Weight	Healthy Weight	Healthy Weight
	Percentiles	5th to 85th	5th to 85th	5th to 85th	5th to 85th	5th to 85th	5th to 85th

Table-I shows the mean and SD of Height in 9 years tribal students was 121.82 ±6.12, 10 years tribal students was 128.3 ±5.93, 11 years tribal students was 134.2 ±6.01, 12 years tribal students was 137.3 ±6.72, 13 years tribal students was 145.2 ±8.58 & 14 years tribal students was 152.8 ±8.31.

The mean and SD of Weight in 9 years tribal students was 21.45 ±2.82, 10 years tribal students was 23.97 ±3.66, 11 years tribal students was 27.91 ±4.20, 12 years tribal students was 30.02 ±5.08, 13 years tribal students was 35.58 ±6.29 & 14 years tribal students was 41.35 ±7.20.

Fig- I

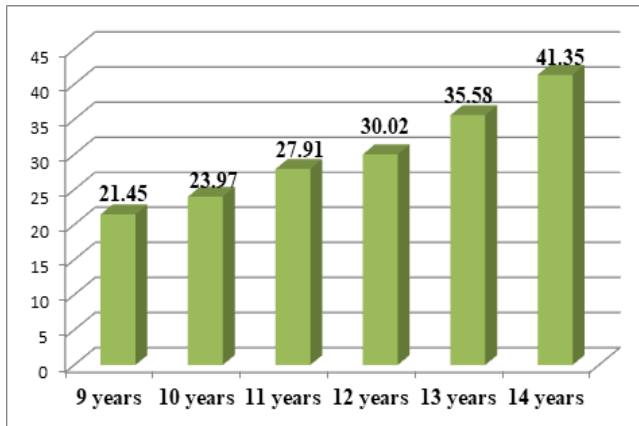
Height of Tribal Students in Tripura



Source: Primary Survey, 2016-17

Fig-I Shows the mean value of height on tribal students of Tripura. The figure shows that the frequency of height was increasing due to their age and nutritional status etc.

Fig- II Weight of Tribal Students in Tripura



Source: Primary Survey, 2016-17

Fig-II Shows the mean value of weight on tribal students of Tripura. The figure was increasing frequently due to their age, physical exercise and nutrition etc.

Fig: III Body Mass Index of Tribal Students in Tripura

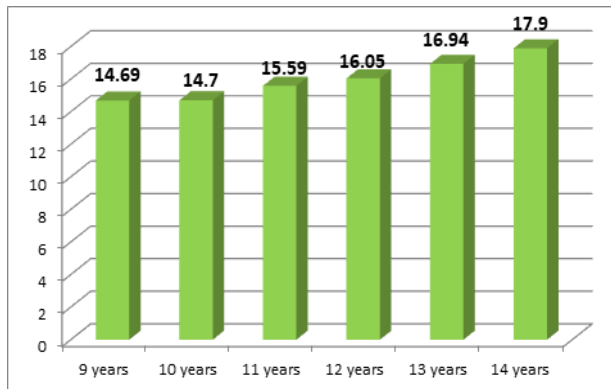


Fig-III Shows the body mass index of tribal students in Tripura. The figure was increasing frequently due to the amount of body fat changes with age, height, weight and nutrition etc. The level of BMI shows that all the tribal students were laid down in healthy weight category due to greater than 5th percentile.

Conclusion

Base on the study we can conclude that the:

- Height that were increasing with their age.
- The weight also increasing due to the amount of body fat changes with age.
- BMI of tribal students of Tripura was placed in healthy weight category due to shows greater than 5th percentiles.

