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Editor's Page

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Impact Factor for Journal of Exercise Science & Physiotherapy, JESP

Year	Impact Factor
2011	2.035
2012	3.217
2013	4.652

I am glad that the **Volume 10, No. 1 issue** of **Journal of Exercise Science and Physiotherapy** ***(JESP)*** is ready for circulation. An important milestone has been achieved during the year 2013 with the indexing of the JESP in the sciencecentral.com, InnoSpace - Scientific Journal Master List database beside Indmed. InnoSpace has announced that JESP was positively evaluated in the SJIF Journals Master List evaluation process, which resulted in a score given **SJIF 2013 = 4.652** (Scientific Journal Impact Factor Value for 2013). The organization has reported steady improvement in the SJIF scores calculated for 2011 (2.035) & 2012 (3.217). More and more commonly used rating is the criteria of citation which has also a great impact on gaining the Impact Factor rating. Building citation rating is long-lasting processes which require strict strategy which is consistently inculcated. All the contributors, reviewers and editorial board members deserve congratulations for their efforts in maintaining the quality of there publications and rigorous review processes and dealing with all this efficiently and in a timebound manner for maintaining the timely release of the journal. The improvement in the SJIF impact factor will help to gain better scores in different kind of evaluations and especially in gaining better citation results. The editorial committee members are busy with their effort to get the journal indexed in more and more databases to further improve the citation of the research published in the JESP. This issue of JESP contains ten original research articles and two case reports on the different aspects of exercise science from different countries of the world. I am sure you will enjoy the same and strengthen our hands to futher improve the position of the journal in the international market.

S.K. Verma

Knowledge, attitude and Practice of Exercise for blood pressure control: A cross-sectional survey

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Abstract

There is emerging empirical evidence of the efficacy of exercise in blood pressure control, however, little is known about factors limiting exercise engagement in patients with hypertension. This cross-sectional study assessed knowledge, attitude and practice of exercise for blood pressure control among Nigerian patients with hypertension. A total of 150 (male, 66 and female, 84) patients with hypertension whose ages were 20 years and older participated in this study. A structured questionnaire which sought information on socio-demographics, knowledge, attitude and practice of exercise for blood pressure control was used to obtain data from the respondents who were recruited from selected government hospitals. Data were analysed using descriptive and inferential statistics at 0.05 Alpha level. More than half of the respondents, 90(60.0%) demonstrated poor exercise practice. A majority, 101(67.3%) had poor knowledge of exercise for hypertension control while a quarter, 39(26.0%) had positive attitude towards exercise. There were significant associations between knowledge of exercise and level of education ($\chi 2$=28.337; p=0.001), attitude ($\chi 2$=38.297; p=0.001) and practice of exercise ($\chi 2$=12.757; p=0.001) respectively. Significant association was found between knowledge and each of socio-economic status ($\chi 2$=19.192; p=0.001) and attitude ($\chi 2$=25.634; p=0.001). Practice of exercise for blood pressure control was low among Nigerian patients with hypertension which was significantly influenced by poor knowledge of and negative attitude towards exercise practice for blood pressure control.

Keywords: Knowledge, attitude, practice, exercise, hypertension control.

Introduction

Hypertension remains a major global public health challenge as the leading risk factor for cardiovascular morbidity and mortality (*WHO 2002; Chobanian et al., 2003; Kearney et al., 2004*). Annually, it accounts for 7.1 million (one-third) of global preventable premature deaths (*Kearney et al., 2004; Bhalt et al., 2006; Gunarathne et al., 2008*). In Nigeria, over 4.3 million individuals above the age of 15 years were classified as hypertensive using 160/90 mmHg cut-off point (*National Expert Committee, 1997; Ike, 2009*). Similarly, *Adedoyin et al, (2008)* reported a prevalence rate of 36.6% among elderly individuals which peaks at 49 years in both sexes using 140/90mmHg cut-off point. Thus, prevention and control of high blood pressure has become an important public health concern. There is substantial evidence that pharmacological therapy is effective in the control or prevention of

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target organ damage in patients with hypertension (*Pontremoil et al, 2001; Elliot, 2004*) but hypertension treatment success rate is still below optimal level (*Rayner et al, 2007)*. Factors such as cost of medication (*Busari et al, 2010*), multiple antihypertensive medications (*Jokisalo et al, 2001*), socio-economic disparity (*Morenoff et al, 2007*) and adverse effects (*Bardage and Isacson, 2000*) have been implicated for poor treatment success rate. Hence, non-pharmacological therapy for BP control has been advocated by many health authorities in the recent times (*Pate et al, 1995; WHO 2003*).

Non-pharmacological approaches for BP control include dietary plan, weight reduction and regular exercise programmes (*Chobanian et al, 2003; Obarzanek et al, 2003*). These approaches are known to have no adverse effects and are less expensive than pharmacological therapy (*Whelton et al, 2002; WHO 2003; Pescatello et al, 2005*). Exercise alone has been reported to offer a reduction in blood pressure up to 12mmHg and 5 mmHg in both systolic and diastolic respectively and has been considered to be clinically relevant in the management of hypertension (*Westhoff et al, 2002*).

In order to achieve the desire goal for hypertension management, knowledge of its care is paramount. Adequate knowledge of a disease condition has been reported to influence patients' attitude and practice in the management of their illnesses, and improving knowledge is known to improve compliance with treatment in conditions such as hypertension (*Busari et al, 2010*). Similarly, exercise practice entails good knowledge of its application in order to maximize its benefits. In spite of emerging empirical evidence of the efficacy of exercise in blood pressure control, little is known about factors limiting exercise engagement in patients with hypertension. Therefore, this study assessed knowledge, attitude and practice of exercise for BP control among Nigeria patients with hypertension.

Materials and Methods

Respondents: This cross-sectional study recruited 165 patients with hypertension who were receiving treatment at the Cardiac Care Clinics of some selected government hospitals in Osun State, southwest, Nigeria. The selected hospitals were Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile – Ife, Wesley Guild Hospital unit of the OAUTHC, Ilesha, and Ladoke Akintola University Teaching Hospital, Osogbo. Inclusion criteria for participation in the study involved having a medical diagnosis of hypertension by the physician, being 20 years and older, and an attendance at the medical outpatient clinics of the any of the selected hospitals for a duration of at least 6 months before the study. Patients were excluded if presented or reported any severe medical condition such as cancer, chronic obstructive pulmonary disease, neurological condition and dementia.

Procedure: Ethical approval for this study was obtained from the Institute of Public Health, Obafemi Awolowo University, Ile-Ife, Nigeria. Permission to conduct study was also obtained from the selected hospitals respectively. Each respondent gave informed consent to participate in the study. Of the 165 copies of questionnaires administered, only 150 copies were returned and found valid for

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013
SJIF IMPACT FACTOR 2013=4.65

analysis therefore yielding a response of 90.9%.

Instruments: *Knowledge, attitude & practice Questionnaire*

The instrument used in this study was developed by a panel of experts on exercise prescription and cardiopulmonary rehabilitation comprising of three physical therapists and exercise physiologists respectively. The questionnaire sought information on knowledge, attitude and practice of exercise for blood pressure control. The questionnaire was tested for content validity and the test-retest reliability was determined in a pilot study among 20 patients with hypertension who were not part of the main study. Consequently, items on the questionnaire that were ambiguous or extraneous were either modified or expunged. The internal consistency of the questionnaire was found to be 0.89 on Cronbach's alpha.

The questionnaire has two sections: section A sought information on demographics such as age, marital status, sex, education, occupation and income. Section B sought information on knowledge, attitude and practice of exercise for blood pressure control. Items on knowledge consists of four sub-sections which included previous advice on exercise by health-care professionals, type of exercise for hypertension control, combination of exercise with medication, the importance of exercise in high BP control, adverse effects of exercise on patient, place of exercise (indoors or outdoors) and forms of exercise (multiple options). Items on attitude were of three sub-sections which included confidence of individuals to participate in exercise programme. Questions on practice also consisted of four sub-sections which included current state of exercise involvement, frequency of exercise practice, and duration of exercise and challenges involved in participating in exercise for BP control.

The answering options were "Yes", "No" or "I don't know". A correct response was assigned score of 2, incorrect response was given a score of 0 and "I do not know" was assigned score of 1. Responses to the questions were summed up and the maximum obtainable score for knowledge was 38 points, attitude was14 points while practice was 26 points. A below average knowledge score (i.e. < 19 points) was graded as "poor", average while scores >19 points was graded as "good". A below average attitude score (i.e. < 7 points) was graded as "negative" while >7 was graded as positive. Similarly, a below average practice score (i.e. <13 points) was graded "poor" while > 13 was graded "good" practice.

Socio-Economic Status Questionnaire

Socio-economic Status was assessed using Socio-economic Status (SES) Questionnaire by *Adedoyin et al. (2005).* The questionnaire was used to obtain information on major SES indicators; occupational status, level of education and income. Important assets and household equipment valuable in Nigerian community such as house, car, Colour TV, video, computer, refrigerator, fan, generator, air conditioner etc. were also assessed. Individual position in the society such as community leader, religious leader etc. was included in the questionnaire. The summative scores of the three socio-economic indicators yielded a maximum obtainable score of

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013
SJIF IMPACT FACTOR 2013=4.65

27. The respondent were categorised as lower class (< 9); middle class (10-18); or high class (19-27).

Data Analysis: Data were summarized using descriptive statistics of mean, standard deviation, frequency and percentage. Inferential statistics of Chi Square test was used to determine associations among age, level of education, occupation, socioeconomic status, knowledge, attitude and practice for blood pressure control.