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International Journal of Physical Education and Applied Exercises

Anthropometric and Proportionality Profile of Elite Indian Women Football Players

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Abstract Background:

During last decade, various studies have shown the importance of morphological parameters in sports performance. Objectives: The present research investigation was undertaken to study the anthropometric profile and body proportionality of elite Indian women Football players as well as to determine the variation in players according to their playing position. Methods: The data for present cross-sectional study were collected on 64 elite female Football players out of whom 28 were international and 36 were national players who won top four positions at senior national level. They were ranging in age from 21.5 to 27 yrs. They were further divided into Forwards (n=28), Midfielders (n=16), fullbacks (n=12) and Goalkeepers (n=8). Various anthropometric measurements were taken using standard anthropometric equipments and by following standard techniques. Body proportions were calculated from anthropometric measurements. Results: The findings of the study show that women Football players are heavier than universal phantom. They resemble with universal phantom in sitting height, upper arm and calf girths. However, the differences in body morphology and body proportions were found to be statistically insignificant among different positional groups. Discussion: The trend in team games is to improve the responsibilities of players.

Key Words: Anthropometry, body proportions, phantom, field Football, heavier

Introduction

Physical characters have been known to be fundamental to excellence in sports performance. Body proportions, indices or ratios are used to know the variation in one body measurement by keeping the other constant in an individual. The term, "Phantom" is a universal, unisex and bilaterally symmetrical model derived from reference male and female data was proposed [1]. The deviations from phantom are expressed as z-values. Z values may be used to analyse the proportional differences within a subject, between a subject and a prototype or between the subjects measured on different occasions. [2] studied the z values of Olympic athletes and observed that runners were more linear than swimmers, since their arm, thigh and tibia lengths proportional to height were larger. The former possess smaller proportional arm girth but larger thigh and calf girths than latter. Weightlifters and wrestlers had similar body proportions but former had proportionally shorter arms and legs and wider shoulders than latter, [3-14]. The body proportionality of 121 national female campers was studied by [15] belonging to Athletics, cycling, Football, Judo, weightlifting and wrestling. They found that national campers possess greater trunks, shoulders and hip widths, greater circumferences and leaner in skin folds as compared to universal phantom. Limited studies have been conducted on proportionality profile

of Indian players,[16-19].However a study on elite senior female Football players is completely lacking. Keeping this in view the present research investigation has been undertaken to study the morphological and proportionality profile of female Football players playing at different positions.

Methods

Data Collection

The data for present study were collected on 64 elite female Football players ranging in age from 21.5 to 27 yrs during senior national competitions held at Jalandhar (Punjab) in 2012. Out of 64 players, 28 participated at international level and 36 participated at national level. All the players won top four positions at senior national level. They were further divided into Forwards (n=28), Midfielders (n=16), Full backs (n=12) and Goalkeepers (n=8). Anthropometric measurements were taken by the investigator using the standard techniques [20]. The technical error of measurement (TEM) was lower than 5% for skin folds and lower than 1% for the other measurements. Standard anthropometric equipments were used for taking body measurements. The instruments were calibrated prior to use and all measurements were taken on the subject's right side. Anthropometric variables included body mass, height, skin folds (biceps, triceps, subscapular, suprailiac, thigh and medial calf), girths (upper arm relaxed and flexed, forearm, thigh and maximum calf), and breadths (humeral, wrist, femoral and ankle). Height was measured on a stadiometer to the nearest 0.1 cm, and the weight was recorded on a portable scale to the nearest 0.1 kg. Skin folds were taken using a calliper (Holtain Ltd, Crymch, UK) to the nearest 0.2 mm, and the girths were performed with a flexible metallic tape measure. Skin folds were taken three times and the average was employed in further calculations.

Body proportionality: z values of each subject were calculated by using the formula e, [21] as mentioned below

$$z = 1/s \times [v \times (170.18/h)^d - p]$$

where z is a proportionality values of z-score

v is any variable of subject

s is phantom SD for given variable

170.18 is the phantom height constant

h is subject's height

d is dimensional constant whose values are 1 for height, lengths, breadths, girths and skinfold thicknesses, 2 for areas values, 3 for all volume and weights p is phantom value for the variable.

Statistical Techniques

Arithmetic mean and Standard deviation of all the variables were calculated. Analysis of variance (ANOVA) was applied to see if the differences within groups were significant or not.

Results

Table 1 gives the mean and standard deviations of anthropometric measurements and body proportions of elite senior level Indian female Football players. It has been observed that players were 159.54 cm tall and 54.47 kg heavy. But they were slightly heavier than universal phantom (z=0.21).

Football players resemble with universal phantom in sitting height ($z = -0.07$). They also resemble with universal phantom in upper arm and calf girths. They are found to possess lesser circumferences of upper arm flexed, fore arm and thigh than universal phantom ($z = -0.78, -0.66, -0.40$, respectively). Our players were found to possess narrower bony widths and leaner in skinfold thickness than universal phantom.

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Table:1

Anthropometric Measurements and Body Proportions of Elite Senior Level Indian Female Players

Variables	Mean	SD	Mean z value	SD
Height(cm)	159.54	4.51	-	-
Weight(kg)	54.47	8.04	0.21	1.33
Sitting height(cm)	83.97	3.53	-0.07	0.74
Biepicondylar humerus(cm)	5.68	0.32	-1.22	0.92
Wrist diameter(cm)	4.87	0.29	-0.15	1.06
Biepicondylar femur (cm)	8.32	0.59	-1.22	1.09
Ankle diameter(cm)	6.12	0.48	-0.28	1.34
Upper arm (relaxed)) circumference(cm)	25.14	6.66	-0.02	3.06
Upper arm (flexed) circumference(cm)	25.81	2.64	-0.78	1.24
Forearm circumference(cm)	22.67	2.26	-0.66	1.76
Thigh circumference(cm)	50.71	5.72	-0.40	1.51
Calf circumference(cm)	33.37	2.52	0.16	1.28
Biceps skinfold(mm)	5.42	2.80	-1.10	1.53
Triceps Skinfold(mm)	8.67	5.09	-1.37	1.26
Subscapular skinfold(mm)	8.53	5.58	-1.58	1.26
Suprailiac Skinfold(mm)	7.09	3.88	-1.74	0.98
Thigh skinfold(mm)	11.03	9.60	-0.53	2.47
Calf skinfold(mm)	7.91	4.05	-1.61	0.97

Table: 2

Anthropometric Measurements of Elite Indian Football Players According to Their Field Positions.

Parameter	For-ward(n=28)		Midfield-er(n=16)		Full-back(n=12)		Goalkeep-er(n=8)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Height(cm)	159.18	5.2	159.73	3.6	158.9	4.4	161.4	4.2
Weight(kg)	52.7	6.9	56.1	8.8	53.5	7.9	59.0	9.4
Biepicondylar humerus (cm)	5.70	0.3	5.67	0.3	5.48	0.4	5.88	0.3
Wrist diameter(cm)	4.80	0.3	4.86	0.2	4.87	0.4	5.11	0.4
Biepicondylar femur (cm)	8.17	0.6	8.41	0.5	8.38	0.6	8.54	0.5
Ankle diameter(cm)	6.03	0.6	6.25	0.4	6.17	0.4	6.11	0.4
Upper arm (N) circumference(cm)	23.78	2.6	27.44	12.6	25.09	1.2	25.36	3.5
Upper arm (F) circumference(cm)	25.22	2.6	26.21	2.4	25.8	1.8	27.10	3.7
Forearm circumference(cm)	22.08	2.1	23.43	2.8	22.59	1.5	23.34	2.0
Thigh circumference(cm)	50.01	4.8	51.67	4.6	48.69	8.1	54.25	5.6
Calf circumference(cm)	32.86	4.7	34.04	2.5	33.03	2.1	34.31	2.2
Biceps skin-fold(mm)	5.29	2.6	5.19	1.7	4.83	1.8	7.25	5.4
Triceps Skin-fold(mm)	8.39	4.3	7.88	3.0	9.50	6.5	10.0	8.3
Subscapular skinfold(mm)	8.39	6.5	7.75	2.3	9.58	6.0	9.0	6.5
Suprailiac Skin-fold(mm)	6.86	4.5	6.81	2.3	7.83	3.8	7.38	4.5
Thigh skin-fold(mm)	11.93	11.3	9.06	5.8	11.17	10.1	11.63	9.7
Calf skin-fold(mm)	8.00	4.1	6.88	1.4	8.08	4.4	9.38	6.7

Table 2 gives the mean and SD values of anthropometric measurements according to their playing positions. It has been observed from Table that Goalkeepers were found to be tallest and heaviest among all the groups. They were found to possess greater bony widths and body girths than other groups. Mid Fielders were found to be leaner in skin fold thickness except at biceps. In statistical terms, F-ratio was found to be non-significant(Table 4) among all the groups for all anthropometric

variables.