Results & Discussion

Table 1: Socio-demographic characteristics socioeconomic status, graded scores for knowledge, attitude and practice of respondents (N=150)

VARIABLE	N	%
Age Group		
20-30	6	4.0
31-40	7	4.7
41-50	28	18.7
51-60	109	72.6
Sex		
Male	66	44.0
Female	84	56.0
Occupation		
Artisans	24	15.8
Business	57	38.1
Civil servants	46	30.8
Retirees	23	15.3
Marital Status		
Single	5	3.3
Married	106	70.7
Divorced	1	0.7
Widowed	38	25.3
Level of education		
Primary school	20	13.3
Secondary school	32	21.3
Tertiary institution	64	42.7
No formal education	34	22.7
Socio-economic status		
Low	33	22.0
Middle	94	62.7
High	23	15.3
Knowledge Score		
Poor	101	67.3
Good	49	32.7
Attitude Score		
Negative	111	74.0
Positive	39	26.0
Practice Score		
Poor	90	60.0
Good	60	40.0

The mean age of the respondents in this study was 57.7±12.6 years. The study recruited higher proportion of females constituting 56.0%. A majority, 106(70.7%) of the respondents were married while less than half, 64(42.7%) had tertiary education. More than half, 94(62.7%) of the respondents were in the middle socio-economic status. 67.3% had poor knowledge exercise for hypertension control and 26.0% had good attitude towards exercise while 40.0% demonstrated good exercise practice (Table 1).

Table 2: Respondents' knowledge, attitude and practice of exercise for blood pressure control (N=150)

Variables	Yes (N%)	No (N%)	Do Not Know (N%)
Knowledge			
Advice on exercise by health-care provider **(Exercise Advise by Health Providers)**	72(48.0)	78(52.0)	
Aerobic	63(42.0)		
Anaerobic	1(0.7)		
Others	86(57.3)		
Combination of exercise and Medication	50(33.3)	1(0.7)	99(66.0)
Exercise is important in controlling high BP	49(32.7)	3(2.0)	98(65.3)
Important	29(19.4)		
Very Important	20(13.3)		
Not Sure	101(67.3)		
Exercise has adverse effects on patient with high BP	18(12.0)	9(6.0)	123(82.0)
Place of exercise			
Indoors		107(71.3)	
Outdoors		43(28.3)	
Forms of exercise (multiple options)			
Brisk walking	149(99.3)	1(0.7)	
Running	24(16.0)	126(84.0)	
Cycling	24(16.0)	126(84.0)	
Strength training	21(14.0)	129(86.0)	
Swimming	3(2.0)	147(98.0)	
Stretching	60(40.0)	90(60.0)	
Jogging	25(16.7)	25 (83.3)	
Attitude			
1: Confident about exercise			
Try hard enough to always overcome barriers with regard to	22(14.7)		

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013

exercise			
Always find ways to exercise and be physically active	39(26.0)		
Easy for me to accomplish my activity and exercise goals	56(37.3)		
When confronted with a barrier to exercise I could find several solutions to overcome this barrier	17(11.3)		
I could exercise even when I am tired	16(10.7)		
2: Exercise interference with personal responsibilities	15(10.0)	115(76.7)	20(13.3)
3: Exercise during the workday	115(76.7)	35(33.3)	
Practice			
1. Engage in an exercise presently	60(40.0)	90(60.0)	
2. Participation in exercise			
Once a week	13(8.7)		
Twice a week	13(8.7)		
Thrice a week	17(11.3)		
Once aweek	17(11.3)		
No Exercise	90(60.0)		
3. Duration of exercise			
0 min	90(60.0)		
10 min	15(10.0)		
20 min	24(16.0)		
30 min	12(8.0)		
1 hour	9(6.0)		
4. Difficulty in participating in an exercise	11(7.3)	139(92.7)	
5. Being on exercise before and unable to stick with it due to health problem	13(8.7)	137(91.3)	

Table 3: Test of association between respondents' knowledge, demographic characteristics, attitude and practice of exercise for blood pressure control

Variables	Knowledge of Exercise			
	Yes(N%)	**No(N%)**	$\chi 2$	p-value
Age Group (Yrs)				
20-30	3(50.0)	3(50.0)		
31-40	3(42.9)	4(57.1)		
41-50	12(42.9) 16(57.1)	16(57.1)	3.357	0.340
>51	31(28.4) 78(71.6)	78(71.6)		
Level of Education				
Primary	8(15.0)	12(85.0)		
Secondary	9(28.1)	23(71.9)	28.337	0.001*
Tertiary	35(54.7)	29(45.3)		
No formal education	2(5.9)	32(94.1)		
Socio-economic status				
Low	2(6.1)	31(93.9)		
Middle	33(35.1)	61(64.9)	19.192	0.001*
High	14(60.9)	9(39.1)		
Attitude				
Slightly confident	1(4.5)	21(95.5)		
Moderately confident	13(30.8)	26(69.2)		
Very confident	14(42.9)	32(57.1)	23.823	0.002*
Extremely confident	10(58.8)	15(41.2)		
Not at all confident	1(6.3)	17(93.7)		
Practice				
Yes	25(58.3)	35(41.7)	12.757	0.001*
No	14(15.6)	76(84.4)		

*p<0.05

Table 4: Chi-Square Test of association between attitude toward exercise as blood pressure control and each of respondent age group, level of education and socio-economic status

Variables	Knowledge of Exercise			
	Yes (N%)	**No (N%)**	$\chi 2$	p-value
Age Group (Yrs)				
20-30	0(0.0)	6(5.5)		
31-40	0(00.0)	4(3.6)	25.615	0.001*
41-50	4(10.3)	24(21.6)		
>51	35(89.7)	74(66.7)		
Level of Education				
Primary	4(10.3)	16(14.4)		
Secondary	6 (15.8)	25(22.5)		
Tertiary	9(23.7)	55(49.5)	38.297	0.001*
No formal education	19(50.0)	15(13.5)		
Socio-economic status				
Low	16(41.0)	17(15.3)		
Middle	18(46.1)	76(68.5)	25.634	0.001*
High	5(12.8)	18(16.2)		

*p<0.05

Table 5: Chi-Square Test of association between practice of exercise for blood pressure control and each of respondent age group, level of education and socio-economic status

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013

Variables	Practice of Exercise			
	Yes(N%)	No(N%)	χ 2	p-value
Age Group (Yrs)				
20-30	5(83.3)	1(16.7)	8.390	0.390
31-40	5(71.4)	2(28.6)		
41-50	11(39.3)	17(60.7)		
>51	39(35.8)	70(64.2)		
Level of Education				
Primary	6(30.0)	14(70.0)	14.861	0.002*
Secondary	17(53.1)	15(46.9)		
Tertiary	32(50.0)	32(50.0)		
No formal education	5(14.7)	29(85.3)		
Socio-economic status				
Low	7(21.2)	26(78.8)	6.786	0.340
Middle	(43.6)	53(56.4)		
High	12(52.2)	11(47.8)		

*p<0.05

Respondents who had received advice from health-care providers on the benefits of exercise for blood pressure control were less than half, 72(48.0%). A quarter, 39(26.0%) reported moderate confidence in exercise engagement for BP control while only a tenth, 15(10.0%) believed that exercise may interfere with their personal responsibilities.

More than half, 90(60.0%) of the respondents admitted that they were not engaged in any form of exercise. However, only a few, 17(11.3%) reported an engaging in exercise thrice weekly with 8.0% of the respondents practicing exercise for 30 minutes. A majority 149(99.3%) considered brisk walking while 21(14.0%) opined strength training as a form of exercise for BP control (Table 2). There was significant association between knowledge of exercise for BP control and each of attitude (χ2 = 23.823; p=0.002) and practice (χ2=12.757; p=0.001). There was significant association between knowledge of exercise for BP control and socio-demographics such as level of education (χ2= 28.337; p=0.001) and SES (χ2=19.192; p=0.001) (Table 3). There were significant inverse association between attitude towards exercise and age (χ2=25.615; p=0.001); level of education (χ2 =38.297; p=0.001) and socio-economic status (χ2=25.634; p=0.001) respectively (Table 4). Significant inverse association was also found between level of education (χ2=14.861; p=0.002) and practice of (Table 5).

Discussion: This study investigated knowledge, attitude and practice of exercise for BP control among Nigerian patients with hypertension. The finding of this study shows that knowledge of exercise for BP control among patients with hypertension was poor. This finding is similar to the reports of previous studies that knowledge of hypertension care using pharmacological treatment is poor among patients with hypertension (*Sabouhi et al, 2011; Piwońska et al, 2012*). This finding may be due to lack of awareness of exercise as complementary or start up therapy in early mild hypertension other than medication. Evidence abound in the literature that pharmacological therapy is the only widely known approach for BP control in spite of emerging evidence on the efficacy of the non-pharmacological management *(Hagberg et al, 2000; Pescatello et al, 2005; Appel et al, 2006; Fagard and Cornelissen, 2007).* This could be linked to inadequate public enlightenment and lack of adequate health education on the causes, prevention, diagnosis, detection, and multidisciplinary management of hypertension using various lifestyle modifications.

Despite conclusive evidence of hypotensive efficacy and enormous

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013

benefits of exercise in the control and management of hypertension, knowledge of exercise for BP control still remains low. Over dependence on drug seems to contribute to poor exercise application for BP control. There is evidence that knowledge transferred from medical staff induces patients' ability to comply with lifestyle modification (*Thorogood et al, 2003; Hroscikoski et al, 2006*) but there is strong suspicion that advice such as regular exercise may not be adequate enough to influence patients in taking informed decision for BP control (*Egede et al, 2002*). However, Huang et al, (2004) submitted that low counselling rates and lack of expertise in exercise prescription among health care professionals could contribute to poor BP control among patients with hypertension. Furthermore, lack of referral to exercise experts such as physical therapists in the cardiopulmonary rehabilitation constitutes a significant shortcoming. Hence, emphasis on team work in the management of hypertension may help increase use of exercise for BP control among patients with hypertension.

Exercise culture is a health behaviour which may be influenced by many psychosocial factors such as family support and confidence. Our study revealed that attitude of patients towards exercise for BP control was negative. Similar to the finding of a previous study, attitude of patients with chronic disease towards exercise was negative (*Murphy, 2011*). Many individuals with hypertension are known to engage in sedentary behaviour and consequent poor confident in taking up specific task such as exercise behaviour (*King et al, 2009*). The ability to take up specific task was described by *Bandura, (1977*) as self-efficacy and has been described as a strong predictor of exercise behaviour. This psychosocial construct is central to several theoretical models such as Trans-theoretical Model, Social Cognitive Theory, Ecological models of health behaviour and Health Belief Model and has been used to explain exercise behaviour in many studies (*Bandura et al, 1997; Sallis et al, 2003*). Hence, exercise self-efficacy should be taking into consideration when goal-setting and reinforcement for exercise programme in achieving adequate BP control.