Table3:

Proportionality Profile of Elite Indian Football Players According to Their Field Positions

Parameter	Forward		Midfielder		Fullback		Goalkeeper	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Weight(kg)	0.04	1.4	0.36	1.1	0.17	1.4	0.56	1.4
Sitting height(cm)	0.01	0.67	-0.19	0.8	0.01	0.6	-0.24	0.88
Biepi-condylar humerus (cm)	-1.09	0.9	-1.26	0.9	-1.73	0.9	-0.82	0.8
Wrist diameter	-0.27	1.1	-0.12	0.7	0.0	1.4	-0.65	1.4
Biepicondylar femur (cm)	-1.63	1.4	-1.17	1.2	-1.11	1.4	-1.07	1.1
Ankle diameter(cm)	-0.62	1.8	-0.06	1.2	-0.21	0.9	-0.64	1.1
Upper arm relaxed circumference(cm)	-0.61	1.3	0.99	5.7	0.01	0.7	-0.05	1.7
Upper arm flexed circumference(cm)	-1.02	1.3	-0.63	1.0	-0.74	0.8	-0.34	1.7
Forearm circumference(cm)	-1.07	1.7	-0.12	2.2	-0.65	1.2	-0.35	1.7
Thigh circumference(cm)	-0.54	1.4	-0.18	1.2	-0.86	2.1	0.34	1.5
Calf circumference(cm)	-0.03	1.5	0.45	1.2	0.07	1.1	0.41	1.1
Biceps skin-fold(mm)	-1.16	1.5	-1.24	0.9	-1.41	1.0	-0.18	2.8
Triceps Skin-fold(mm)	-1.42	1.1	-1.57	0.7	-1.16	1.6	-1.09	1.9
Subscapular skin-fold(mm)	-1.59	1.5	-1.76	0.5	-1.36	1.3	-1.52	1.4

Suprailiac Skin-fold(mm)	-1.76	1.2	-1.82	0.5	-1.56	0.9	-1.71	1.1
Thigh skin-fold(mm)	-0.29	3.0	-1.86	0.3	-0.50	2.5	-0.43	2.3
Calf skin-fold(mm)	-1.58	1.0	-1.58	1.0	-1.57	1.0	-1.31	1.5

Table 3 gives the mean and SD values of body proportions (Z values) in senior female Football players according to their playing positions. Goalkeepers were found to possess maximum z value for weight ($z=0.56$), followed by midfielders ($z=0.36$), full backs ($z=0.17$) and forwards ($z=0.04$). All the groups resemble with universal phantom in their trunk lengths. Both midfielders ($z=-0.12$) and fullbacks ($z=0$) similar proportional values for wrist diameter as that of universal phantom. However, all these groups do not differ significantly (Table 4) from each other in their bony diameters. It has been observed from Table 3 that goalkeepers possess lightly more thigh ($z=0.34$) and calf girths (0.41) than universal phantom. However, all these groups do not differ significantly (Table 4) from each other in their body girths and skinfolds.

Table 4:

F-Ratio and P Values of Anthropometric Variables of Elite Senior Football Players According to Different Playing Positions.