The present study also found that patients with hypertension demonstrated poor level of exercise practice. This finding is consistent with reports of previous study that practice of exercise among patients with hypertension was below optimal level (*Khanam, 2008; Sabouhi et al, 2011*). Many factors may contribute to poor level of exercise practice among patients which are not limited to perceived benefit of exercise, level of education, access to recreational facilities and neighbourhood environment (*Pan et al, 2009*). Amongst these, educational level has been reported to play significant role to influence good practice. This is in accordance with study *of Giardina et al, (2009)* who opined that individuals with higher level of education were more knowledgeable about the health benefits of exercise. Consequent to the foregoing, our study revealed that SES was significantly associated with knowledge, attitude and practice of exercise for BP control. This is consistent with result of previous study that SES is a salient factor in hypertension pathogenesis and management

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013

(*McMurray et al, 2000; Lynch et al, 2007*). SES might be independently associated with hypertension care which could affect factors such as disease awareness and knowledge, health-promoting behaviours, access to health care, and family and social support (*Morenoff et al, 2007*). There is the need to improve social equalities in terms of health services, social welfare and health education on various lifestyle modifications.

In line with studies on knowledge, attitude and practice (KAP), this present study has some limitations which bothered on non-availability of standardized instrument for KAP of exercise for BP control which has been employed previously or in other settings. However, the questionnaire used in this study was subjected to various psychometric processes. Furthermore, the sample size used in this study may limit its generalizability, however, the study employed a multi-venue approach reduce sampling bias.

Clinical Implication of findings: Epidemiological studies suggest that exercise is efficacious in BP control. Exercise has multiple benefits for patients with hypertension thereby reducing the risk of cardiovascular event and mortality. Unfortunately, most patients with hypertension are placed on pharmacological therapy exclusively. Although some informed physician often advise patients with hypertension to engage in exercise programme. Some even assume the role of exercise experts without adequate knowledge of exercise prescription and training. Furthermore, there seems to be insufficient number of physical therapists who are skilled in exercise prescription and management of high risk patients such as the hypertensives. In line with emerging evidence-based practice, it behooves the physical therapists to have empirical data on the perception of patients with hypertension towards exercise for BP control and also to understand the limiting and facilitators of exercise practice for BP control. This present study provided insight into exercise practice of patients with hypertension and also evaluated the influence of knowledge and attitude towards exercise on exercise practice. The outcome of this study may serve as leverage for future study on the use of exercise in prevention and management of hypertension.

Conclusion: Practice of exercise for blood pressure control was low among Nigerian patients with hypertension which was significantly influenced by poor knowledge of and negative attitude towards exercise practice for blood pressure control. Education significantly influenced knowledge, attitude and practice of exercise for BP control. Concerted efforts are needed in improving knowledge of exercise in order to maximise its benefits for prevention and management of hypertension.

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Date of Communication: Nov. 26, 2013
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SJIF IMPACT FACTOR 2013=4.65

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Chest Physiotherapy Techniques Used in Neonatal & Paediatric Intensive Care Units in Punjab

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Abstract

The purpose of this study was to observe the common chest physiotherapy techniques (CPT) used by physiotherapists in Neonatal and Paediatric Intensive Care Units (NICU &PICU) in the hospitals located in Punjab. The design of the study was exploratory cross sectional survey. Data was collected with the help of standardised questionnaire, which was sent to one hundred thirty therapists who worked in thirty eight different hospitals in Punjab and these hospitals have claimed physiotherapy facilities in their NICU and PICU premises. A period of two weeks was given to the therapists for the completion of questionnaire. If the therapists were not able to send the filled questionnaire within two weeks, then a reminder call was given to them for the next two consecutive weeks. It was found that only eighty-four (i.e. 64.61%) completed questionnaires was received from the twenty five hospitals. It was concluded that percussion, vibration, suctioning, positioning, breathing exercises of CPT techniques were commonly practised in both PICU and NICU.

Key words: ICU, Neonatal, Paediatric, Physiotherapy, Punjab

Introduction

The precise role of the physiotherapists in the Intensive Care Unit (ICU) varies considerably from one unit to the other, depending on factors such as the country in which the ICU is located, local tradition, staffing levels, training and expertise. The referral process is one such example of this variation. In some ICU's, physiotherapists assess all patients, whereas in other ICU's patients are seen only after referral from medical staff. Despite the emphasis on multidisciplinary team, the lack of role definition has resulted in many specialist physiotherapy services being subsumed by other professional groups, mostly nursing staff. Inspite of presence of strong evidence base to support the role of physiotherapists in the ICU, it has undermined the importance of providing specialist physiotherapists *(Jithendra et al, 2007).* NICU is a unit that provides high quality skilled care to critically ill neonates by offering facilities for continuous clinical, biochemical and radiological monitoring and use of life support systems with the aim of improving survival of babies *(Fernandez and Mondkar, 1993).* Pediatric intensive care unit is an area within a hospital specialising in the care of critically ill

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013

SJIF IMPACT FACTOR 2013=4.65

infants, children, and teenagers. The ratio of professionals to patients is generally higher than in other areas of the hospital, reflecting the acuity of PICU patients and the risk of life-threatening complications *(Pronovost et al, 2001).*The role of ICU physical therapist is to promote healing and recovery and return the patient to the highest level of life participation and satisfaction. Physiotherapists are frequently found as members of the highly skilled team contributing to the infants' outcome. Although the physiotherapists role varies between neonatal intensive care units, it has traditionally focused on the respiratory care of infant, the education and training of physiotherapists and their role in relation to other health professionals, such as nurses varies greatly (*Hudson and Box, 2003).* The basic therapeutic principles in paediatric chest physiotherapy (CPT) are identical to those applied in adults. However, the child's growth and development results in continuing changes in respiratory structure and function, and the requirement for different applications of CPT in each age group *(Zach and Oberwaldner, 1987).* The objectives of CPT are to prevent or reduce the mechanical consequences of obstructing secretions, such as hyperinflation, atelectasis, maldistribution of ventilation, ventilation/perfusion mismatch and increased work of breathing.

Physiotherapy is sought when there is excess secretion, poor gas exchange, and increased work of breathing or radiologic evidence of atelectasis *(Vaishali et al, 2012).* Different techniques of cardiopulmonary physiotherapy including humidification, positioning, postural drainage, percussion, vibration and endotracheal suctioning *(Zach and Oberwaldner, 1999)* are being employed. The role of physiotherapist in the NICU has been associated with the care of neonate lung. Postural drainage with percussion, vibration and suction are incorporated in physiotherapy management. In some institutions around the world extubation are also performed by physiotherapists in accordance with the neonatal unit protocol. In addition to respiratory care, the physiotherapists are also engaged in assessment and management of neonates with either neurological or musculoskeletal disorders *(Bertone, 1988)*. The purpose of the study is to find the practice of Physiotherapy techniques and role of physiotherapists in the care of ill neonatal and pediatric population in NICU and PICU in Punjab state.

Materials & Methods

The design of the present study was exploratory cross sectional survey. The participants of the present study were physiotherapists and nurses who were working in NICU and PICU. They were requested to fill the questionnaire. A list of hospitals of Punjab state was obtained from the website of Govt. of Punjab, Department of Family and Health Welfare Society and also from various pediatricians across the state. Following which data collection was started from various hospitals and nursing homes in Punjab. The hospitals in Patiala district and nearby towns were personally visited by the investigator and data was collected from the therapists who were working in NICU and PICU. Questionnaires to the hospitals located in other districts of Punjab were sent either by e-mails or

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013
SJIF IMPACT FACTOR 2013=4.65

personally by fellow colleagues. The investigator did not get the opportunity to meet every therapist personally. Two weeks time was given to the respondents to fill the questionnaire and after that a reminder call was given to them after consecutive one week. The aim and objectives of the study were clearly stated in a cover letter attached to the questionnaire in order to obtain the consent of respondents. The respondents were made clear that the information gathered from them shall remain confidential and would be used only for research purpose. Some therapists filled the questionnaire immediately whereas others asked the investigator to leave the blank questionnaire and collect the filled one at a later date. The investigator distributed the questionnaire to 130 therapists. Repeated requests were made to them regarding to fill the questionnaire two times after 2 weeks. Even after repeated requests made to the respondents, 46 questionnaires were not obtained and only 84 filled questionnaires were collected. Thus the response rate of this survey was 64.61%.

Results

A total of 84 completed questionnaires were received out of 130 (64.61% response rate) and the largest response was from Patiala followed by Mohali, Bathinda, Ludhiana, Muktsar. Table 1 shows the physiotherapy techniques frequently used in PICU and it was found that 91.67% respondents were involved in oxygen therapy, 90.48 % in percussion, 77.38% in suctioning and nebulisation, 76.19% in breathing exercises, 73.80% and 72.62% in postural drainage and positioning respectively. 58.33% and 50% respondents were involved in assisted coughing and huffing and only 14.29% were involved in incentive spirometery.

Table 1: Chest Physiotherapy Techniques used in PICU

Chest Physiotherapy Techniques	N	Percentage
Percussion only	76	90.48%
Vibration only	57	67.86%
suctioning only	65	77.38%
Positioning (Supine, side-lying, prone)	61	72.62%
Breathing exercises	64	76.19%
Incentive spirometery	12	14.29%
Ambulating non intubated patients in PICU	27	32.14%
Aerosol therapy	33	39.29%
Nebulisation	65	77.38%
Oxygen therapy	77	91.67%
Postural drainage	62	73.80%
Forced expiratory technique	40	47.62%
Assisted coughing	49	58.33%
Assisted huffing	42	50%

Table 2: Chest Physiotherapy Techniques used in NICU

Chest Physiotherapy Techniques	N	Percentage
Percussion only	55	65.48%
Vibration only	48	57.14%
suctioning only	56	66.67%
Positioning (Supine, side-lying, prone)	53	63.09%
Aerosol therapy	12	14.29%
Nebulisation	64	76.19%
Oxygen therapy	56	66.67%
Postural drainage	36	42.86%

Table 2 shows the physiotherapy techniques frequently used in NICU, the nebulisation was used by maximum respondents with 76.19% and 66.67% respondents were involved in suctioning, 65.48% in percussion, 57.14% in vibration, 63.09% in positioning and only 42.86% respondents were involved in postural drainage.

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013

Table 3 shows that physiotherapy treatment techniques decided for patients and 57.1% respondents decided the techniques by discussing with doctors and 29% provided the physiotherapy treatment as per the prescription of doctor. Only 7% respondents decide techniques personally and 1.2% decides by discussing with nurses.

Table 3: Mode of Physiotherapy Treatment decided for patients

Physiotherapy Treatment	N	Percentage
Decided by Physiotherapist - personally	6	7.1%
Decided by Physiotherapist - discussing with doctors	48	57.1%
As per order of the doctor	29	34.5%
Decided by Physiotherapist - discussing with nurses	1	1.2%

Discussion

A total number of 48 hospitals were identified in Punjab with NICU and PICU facilities and 38 hospitals were invited for the study, out of which 25 responded. The investigator found very little or no considerable data regarding the role of Physiotherapy in NICU and PICU in India or any of its state and this study may be the first to report the practice of physiotherapy in NICU and PICU in Punjab state. *Lewis et al. (1992),* reported that, methods of chest treatment and the indicators for commencing chest treatment were similar throughout NICU in Australia. *Norrenberg et al (2000)* study also showed that almost 100% of the ICU physiotherapists performed respiratory therapy, mobilization and positioning whereas in the study of *Robyn et al (2001)* techniques used by therapists in neonatal intensive care units were postural drainage no tip (35%), postural drainage with tip (0%), non-specific positioning to alter ventilation (75%), vibrations (75%), percussion (75%), positioning prior to treatment (55%) and pre-extubation suction (55%). Other techniques used by physiotherapists in the overall management of neonates included water pillows (15%), peanut pillow (50%), nesting (90%) and techniques such as education, Fraser chair, bean bags and action pads (30%). Another study by *Jithendra et al (2007)* reported that 91% of the respondents were involved in chest manipulations (percussion, vibration, suctioning), 100% in mobilization, 100% in breathing exercises, 94% in incentive spirometery, 98% in postural drainage, 95% in assisted coughing in the ICU of India. Our study showed that 65.4% therapists were involved in Percussion, 57.14% in Vibration, 66.67% in suctioning, 63.09% in positioning, 42.86% in postural drainage in the NICU of Punjab. Other techniques used by the therapists were nebulisation (76.19%), oxygen therapy (66.67%), and aerosol therapy (14.29%) in the neonatal intensive care units whereas in the paediatric intensive care unit 90.48% therapists were involved in percussion, 67.86% in vibration, 77.38% in suctioning, 72.62% in positioning, 76.19% in breathing exercises, 14.29% in incentive spirometery, 73.80% in postural drainage, 47.62% in forced expiratory technique, 58.33% in assisted coughing, 50% in assisted huffing. Other techniques used by the therapists in paediatric intensive care unit were nebulisation (77.38%), oxygen therapy (91.67%), and aerosol therapy (39.29%). 32.14% therapists were also involved in ambulating no intubated patients in PICU. Less involvement of

Date of Communication: Nov. 26, 2013
Date of Acceptance: Dec. 25, 2013
SJIF IMPACT FACTOR 2013=4.65

therapists in NICU may be because of critical conditions of the neonates or because of lack of exposure to neonate population. In our study 57.1% respondents reported that treatment techniques applied to the patient were given after discussing with the doctor, 34.5% responded that they provide physiotherapy as per the order of the doctor and only 7.1% respondents decides personally about the treatment. 1.2% respondents also reported that they provide treatment after discussing with the nurses.

Conclusion: It was concluded that majority of CPT techniques were used in PICU as compared to NICU. It may be due to lack of exposure to neonate population or because of critical condition of the neonates and physiotherapy should be standard routine management of patients in intensive care units.

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A Comparison of Nerve Conduction Properties in Male and Female of 20 to 30 Years of Age Group

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Abstract

Objective: The study aimed to compare nerve conduction properties of both gender in 20-30 age group. Method: Total 70 subjects of both genders ranging in age between 20 to 30 years were selected as per inclusion and exclusion guidelines of the study. Nerve conduction properties of median and ulnar nerves of both genders were recorded as per set guidelines. Result: Gender has definite effects on, latency, amplitude and conduction velocity of motor and sensory nerves. These effects are not identical in different motor and sensory nerves. Females had higher amplitude and conduction velocity in both motor and sensory stimulation of median and ulnar nerves, whereas, motor and sensory latency of median and ulnar nerve is higher in males.

Key words: Gender, Median Nerve, Ulnar Nerve, H- reflex, Amplitude, Latency

Introduction

In the recent years electro-diagnostic studies have been identified to play a key role in the evaluation of patients with various neuromuscular disorders. The nerve conduction studies are most often used to diagnose disorders of the peripheral nervous system. Conduction velocity of the nerves depends on the fibre diameter, degree of de-myelination and internodal distance. Motor nerve conduction studies require stimulation of a peripheral nerve while recording from a muscle innervated by the nerve. Sensory nerve conduction studies are performed by stimulating a mixed nerve while recording from a mixed or cutaneous nerve. These studies have been used clinically for many years to identify the location of peripheral nerve disease in single nerves and along the length of nerves and to differentiate these disorders from diseases of muscle or neuromuscular junction *Aminoff (1999)*. It is a diagnostic tool for various neuropathies. The nerve conduction velocity is the speed at which an electrical stimulus passes through the nerves. The motor nerve conduction velocity (MNCV) is performed by the electrical stimulation of a peripheral nerve and by using the recording from a muscle which is supplied by this nerve. The time it takes for the electrical impulse to travel from the stimulation site to the recording site is measured. This value is called the latency and it is measured in milliseconds (ms). The size of the response called the amplitude is also measured. The motor amplitudes are measured in millivolts (mv). Routine nerve conduction study

Date of Communication: Dec. 10, 2013
Date of Acceptance: Jan. 15, 2014

SJIF IMPACT FACTOR 2013=4.65

includes assessment of compound muscle action potential (CMAP) and sensory nerve action potentials (SNAP) of accessible peripheral nerves. Commonly measured parameters of CMAP include latency, amplitude, duration, conduction velocity and late response, e.g. F-waves. Similarly for SNAP, latency, amplitude, duration and conduction velocity are routinely measured.

There are several factors which may influence nerve conduction study such as temperature, age, height, BMI etc. *(Campbell et al, 1981, Soudmand et al, 1982, Kimura, 1984, Robinson et al, 1993, Falco et al, 1994).* They have to be taken into consideration while doing nerve conduction study. However, these factors vary according to different geographic region. Many studies have been published regarding normative data from Western countries with cold climatic condition *(Kumar & Gill, 1985, Falco et al, 1992, Hennessey et al, 1994).*

The present study was designed to compare the effect of gender on nerve conduction properties of dominant hand in selective nerves. In the present endeavour the motor as well as sensory nerve conduction properties of Median and Ulnar nerve in both sex of subjects have been evaluated.

Materials & Methods

This study was done in 70 (35 males and 35 females) healthy adults of age between 20-30 yrs either sex in the Prem Physiotherapy and Rehabilitation College, Panipat. An informed written consent was taken from the volunteers and they were screened to exclude any history of orthopaedic, systemic or neuromuscular disorder by relevant history taking with psychological, musculoskeletal and neurological examination. Subjects were excluded if any of them did not fit to the inclusion criteria. All the participants were examined through NEUROPERFECT 2000 machine, which was used to check nerve conduction properties of the subjects. Nerve conduction properties were evaluated by using standard techniques of supramaximal percutaneus stimulation with a constant current stimulator and surface electrode recording for both nerves of each subject. The room temperature of the laboratory was maintained at the thermo neutral zone i.e. 26±2 degree Celsius.

The motor and sensory evaluations were performed on the ulnar and the median nerves in the present study. The ground electrode was placed on the dorsum of the hand, between the stimulating and the recording electrodes. For the motor evaluation, the active electrodes were placed over the motor point of the abductor pollicis brevis for the median nerve, and over the abductor digiti minimi for the ulnar nerve. The reference electrode was placed 3 cm distal over the 1st metacarpo-phalangeal joint for the median nerve and over the 5th metacarpo-phalangeal joint for the ulnar nerve. The sites of stimulation for both were the wrist, elbow and the axilla. With surface electrodes, distal stimulations were performed at the wrist (3cm proximal to the distal wrist crease) between the flexor carpi radialis and the Palmaris longus tendon for the median nerve, while they were performed posterior to the flexor carpi ulnaris for the ulnar nerve. Similarly stimulation of the median nerve at the elbow was performed

Date of Communication: Dec. 10, 2013
Date of Acceptance: Jan. 15, 2014

medial to the biceps tendon, on the volar crease of the brachial arterial pulse, whereas for the ulnar nerve, stimulation was 3-4cm distal to the medial epicondyle, with the wrist and the elbow in 90° of flexion *(Harding & Haler, 1983).* For the proximal stimulation the stimulation was given at Axilla for both nerves *(Checkles et al, 1971).* For the sensory studies, the median and the ulnar nerves were examined antidromically. The ring electrode was placed over the 2nd and 5th digits to record the responses along the median and the ulnar nerves, respectively. The reference electrode was placed about 3 cm distal to the ring electrode. The median nerve stimulation was performed 14 cm proximal to the active electrode and medial to the flexor carpi radialis tendon. For the ulnar sensory nerve, the stimulation was performed 10cm proximal to the active electrode and posterior to the flexor carpi ulnaris tendon *(Mishra & Kalita, 2006).*

Results & Discussion

75 healthy volunteers (35 males & 35 Females) of 20 to 30 years of age group were included in the study. Mean age for males was 23.74±2.5 years and in female it was 22.65±1.69 years. Average height of the males was 171.9±7.3 cm and of the females was 154.3±4.35 cm. The mean weight of male sample was 66.17±11.04 kg and of the females was 55.69±10.54 kg. The B.M.I for males was 22.43±2.82 and that of females was 23.36±3.99. Among the physical parameters height, weight are observed to reveal statistically significant differences between males and females. Males had greater height, weight, than that of the females. However, gender wise differences in body mass index were not found to be statistically significant.