Variables	F-ratio	P-value	F-ratio	P-value
Height(cm)	0.61	0.61	-	-
Weight(kg)	0.73	0.53	0.41	0.75
Sitting height(cm)	0.08	0.97	0.56	0.64
Biepicondylar humerus (cm)	2.41	0.08	2.48	0.07
Wrist diameter(cm)	2.09	1.11	0.60	0.62
Biepicondylar femur (cm)	1.12	0.35	0.77	0.53
Ankle diameter(cm)	0.74	0.53	0.61	0.61
Upper arm (relaxed) circumference(cm)	0.38	2.75	1.01	0.39
Upper arm (flexed) circumference(cm)	1.24	0.30	0.74	0.53
Forearm circumference	1.51	0.22	1.03	0.38
Thigh circumference	1.88	0.14	1.18	0.23
Calf circumference(cm)	1.21	0.31	0.74	0.53
Biceps skinfold	1.39	0.25	1.24	0.30
Triceps Skinfold	0.43	0.73	0.26	0.85
Subscapular skinfold	0.26	0.85	0.22	0.88
Suprailiac Skinfold	0.21	0.88	0.22	0.21
Thigh skinfold	0.31	0.82	0.23	0.87

Calf skinfold	0.70	0.56	0.48	0.69
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Discussion

The results of the study indicate that the female Football players of the present study were slightly heavier than universal phantom. They are shorter and lighter than Italian female Football players,[22].They resemble with universal phantom in sitting height, upper arm and calf girths. They were found to possess lesser forearm and thigh girths, narrower bony widths and leaner skinfolds than universal phantom. The leaner skin folds at various sites indicate that they possess less fat and are more physically fit than phantom.

While comparing the players according to their field positions, goalkeepers were found to be taller and heavier with slightly greater bony widths and body girths than other groups. But the differences were found to be non-significant. Similar results were report by,[22].They studied 48 Turk cell Super league football male players. They did not observe any significant difference in anthropometric variables among players playing at different positions. The trend in team games is to improve the responsibilities of players playing in every position. Furthermore, studies based on large sample size should be conducted to explore the variations in body morphology and proportions among different positional group.

Conclusions:

Thus, it can be concluded from the above results that the players of present series are slightly heavier than universal phantom. The leaner skin folds at various skin fold sites indicate their fitness. We have observed no significant difference in body morphology and proportion while comparing players according to their field positions.

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Biomechanical Analysis of the Lay-Up Shot in Basketball: Joint Angles and Center of Gravity

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Abstract:

This research examines the biomechanical aspects of the lay-up shot in basketball, concentrating on joint angles and centre of gravity during ball release. Ten male right-handed basketball players, ages 18 to 22, were examined. The results revealed no significant link between joint angles and performance, with correlation coefficients (e.g., left hip $r = 0.622$, right ankle $r = -0.126$) below the threshold value (0.632). The centre of gravity correlation ($r = -0.167$) was similarly statistically insignificant. These studies suggest that lay-up performance may be dependent on ability, technique, and psychological aspects rather than only biomechanics.

Keywords:

Keywords: biomechanics, lay-up shot, joint angles, centre of gravity, and basketball performance.

1. INTRODUCTION

Over the years, the area of physical education has changed drastically and produced specialist disciplines like sports science. The inclusion of basic scientific ideas—including biomechanics—into the analysis of sports performance—including fuels this development (McGinnis, 2013). Understanding the biomechanics of certain sports strategies becomes even more important as contemporary training approaches keep stretching human capacity.

Basketball, a game marked by its quick speed and explosive motions, requires from its players a certain combination of agility and accuracy. Among the several basketball shooting forms, the lay-up shot is one of the most basic ones that calls for careful balancing movement with precision. Since the main way a basketball player scores is by shooting, our study attempts to clarify the biomechanical details of the lay-up shot and their possible influence on performance.

The Biomechanics of the Lay-Up Shot

Fundamentally, biomechanics is the use of mechanical ideas on biological systems (Knudson, 2007). We investigated certain biomechanical factors in our work: joint angles and the height of the center of gravity at the moment of ball release during a lay-off shot. Understanding the efficiency and efficacy of the movement depends on these factors, so they are rather important (Hay, 1993).

The lay-up shot consists of a difficult series of motions, each of which is essential for the effective application of the technique:

The player sprints while dribbling the ball; plants the right foot; then, the left; takes off from the ground underhand using an extended shooting arm.

According to Krause et al. (2008), this series calls for exact timing and coordinated effort among several muscle groups to provide best effects. We investigated this movement pattern using important biomechanical factors at the pivotal time of ball release.

Understanding joint angles during the lay-up shot offers important new perspectives on the kinetic chain engaged in this basic basketball ability. Bartlett (2007) notes that the angles of the ankle, knee, and hip joints at the instant of ball release may greatly affect the power and accuracy of the stroke. Moreover, the way these joints are positioned influences the player's control and stability throughout the shot execution.

Another important determinant of the biomechanics of the lay-up shot is the height of the center of gravity upon ball release. Ackland et al. (2009) claim that this change affects not just the ball's trajectory but also the player's balance and dodging capacity against defenders. Knowing the ideal height for ball release will enable athletes to enhance their scoring efficiency while keeping control and stability.

By concentrating on these particular biomechanical features, we want to offer a complete understanding of the lay-up shot method. As Robertson et al. (2014) emphasize, this approach conforms with the increasing tendency in sports science to use quantitative techniques to the study of athletic performance. For coaches and athletes, such thorough biomechanical study might provide insightful information that could guide training programs and improve on-court performance.

Moreover, this biomechanical study of the lay-up shot adds to the larger subject of sports biomechanics, which has advanced noticeably lately. As Glazier and Davids (2009) note, a more complete knowledge of athletic performance can come from combining biomechanical studies with other fields such motor learning and sports psychology.

Finally, our study's emphasis on the biomechanics of the lay-up shot marks a vital first step in close proximity between scientific inquiry and useful application in basketball. Through the prism of biomechanics, we want to provide insightful analysis of this basic ability that might guide coaching decisions, improve player performance, and maybe shape the course of basketball training approaches going forward.

2. Selection of Subjects

Ten men from the Lakshmbai National Institute of Physical Education in Gwalior, India, made up our research. Ages ranging from 18 to 22, the contestants were all right-handed shooters with Intervarsity Championship level competition experience.

Variational Biomechanics

We investigated the next kinematic variables:

One set of linear variables is

o Centre of gravity height at ball release

2. angular variations:

Ankle; knee; hip; shoulder; elbow; wrist; joint angles for both left and right sides

We used segmentation techniques and joint-point analysis to gauge these factors. To find the center of gravity and estimate joint angles, this included creating stick figures from images.

Data Analysis

The correlations between our chosen biomechanical factors and lay-up shot performance were investigated using Pearson's Product Moment Correlation. The significance degree was 0.05.

3. Results

Angular Biomechanical Variables

S. No.	Joint	Coefficient of Correlation (r)
1.	Ankle (Left)	0.582
2.	Ankle (Right)	-0.126
3.	Knee (Left)	0.407
4.	Knee (Right)	0.005
5.	Hip (Left)	0.622
6.	Hip (Right)	0.583
7.	Shoulder (Left)	-0.472
8.	Shoulder (Right)	-0.074
9.	Elbow (Left)	-0.002
10.	Elbow (Right)	-0.081
11.	Wrist (Left)	0.00
12.	Wrist (Right)	0.225

Our analysis revealed that none of the angular variables demonstrated a significant relationship with lay-up shot performance. The threshold for significance, given 8 degrees of freedom, was 0.632 at the 0.05 level. All obtained correlation coefficients fell below this critical value.

4. Linear Biomechanical Variables

Variable	Coefficient of Correlation (r)
Height of Center of Gravity	-0.167

The height of the center of gravity at the moment of ball release showed a weak, negative correlation with lay-up shot performance. However, this correlation was not statistically significant.

5. Discussion

Our results offer a unique viewpoint on the biomechanics of the basketball lay-up shot. Against what one would naturally assume, neither the angular nor the linear biomechanical factors we investigated exhibited any appreciable correlation in our sample of basketball players with lay-up shot performance. Particularly in basketball, this result questions certain accepted wisdom on the direct relationship between biomechanical characteristics and success in sports.