Effect of gender on motor nerve conduction study variables:

- Motor latency of median nerve is longer in males than females but in statistical sense the differences are not significant.
- Motor amplitude of Median nerve in females is higher than males but but in statistical terms the differences are not significant..
- Motor velocity of median nerve in females is statistically significantly greater as compared to males.

Table 1: Comparison of motor median & ulnar nerve conduction properties of males & females

Nerve	Gender	Motor Nerve Conduction Properties		
		Latency Mean±SD	Amplitude Mean±SD	Velocity Mean±SD
Median	Male	2.99 ±0.49	7.90 ±4.17	54.44 ±6.44
	Female	2.72 ±0.68	8.72 ±3.44	57.85 ±5.13
Ulnar	Male	2.73 ±0.99	6.61 ±2.51	50.93 ±8.17
	Female	2.60 ±0.58	8.42 ±2.12	53.97 ±5.92

- Average Motor latency of ulnar nerve is observed to be longer in males than females but in statistical sense the differences are not significant.
- Mean Motor amplitude of ulnar nerve in females is observed to be significantly greater than the males.
- Mean Motor conduction velocity of ulnar nerve in females is greater than males but in statistical sense the differences are not significant.

Effect of gender on Sensory nerve conduction study variables:

- Mean Sensory latency period of median nerve is observed to be longer in males than the females

Date of Communication: Dec. 10, 2013
Date of Acceptance: Jan. 15, 2014
SJIF IMPACT FACTOR 2013=4.65

with statistically significant differences.

Table 2: Comparison of sensory median & ulnar nerve conduction properties of males & females

Nerve	Gender	Sensory Nerve Conduction Properties		
		Latency Mean±SD	Amplitude Mean±SD	Velocity Mean±SD
Median	Male	2.30±0.59	14.65±5.55	49.57±9.20
	Female	2.06±0.28	12.08±4.62	56.55±6.46
Ulnar	Male	2.32±0.42	12.03±9.35	45.82±9.19
	Female	2.11±0.23	12.85±4.57	49.85±5.45

- Average Sensory amplitude of Median nerve has been observed to be greater in males than the females but in statistical sense the differences are not significant.
- Mean Sensory conduction velocity of median nerve in females is observed to be significantly greater as compared to the males.
- Average sensory conduction velocity, sensory latency period are observed to show statistically significant differences among the males and females with males demostraing significantly longer sensory latency period and females demonstrate signicantly faster sensory conduction velocity.
- Sensory amplitude of ulnar nerve in females is higher than males but in statistical sense the differences are not significant.

Discussion:

This study examined the nerve conduction parameters of the two commonly tested nerves i.e the median and the ulnar nerves, in the upper limbs of a healthy adult population of both gender in Haryana.

In our study, latencies of both the nerves i.e median and ulnar for motor and sensory were observed to be longer in males than the females which are similar to previous researches done by *LaFratta & Smith, (1964), Stetson et al, (1992), Falck & Stålberg, (1995), Shehab, (1998), Kimura, (2005).* Probably, the reason behind this finding may be the greater height and limb length of the male volunteers.

According to *Kimura,* gender related amplitude differences persist despite of the adjustment of height. *Huang et al, (2009)* found that female subjects had higher median and ulnar sensory amplitude. *Robinson et al (1993)* in their study found that three of the four sensory amplitudes were larger in women; two of four motor amplitudes were larger in men and women had significantly faster conduction velocities than men for all nerves except median motor. Our study has some similarity and some dissimilarity with this study, in our study all the four motor and sensory nerve amplitudes of both the nerves were higher in the females than males. Whereas the conduction velocity for motor and sensory of median and ulnar is observed to be greater in females. *Hennessey et al (1994)* in their study found that women had greater SNAP amplitude than men in the upper limb nerves (median, ulnar, and radial) which is in accordance with our study. Whereas *Stetson et al (1992)* in their study in the upper limb nerves (median, ulnar) confirmed that gender did not have any statistically significant effect on

Date of Communication: Dec. 10, 2013
Date of Acceptance: Jan. 15, 2014

SNAP amplitude.

Conclusion: The overall mean motor and sensory nerve conduction parameters for the median and the ulnar nerves correlated favourably with the literature data. Gender has definite effects on, latency, amplitude and conduction velocity of motor and sensory nerves. These effects are not identical in different motor and sensory nerves. Females had higher amplitude and conduction velocity in both motor and sensory stimulation of median and ulnar nerve. Where as motor and sensory latency of median and ulnar nerves are observed to be higher in males.

The results of the present study have many similarities and some dissimilarity with the reported NCS variables, the probable reasons could be the true differences among populations, and small sample size.

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A Study of Speed, Power & Fatigue Index of Cricket Players

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Abstract

The purpose of this investigation was to study speed, power and fatigue index of under 19 year cricket players. The design of this study required participants to perform six sprints each of 35 meter. Thirty one (N=31) trained male cricketers between the ages of 15 and 19 years volunteered for this study. The mean age, height and weight of cricketer were 16.81±1.13year, 172.23±6.85cm and 61.33±8.93Kg respectively. The mean sprint time of each 35m sprints-of cricketers was 5.39±0.34 seconds, 5.53±0.31 seconds, 5.61±0.36 seconds, 5.85±0.26 seconds, 5.94±0.25seconds and 6.07±0.17 seconds. The mean power-1, 2,3,4,5 and 6 of cricketer was 491.00±105.90 watts, 454.90±94.81watts, 435.23±90.49 watts, 382.84±78.54watts, 364.68±78.62watts and 339.94±58.96watts.The maximum power, minimum power and average power of cricketer was 511.55±94.97watts, 333.71±65.83watts, and 411.42±73.59 watts. It was concluded from the results of this study that sprint time and power decline in cricketer may be due to reduced energy production via anaerobic glycolysis and muscle acidosis.

Key words: Speed, Power, Anaerobic glycolysis, Fatigue

Introduction

Although cricket is one of the oldest organized sports, there is a relative lack of scientific research of this sport or its players. Very few studies of the physical and physiological demands of cricket playing are available in the literature *(Woolmer & Noakes, 2008; Christie & King, 2008).* International cricket is undergoing a phase of rapid change as it competes to attract a more global audience. International cricketers are now exposed to greater demands reflected by more five-and one day matches per season, longer seasons and more frequent touring *(Noakes & Durandt, 2000).* Thus, there is a real need to understand critically the physiological demands of modern cricket, initially for the benefit of individual players and teams, but eventually for the survival and growth of the game itself. Due to the nature of cricket that demands varying degress of intermittent activities such as batting, bowling, fielding, anaerobic power and capacity is of great interest to those involved in the sport, as most rely heavily on players' ability to move quickly and powerfully. Sprint running times have been shown to be well correlated to peak and mean power output *(Patton & Duggan, 1987).* The purpose of this investigate was to evaluate the speed, power and fatigue index (i.e. anaerobic power and capacity) of under 19 year cricket players.

Materials & Methods

The design of this study required participants to perform six sprints each of 35 meter. A rest of 10 second was given to the participants between each sprint. Thirty one (N=31) trained male cricketers between the ages of 15 and 19 years of Punjab Cricket Academy volunteered for

Date of Communication: Dec. 10, 2013
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SJIF IMPACT FACTOR 2013=4.65

this study. Sprint running style requires specific set of technique for the assessment of anaerobic power and capacity. Hence, a cricketer population was deemed to be more familiar with the skill set required for cricket style than the athletes of other sports. The use of trained participants with experience of sprint running style has generated no questionable results either due to inefficiency of movement due to lack of familiarity or due to the physiological adaptations of completely unfamiliar training. The power and fatigue index was calculated using the equations of *Draper and Whyte (1997).*

Statistical Analysis

Statistical analysis was performed with SPSS version 16.0 (free trial, SPSS Inc, Chicago). Mean and Standard Deviation was observed for age, height, weight, speed, power and fatigue index.

Results & Discussion

The mean age, height and weight of cricketer were 16.81±1.13year, 172.23±6.85cm and 61.33±8.93Kg respectively. The mean sprint time 6 sprints of each 35m with rest intervals of 10s between each trial of the cricketers was 5.39±0.34 seconds, 5.53±0.31 seconds, 5.61±0.36 seconds, 5.85±0.26 seconds, 5.94±0.25seconds and 6.07±0.17 seconds (Table 1). The mean power-1, 2,3,4,5 and 6 of cricketers at each trial was 491.00±105.90 watts, 454.90±94.81watts, 435.23±90.49 watts, 382.84±78.54watts, 364.68±78.62watts and 339.94±58.96watts respectively. In addition, the maximum power, minimum power and average power of cricketer was 511.55±94.97watts, 333.71±65.83watts, and 411.42±73.59 watts (Table 1).

Table 1: Descriptive Statistics of male cricketers

Variables	Mean	SD
Age, year	**16.81**	**1.13**
Height, cm	**172.23**	**6.85**
Weight, kg	**61.38**	**8.93**
Sprint time-1,seconds	**5.39**	**0.34**
Sprint time-2,seconds	**5.53**	**0.31**
Sprint time-3,seconds	**5.61**	**0.36**
Sprint time-4,seconds	**5.85**	**0.26**
Sprint time-5,seconds	**5.94**	**0.25**
Sprint time-6,seconds	**6.07**	**0.17**
Power-1,watts	**491.00**	**105.90**
Power-2,watts	**454.90**	**94.81**
Power-3,watts	**435.23**	**90.49**
Power-4,watts	**382.84**	**78.54**
Power-5,watts	**364.68**	**78.62**
Power-6,watts	**339.94**	**58.96**
Maximum power, watts	**511.55**	**94.97**
Minimum power, watts	**333.71**	**65.83**
Average power, watts	**411.42**	**73.59**
Fatigue index	**5.20**	**1.92**

The mean fatigue index of cricketers was 5.20 ± 1.92 (Table 1). Table 2 shows absolute and percent increase in time among six different sprint times. It was found that the maximum absolute and percent increase value of sprint time was 0.68 seconds & 12.61 % (sprint time-1 vs. sprint time-6) followed by 0.55 seconds & 10.20% (sprint time-1 vs. sprint time-5), 0.54seconds & 9.76 % (sprint time-2 vs. sprint time-6), 0.46 seconds & 8.53 % (sprint time-1 vs. sprint time-4), 0.46 seconds 8.19 % (sprint time-3 vs. sprint time-6) and 0.41 seconds and 7.41 % (sprint time-2 vs. sprint time-5). Thus, it was observed that the time taken by the subjects for the completion of sprint-1 was minimum (5.39±0.34 seconds) then there was an increase in the value of time for the subsequent sprint-2 (5.53±0.31 seconds), sprint-3(5.61±0.36 seconds), sprint-

Date of Communication: Dec. 10, 2013
Date of Acceptance: Feb. 10, 2014

SJIF IMPACT FACTOR 2013=4.65

4(5.85±0.26 seconds), sprint-5(5.94±0.25 seconds) and sprint-6(6.07±0.17 seconds) trials.

Table 2. Mean ±SD of absolute & percent change in time for different sprints

Variables	Mean±SD	Absolute	%percent
Sprint time-1 vs. time-2	5.39±0.34 vs. 5.53±0.31	0.14	2.59
Sprint time-1 vs. time-3	5.39±0.34 vs. 5.61±0.36	0.22	4.08
Sprint time-1 vs. time-4	5.39±0.34 vs. 5.85±0.26	0.46	8.53
Sprint time-1 vs. time-5	5.39±0.34 vs. 5.94±0.25	0.55	10.20
Sprint time-1 vs. time-6	5.39±0.34 vs. 6.07±0.17	0.68	12.61
Sprint time-2 vs. time-3	5.53±0.31 vs. 5.61±0.36	0.08	1.44
Sprint time-2 vs. time-4	5.53±0.31 vs. 5.85±0.26	0.32	5.78
Sprint time-2 vs. time-5	5.53±0.31 vs. 5.94±0.25	0.41	7.41
Sprint time-2 vs. time-6	5.53±0.31 vs. 6.07±0.17	0.54	9.76
Sprint time-3 vs. time-4	5.61±0.36 vs. 5.85±0.26	0.24	4.27
Sprint time-3 vs. time-5	5.61±0.36 vs. 5.94±0.25	0.33	5.88
Sprint time-3 vs. time-6	5.61±0.36 vs. 6.07±0.17	0.46	8.19
Sprint time-4 vs. time-5	5.85±0.26 vs. 5.94±0.25	0.09	1.53
Sprint time-4 vs. time-6	5.85±0.26 vs. 6.07±0.17	0.22	3.76
Sprint time-5 vs. time-6	5.94±0.25 vs. 6.07±0.17	0.13	2.18

Table 3 shows absolute and percent decrease in power for six different sprints. It was found that the maximum absolute and percent decrease value of power was -152watts & -30.95% (Power-1 vs. Power-6) followed by -127watts & -25.86% (Power-1 vs. Power-5),-115watts & -25.33% (Power-2 vs. Power-6), -109watts -22.19% (Power-1 vs. Power-4),-96watts & -22.06% (Power-3 vs. Power-6), -90watts & -19.82% (Power-2 vs. Power-5).,-71watts & -16.32% (Power-3 vs. Power-5) and -72watts & -15.85% (Power-2 vs. Power-4).Thus, it was observed that the maximum value of power was 491.00±105.90 watts for power-1 (i.e. during sprint-1) then there was a gradual decrease in the value of power for the subsequent sprints i.e. power-2(454.90±94.81watt), power-3(435.23±90.49watt), power-4(382.84±78.54watt), power-5(364.68±78.62watt) and power-6(339.94±58.96watt).

Table 3. Mean ±SD of absolute & percent change in Power for different sprints

Variables	Mean±SD	Absolute	%percent
Power-1 vs. Power-2	491.00±105.90 vs. 454.90±94.81	-37	-7.53
Power-1 vs. Power-3	491.00±105.90 vs. 435.23±90.49	-56	-11.40
Power-1vs. Power-4	491.00±105.90 vs. 382.84±78.54	-109	-22.19
Power-1 vs. Power-5	491.00±105.90 vs. 364.68±78.62	-127	-25.86
Power-1 vs. Power-6	491.00±105.90 vs. 339.94±58.96	-152	-30.95
Power-2 vs. Power-3	454.90±94.81 vs. 435.23±90.49	-19	-4.18
Power-2 vs. Power-4	454.90±94.81 vs. 382.84±78.54	-72	-15.85
Power-2 vs. Power-5	454.90±94.81 vs. 364.68±78.62	-90	-19.82
Power-2 vs. Power-6	454.90±94.81 vs. 339.94±58.96	-115	-25.33
Power-3 vs. Power-4	435.23±90.49 vs. 382.84±78.54	-53	-12.18
Power-3 vs. Power-5	435.23±90.49 vs. 364.68±78.62	-71	-16.32
Power-3 vs. Power-6	435.23±90.49 vs. 339.94±58.96	-96	-22.06
Power-4 vs. Power-5	382.84±78.54 vs. 364.68±78.62	-18	-4.71
Power-4 vs. Power-6	382.84±78.54 vs. 339.94±58.96	-43	-11.25
Power-5 vs. Power-6	364.68±78.62vs. 339.94±58.96	-25	-6.86

Discussion

The repeated sprint ability (RSA) tests which have been performed in

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Date of Acceptance: Feb. 10, 2014

previous studies involved 6x40 m sprints departing every 30s *(Dawson et al., 1993).* These studies recorded mean performance decrements of 5.6% and 5.3%, respectively. The present study also provides a similar mean performance decrement (i.e. sprint time) of 2.59%, 4.08%, 8.53%, 10.20%, and 12.61% respectively (Table 2). During 6x40 m sprints departing every 30s, approximately 2 - 3s of additional sprinting is performed for each sprint. This would be expected to deplete the CP stores during each sprint to a greater extent than the protocol used in the present study *(Hirvonen et al., 1987).* However, these previous RSA test protocols also provide an additional 7 - 8s of recovery. These longer recovery periods may offset the additional 2 - 3s of sprinting and allow for similar proportions of phosphagen depletion and resynthesis when compared with the sprint protocol used in this study. In the present investigation, sprint time, power and fatigue index was used as an indirect measure of anaerobic glycolytic energy production in the under 19 year cricketers. The results showed that power following sprint-1 to sprint-6 declined. Moreover, the decline in power was related to increases in running times. Therefore, these data support the view that reduced energy production via anaerobic glycolysis in cricketers may be a factor in the deterioration in sprint performance *(Reaburn and Dascombe, 2009).* In our study, results, suggesting muscle acidosis might have played a role in the fatigue response among these cricketers in different sprint runs.

Conclusion: It was concluded from the results of this study that sprint time and power decline in cricketer may be due to reduced energy production via anaerobic glycolysis and muscle acidosis.

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Comparision of Ankle Joint Range of Motion on Balance Score in Healthy Young and Adult Individuals

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Abstract

Background and Introduction: Flexibility at the ankle joints provides an important contribution to safe execution of many functional tasks in our day to day activities like walking, negotiating stairs, rising from a chair and added efficiency in the maintenance of postural stability. Lack of mobility at ankle joint leads to inefficient balance and frequent falls. A number of studies have been performed for falls in elderly and analyzed the composition of sway in adults and ''healthy'' elderly people. In this study comparison of ankle joint range of motion on balance score in healthy young and adult individuals is done. *Method:* 30 subjects were selected according to the inclusion and exclusion criteria. Subjects were measured for active and passive ankle dorsiflexion and plantar flexion in high sitting position to measure range of motion at ankle joint. Then subjects went through Functional reach test and Timed up and go test and score was measured and noted. *Results:* Analysis of the relation between balance score and joint range of motion showed that ankle joint range of motion and balance are mutually dependent. *Conclusion:* The result of study shows that there is decrease in ankle joint range of motion with increasing age and thus affects balance also.

Key Words: Ankle joint range of motion, balance score

Introduction

The ankle is a complex joint that connects the foot to the lower leg. A hinge joint formed by the articulation of the tibia and the fibula with the talus below also called mortise joint. It bears up to eight times the body weight when one runs. Normal ankle function is needed to walk with a smooth and nearly effortless gait. The muscles, tendons, and ligaments that support the ankle joint work together to propel the body *(Chaurasia, 2012).* Flexibility at the ankle joints provides an important contribution to safe execution of many functional tasks (e.g. walking, negotiating stairs, rising from a chair) and added efficiency in maintenance of postural stability *(Nitz & Nancy, 2004).* Consequently it is impossible to stand motionless as even when standing quietly on both feet, the body sways over its base of support. The basic requirement for standing balance is that the position of the body's centre of mass is held within the boundaries of the base of support established by the feet *(Maki & McIlroy, 1998).* Flexibility at the ankle joint is directly related to the balance. Balance is defined as the ability to control body mass or centre of gravity to base of support *(Gordon & Ghez, 1991).* Balance is a complex process involving reception and integration of sensory inputs and the planning and execution of movements to achieve a goal requiring upright posture. The ability to control postural balance is a prerequisite to performing many of the

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SJIF IMPACT FACTOR 2013=4.65

activities of daily living, and underpins the ability to maintain an independent lifestyle. Balance control is a complex system of coordinated muscular responses, dependent on somatosensory, vestibular and visual information *(Johansson & Magnusson, 1991).* Inaccurate or insufficient information from any of these sensory receptors or impairment affecting the processing of these messages can disturb the triggering and regulation of movement *(Quoniam et al, 1995).* The ability to maintain balance in stance and locomotion is thus dependent on the integrity of the receptor systems. Ankle movements are also necessary for muscular responses used to maintain perturbations to balance, such as rapid compensatory stepping movements**.** Recent studies highlight the importance of compensatory stepping to preserve stability, and the spatial and temporal demands placed on the control of this reaction. Age-related changes in the control of stepping could greatly influence the risk of falling *(McIlroy & Maki, 1996).*