These findings imply that effective lay-up shots might rely more on other elements such:

1. General degree of proficiency
2. Mastery of shooting technique
3. Strategic awareness
4. Psychological elements (e.g., concentration, confidence)

Though they are fundamental for understanding sports motions, biomechanics may not always clearly correlate with performance outcomes, particularly in difficult, multifarious talents like the lay-up shot.

This surprising result fits the idea of "equifinality" in motor control as articulated by Bernstein (1967). Equifinality implies that there are several approaches to get the same motor output, which might help to explain why certain biomechanical characteristics did not show any appreciable correlation with lay-up performance. In basketball, this suggests that players could use different movement techniques to effectively perform a lay-off shot, therefore adjusting to their own physical traits and situational needs.

Regarding the improvement of shooting technique, Okazaki et al. (2015) underline the need of movement variety in basketball shooting. Expert players, they contend, show functional variation in their shooting technique, which lets them be flexible in many game conditions. This idea can also apply to lay-up shots, which helps to explain why exact biomechanical criteria might not directly link with performance.

Emphasized in the study of Gréhaigne et al. (2005), tactical awareness is another element possibly affecting lay-off shot success. They contend that in team sports like basketball, performance mostly depends on one's capacity to make decisions and to understand the game environment. Regarding lay-up shots, a player's capacity to select the appropriate timing and technique for the shot might be more decisive of success than certain biomechanical factors.

Many people agree that sports success depends critically on psychological elements including confidence and attention. Sport confidence may greatly affect an athlete's performance, as Vealey (2001) notes, therefore perhaps negating the need of biomechanical considerations in some circumstances. Regarding lay-up shots, a player's confidence in their capacity to score and their concentration on the current work may be more important than first considered.

Although our results imply that the investigated biomechanical factors might not be directly predictive of lay-up shot performance, it is important to treat these data carefully. As Glazier and Davids (2009) point out, sportsmen's biomechanics and performance typically have a complicated and nonlinear relationship. They advocate a combined strategy that takes biomechanics into account in addition to other elements like physiology, motor control, and psychology.

Moreover, the lack of notable connections in our research does not diminish the relevance of biomechanics in comprehension and enhancement of basketball performance. As Knudson (2007) emphasizes, biomechanical study is still a useful tool for pointing up possible areas for method development and injury avoidance. Our results could alternatively imply that the link between biomechanics and performance in lay-up shots is more complex than formerly thought.

Finally, our study emphasizes how difficult sports performance is, especially in regards to abilities like the basketball lay-off shot. Although biomechanical elements surely influence movement performance, our results imply that effective performance may rely on a wider spectrum of variables including skill level, technique improvement, tactical awareness, and psychological aspects. This emphasizes the need of a multidisciplinary approach in sports science research and practice, including biomechanical analysis together with other pertinent disciplines to acquire a more complete knowledge of athletic performance.

6. Conclusion

One has little influence of biomechanics. Our study revealed that basketball players' lay-up shot performance was not much affected by the particular biomechanical elements we investigated: joint angles and center of gravity height.

2. Performance is complicated: This does not imply biomechanics are less crucial. It just demonstrates how complicated athletic performance—especially in something like a lay-up—is and cannot be reduced to a few basic parameters.

3. Biomechanics Still Matters: Understanding athlete movement and performance depends on biomechanics even if these factors have minimal effect. Though they are not the full image, it provides fragments of the jigsaw for us.

4. Whole Approach Required: The findings underline how training and performance enhancement should be handled from several directions. It's about blending physical, technical, and mental elements of the game as much as about style.

Examining muscle action during the lay-up shot will help one better grasp where the power and control originate.

- See how performance changes with approach speed and angle.

Look at how a defender alters a player's biomechanics and decision-making.

- Think about how performance interacts with physical elements on the psychological level.

Examining these areas will assist us to better grasp what constitutes a good lay-off and enable coaches to create more well-rounded training programs enhancing the mental and physical components of basketball play.

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