Loss of joint range is considered to be a part of normal aging process. Therefore, decreased ankle range of motion with age may require altered movement patterns which may compromise balance, thus limiting functional activities such as ambulation with aging; there is a significant deterioration in balance control mechanisms *(Woollacott, & Shumway-Cook, 1990).* Loss of balance and falls in the elderly constitute a major problem associated with human suffering as well as high costs for society *(CDC, 2006).* Falls might occur during various daily activities, such as tripping or tangling the feet, reaching movements or bending *(Maki & McIlroy, 1996).* Many of these activities are constrained by limits of stability (LOS). The cause of falls in the elderly is multifactorial *(Tinetti, 2003).* Amongst the many factors described, the fact that the aging process results in reduced joint flexibility and reduced afferent sensory information is well established. All joints show a significant reduction in range of motion (ROM) with age. Ankle dorsiflexion (knee extended) shows the greatest age-related decline *(James & Parker, 1989).* Decrease in dorsiflexion ROM is associated with normal aging in both men and women *(Lung et al, 1996, Gadjosik et al, 1999).* Fallers show a reduced ankle ROM *(Kemoun et al, 2002).* LOS can be described as the maximum distance a person can intentionally displace his/her centre of gravity, and lean his/her body in a given direction without losing balance, stepping or grasping. Accordingly, one's LOS capacity is likely to be an important prerequisite for the successful planning and execution of movements such as using a step stool to reach into a high cabinet as well as bending over from standing position to pick up an object from the floor. In the human body the high centre of gravity, together with the small base of support in standing, place the body in unstable equilibrium. Balance is continually challenged by destabilizing internal perturbations from neuromuscular noise and hemodynamic *(Conforto et al, 2001),* as well as by the force of gravity, perturbations from volitional movement (e.g. turning, bending) and interactions with the environment. Adequate postural control depends on the spatial and temporal integration of vestibular, visual,

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Date of Acceptance: Dec. 18, 2013
SJIF IMPACT FACTOR 2013=4.65

and somatosensory information about the motion of the head and body, and the generation of appropriate responses to that motion. The increased incidence of falls in the older population suggests that one or more of these components degenerate with age. Diminished visual, vestibular, and somatosensory function and slowing of sensorimotor processing all occur with normal aging, and older people are also at higher risk for many diseases affecting the peripheral and central nervous system *(Horak et al, 1989).* In addition to decreases in muscle strength and slower neural processing, there are a number of sensory changes that may contribute to unsteadiness in the elderly. These include age-related decreases in the number of hair cells in both the canals and the otolith organs, and in the number of nerve fibers in the vestibular nerve, eventually resulting in reduced vestibular excitability *(Rosenhall, 1973, Bergstrom, 1973, Rosenhall & Rubin, 1975).* Elderly also show a significant decrease in the sensitivity of vision to low frequency spatial motion *(Sekuler & Hutman, 1980).* The study was conducted to compare the ankle joint range of motion on balance score of healthy young and adult individuals

Materials and Methods:

The study was conducted on 30 subjects belonging to Delhi region with random sample selection. Individuals who fulfilled the inclusion and exclusion criteria and gave written consent for participation were selected and divided into two groups made for the purpose of comparison including randomly allocated 15 subjects in each group**.** The purpose of this study was explained to the subjects. All the subjects fulfilling the inclusion and exclusion criteria who volunteered to participate in the study were described verbally about the procedure to be used in the study. Testing was performed only after informed consent was taken from the subjects.

Following procedures were performed -

Measurement of dorsiflexion and plantar flexion range-

Subject was placed in high sitting position on a plinth. A double arm goniometer was used to measure the range of motion. Fulcrum was placed on the lateral malleoli, stable arm of goniometer along the tibia in such a manner that a imaginary line joining the lateral malleoli and head of fibula. Foot was maintained in 90 degree position to the tibia, movable arm of the gonio was placed parallel to V Metatarsal. Now subject was asked to move the ankle upward (active dorsiflexion). Then after maintaining the initial position, subject was asked to take his foot in downward direction (active plantar flexion). After that, whole procedure was repeated passively to take passive dorsi flexion and planter flexion range of motion.

Functional Reach Test (FRT) (Duncan, 1991)

- Subject staood with feet shoulder width apart and with the arm raised to 90 degrees of flexion along a yardstick placed at humeral level.
- Without moving the feet, the subject was asked to reach as far forward as possible while maintaining balance.
- 3 trials were given.
- The distance reached was measured, average of the three trials was taken and compared to age-related norms. While measurement were taken, it was kept in mind that readings were taken at

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Date of Acceptance: Dec. 18, 2013
SJIF IMPACT FACTOR 2013=4.65

metacarpo phalangeal joint line up and fist closed. Less than 7 inch reach is associated with frailty and increased fall risk.

Timed Up & Go Test (TUG) (Podsiadlo, and Richardson, 1991)

Instructions*:*

The person was allowed to wear their usual footwear and allowed to use any assistive device they normally use.

- The subject was asked to sit in the chair with their back to the chair and their arms resting on the arm rests.
- The subject was asked to stand up from a standard chair and walk a distance of 10 ft. (3m) and then turn around, walk back to the chair and sit down again. The time was measured from the point the subject started to rise from the chair to the end when he or she returned to the chair and sat down. Three trials were given and the average time of the three attempts was calculated. Data was collected and for the purpose of comparison and were analyzed to obtain the result.

Results & Discussion

Table 1: Physical characteristics of the subjects

	GROUP A	GROUP B
N	15	15
Male (N)	6	8
Female (N)	9	7
Mean age (SD)	21.53 (0.915)	51.46 (5.208)
Mean height (SD)	5.25 (0.393625)	5.18 (0.447413)
Mean weight (SD)	58.73 (13.46671)	61.46 (11.54412)

Table 2: Comparison of mean active dorsiflexion and planter flexion range of motion in the two groups

	Mean Active Dorsiflexion ROM (SD)	Mean Active Plantar flexion ROM (SD)
GROUP A	15.33(2.43975)	43.66(6.904105)
GROUP B	14.13(2.030717)	41.26(3.261609)

Table 3: Comparison of Mean passive dorsiflexion and plantar flexion range of motion in in the two groups

	Mean Passive Dorsiflexion ROM, (SD)	Mean Passive Planter flexion ROM, (SD)
GROUP A	24.6(3.5817)	60.4(7.962412)
GROUP B	20.2(3.820995)	50.4(7.509993)

Table 4: Comparison of Mean Functional Reach score (FRT) Scores among the two groups

	GROUP A	GROUP B
Mean FRT score	8.05	4.19
SD	1.49	0.70

Table 5: Comparison of Mean Timed Up & Go score (TUG) Scores among the two groups

	GROUP A	GROUP B
Mean TUG score	6.787	11.155
SD	0.713	3.1145

The results of present study showed a statistically significant lower ankle joint range of motion in the older age group. A number of studies have already revealed that this reduction in joint range is due to ageing. Ageing is a normal process in every individual's life and it can't be stopped. The process of ageing starts just after child takes birth. Ageing affects all the body parts ranging from cellular level to organ level. Some changes related to ageing have been observed in our joints also. Common changes related to increasing age seen in the joints are- increased stiffness of periarticular connective tissue, decreased movement about the ankle joint produced by a lower muscle force, loss of proprioceptors, decreased activity level.

Balance while walking, negotiating stairs, and even while standing need good flexibility, proprioception, and muscle strength in lower extremity. Ankle joint

Date of Communication: Nov. 28, 2013
Date of Acceptance: Dec. 18, 2013

plays a very critical role while walking and standing. All joints show a significant reduction in range of motion (ROM) with age. Ankle dorsiflexion (knee extended) shows the greatest age-related decline *(Tinetti, 2003).* Several studies have revealed a decrease in dorsiflexion ROM with normal aging in both men and women *(Lung et al, 1996, Gadjosik et al, 1999).* In our study, a significant reduction in dorsiflexion and as well as in planter flexion range of motion with increasing age has been observed that is in accordance with the above reports. The reduction in movement is not only limited to active movement of ankle but also to the passive movement as well. Mean Active Dorsiflexion ROM of group A is found to be 15.33 while for group B it is 14.33. Mean Active Planter flexion ROM of group A is found to be 43.66 and that of group B is 41.26. Differences are also seen in passive movements of ankle also. mean passive dorsiflexion ROM of group A is 24.6 while for group B it is 20.2. mean passive plantar flexion ROM of group A is 60.4 and for group B it is 50.4, suggesting that with increasing age, periarticular structures of ankle lose their flexibility.

According to *Kemoun et al, (2002), f*allers show a reduced ankle ROM. Despite the atrophy of the ankle musculature which occurs with aging, passive resistive torque of stretched connective tissue shows an increasing trend in older subjects *(Lung et al, 1996).* Adequate ROM of the ankle and MTP joints is an important prerequisite to enable balance and locomotion which are essential daily activities *(Lung et al, 1996).* and have found an age-related decrease in flexion of the first metatarso phalangeal (MTP) joint. In addition to the musculoskeletal aspects, control of balance requires coordinated activity of the neuromuscular system. Accurate sensory inputs are necessary to organize motor programs and to generate effective motor output responses *(Lung et al, 1996).* A good amount of proprioceptors and coordination is a prerequisite of good balance. However decrease in proprioceptors is also taken as a part of normal ageing process. Different parameters are used to measure the balance score. Out of the different parameters in the present investigation functional reach test and timed up and go test as a measure of balance score was taken. Significant differences are also found after comparing the balance score of group A and group B. Mean FRT score for group A is found to be 8.05 while for group B that comprise of older subjects, it is 4.19. So, from the above mentioned scores it is clear that group A individuals who are younger demonstrate significantly greater balance scores than group B individuals who are older. Scores predict that chances of falls in group B individuals are quiet higher than group A individuals. TUG scores also show that mean TUG score for group A is 6.78 and for group B it is 11.15. It shows that to cover particular distance group B individuals took much more time than group A individuals. It is suggestive of lowering of gait with age and lack of balance & flexibility

Interpretation- From the above mentioned data, it is clear that there is significant differences in the mean FRT values of group A & group B. Group A individual are having higher mean FRT values than group B individuals, showing good

Date of Communication: Nov. 28, 2013
Date of Acceptance: Dec. 18, 2013

flexibility of ankle joint and have good balance.

From the above mentioned data, it is also clear that there is significant difference in the mean TUG values of group A & group B. According to the scale mentioned by Hamilton County, individuals of group A are mostly independent (<20) while individuals of group B are Freely Mobile (<10), group B individuals are having comparatively higher risk of falls than group A individuals.

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Knowledge of Effect of Exercise on HIV-Infected Persons among Health Care Professionals in North Eastern Nigeria

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Abstract

Objectives: To investigate the knowledge of effect of exercise on HIV- infected persons among health care professionals. **Methods:** The study was conducted at the University of Maiduguri Teaching Hospital (UMTH), a tertiary referral center located in Maiduguri, northeastern Nigeria. Instrument for the study was self administered questionnaire validated by experts in cardiopulmonary physiotherapy and exercise physiology with reliability coefficient of 0.82, and distributed among 289 participants with response rate of 90%. **Results:** The age range and mean age of the participants were 20-59 years and 37.27 ± 7.75 respectively. Substantial number of the participants (46.2%) demonstrated good knowledge of effect of exercise on HIV-infected persons. The mean scores for nurses and dentists were quite low compared to each of the other health care professionals. **Conclusion:** More than a quarter of the participants lacked good knowledge on the effect of exercise on HIV-infected persons. This needs to be remedied through organized enlightenment programs.

KEY WORDS: Health Care Professionals; HIV-Infected Persons; Cardiopulmonary Physiotherapy; Highly Active Antiretroviral Therapy; Complementary Therapy; Tertiary Referral health institution

Introduction

HIV infection was hitherto a fatal condition but with the advent of highly active antiretroviral therapy (HAART) in 1996, it has since changed to a manageable chronic illness. *Cade et al. (2004)* observed that as a result of this breakthrough, a greater number of infected individuals live longer by overcoming the health related consequences and challenges associated with HIV. However, the resultant effect of this life-prolonging antiretroviral therapy is the increase in the pool of HIV infected persons *(Whiteside, 2002).* This increase in population has in turn escalated the societal burden of the disease, and led to high demand on health care services and resources *(Fido and Al Kazeemi, 2002).* Beside the health benefits of HAART, it has been observed that since the commencement of this therapy, some known and previously unrecognized adverse reactions that were not detected at the early clinical trials are now present. For instance, *Boufassa et al. (2001)* observed that apart from numerous health problems associated with the HIV infection itself, affected individuals also experience adverse effects arising from HAART that could affect the physical, physiological and psychosocial components of their health. Thus, persons

Date of Communication: Oct. 13, 2013
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SJIF IMPACT FACTOR 2013=4.65

living with HIV face a lot of health challenges that arise from the infection itself, knowledge of the fact that one is infected, the therapy used in the treatment of the disease or a combination of all these factors. While many of these health challenges are treatable with pharmacological agents, *Ciccolo et al. (2004)* posited that it is not practicable or wise to rely on additional medications to achieve this effect. The authors therefore advocated for the use of non-pharmacological methods as adjunct to HIV treatment to reduce the adverse effects of drugs, pill burden and possible drug interactions *(Ciccolo et al., 2004).* In the United States (US), *Standish et al. (2001)* documented that exercise is consistently listed as the most common, most effective, non toxic and the least expensive non-pharmacological method and complementary therapy utilized by HIV-infected persons. This was subsequently supported by numerous anecdotal and empirical studies *(Dudgeon et al., 2004; O'Brien et al., 2006; Terry et al., 2006; Hand et al., 2009; Tiozzo et al., 2013).* It is therefore reasonable to expect HIV-infected persons all over the world to utilize exercise as a strategy to cope with the health problems imposed by HIV and its treatment.

Despite these documented and established evidence on the beneficial effects of exercise on HIV, there is dearth of published studies on knowledge of effect of exercise on HIV-infected persons among health care professionals, notwithstanding the recognition and knowledge of the effectiveness of exercise on persons living with HIV/AIDS in the developed world. In most parts of the developing world, including Nigeria, in spite of the burden and complications of HIV infection and its treatment, there is paucity of data on the effect of exercise on HIV-infected individuals, let alone on the knowledge of effect of exercise on this population. We therefore posit that the lack of knowledge on the effect of exercise on HIV-infected persons among Nigerian health care professionals might be the reason for the dearth of literature on the effect of exercise on the overwhelming population living with HIV/AIDS in the country, notwithstanding the country's ranking as the third and second among the countries with the highest inhabitants of HIV-infected persons in the world and Africa respectively. This apparent gap prompted this study in an attempt to fill the existing vacuum. The purpose of the study is therefore to determine whether health care professionals working at a teaching hospital in northeastern Nigeria have the basic knowledge on the effect of exercise on HIV-infected persons.

Methods

The study was carried out at the University of Maiduguri Teaching Hospital (UMTH), a tertiary referral health institution located in Maiduguri, the capital of Borno State in the northeastern region of Nigeria. The hospital serves the entire region and neighboring countries of Cameroun, Chad and Niger. It has an established antiretroviral (ARV) clinic supported by President's Emergency Plan for Aids Relief (PEPFAR) which offers comprehensive care to over 600 persons living with HIV/AIDS per month.

Health care professionals aged 20 years and above with more than one year working experience were included in the

Date of Communication: Oct. 13, 2013
Date of Acceptance: Dec. 27, 2013
SJIF IMPACT FACTOR 2013=4.65

study. The instrument for the study was a self administered questionnaire which underwent face and content validation by experts in cardiopulmonary physiotherapy and exercise physiology. To ensure reliability, test re-test of the instrument was carried out two weeks apart on 20 randomly selected health care professionals from the participating clinical departments. The interval of two weeks was in order to reduce memorization and potential problems with the wording of the items, which according to *Smith et al. (2006),* are the impetus for test-retest. The obtained correlation coefficient, r was 0.82. The selected 20 health care professionals used in testing the instrument were excluded from the study.

An informed consent form was attached to each copy of the questionnaire and ethical approval for the study was obtained from the Research and Ethical Committee of the hospital. The questionnaire comprised two sections. The first section (section A) dealt with the socio-demographic characteristics of the respondents, while the other section (i.e. section B) contained close-ended 20 item questions, each with three domains (Agree, Disagree or Undecided responses). Some of the item questions on the questionnaire are on what the respondents thought were the impact of exercise on CD4 cell count, immune status, and patients' well being and resistance to diseases. Two hundred and eighty nine copies of the questionnaire were distributed to the participants, out of which 260 were duly filled, returned and used for data analysis, giving a response rate of 90%.

Scoring: A correct answer to each question scored 1, hence the maximum score was 20 and minimum 0. An "Agree" and "Disagree" responses to a correct and wrong statement respectively scored 1 each, while an "Undecided" response was disregarded. Based on these, the higher the score, the higher the knowledge of the health care professional/s on the effect of exercise on HIV-infected persons. For the purpose of simplicity, the scores were ranked as follows: 0-5, 6-10, 11-15 and 16-20 indicating poor knowledge, fair knowledge, good knowledge and very good knowledge of effect of exercise on HIV infected persons respectively.

Statistical Analysis: Descriptive statistics were used to summarize the sociodemographic characteristics of the participants. Independent t-test and one way analysis of variance (ANOVA) as inferential statistics were used to analyze the knowledge of effect of exercise on HIV-infected persons by sociodemographic characteristics. Least of square difference (LSD) post hoc test was employed to determine where any significant difference exists. An alpha value of $p<0.05$ was considered significant. Data were analyzed using Statistical Package for the Social Sciences (SPSS) version17.0 software (SPSS Inc., Chicago, Illinois, USA).

Results

A total of 260 health care professionals at the teaching hospital participated in this study. The age of the participants ranged from 20 to 59 years with mean age of 37.27 ± 7.75 and majority were in the ranges of third (38.8%) and fourth decades (36.2%).

Date of Communication: Oct. 13, 2013
Date of Acceptance: Dec. 27, 2013

Male participants accounted for 58.5% and most (84.2%) were married. Nursing recorded the highest number of participants (57.3%) among the health care professional groups. Based on educational qualification, 68.1% possessed degrees while those with postgraduate qualification accounted for 24.2%. Participants in the low designation were the majority (48.1%) and participants with 2-9 years of working experience constituted 41.9%.

Table 1: Socio-demographic characteristics of the participants

VARIABLE	CATEGORY	N (%)
Age group	20-29	47 (18.1)
	30-39	101 (38.8)
	40-49	94 (36.2)
	≥50	18 (6.9)
Gender	Male	152 (58.5)
	Female	108 (41.5)
Marital Status	Single	40 (15.4)
	Married	219 (84.2)
	Separated	1 (0.4)
Profession	Physiotherapy	10 (3.8)
	Medicine	64 (24.6)
	Medical Lab. Science	22 (8.5)
	Dentistry	3 (1.2)
	Nursing	149 (57.3)
	Pharmacy	12 (4,6)
Educational Qualification	Degree	177 (68.1)
	Diploma/Certificate	83 (39.1)
Postgraduate Qualification	Yes	63 (24.2)
	No	197 (75.8)
Designation/Rank	High	71 (27.3)
	Middle	64 (24.6)
	Low	125 (48.1)
Years of Working Experience	1-10	109 (41.9)
	11-20	97 (37.3)
	21-30	44 (16.9)
	≥31	10 (3.9)

Table 2: Ranking of scores on knowledge of effect of exercise

CATEGORIES OF SCORE	N (%)
0-5 (poor knowledge)	10 (3.8%)
6-10 (fair knowledge)	58 (22.3%)
11-15 (good knowledge)	120 (46.2%)
16-20 (very good knowledge)	72 (27.7%)

The socio-demographic characteristics of the respondents are summarized in Table 1. Substantial number of the participants (46.2%) demonstrated good knowledge of effect of exercise on HIV-infected persons as shown in Table 2.

Table 3: Mean scores and significant levels on knowledge of effect of exercise on HIV infected persons

VARIABLE	N	MEAN SCORE	TEST STAT	P-VALUE
Gender				
Male	152	13.68±3.7	0.297†	0.000*
Female	108	11.83±3.9		
Martial Status				
Single	40	12.90±3.2	0.509††	0.750
Married	219	12.93±4.0		
Separated/Divorced	1	10.00±0.0		
Profession				
Physiotherapy	10	14.80±3.4	0.884††	0.000*
Medicine	64	13.86±4.4		
Medical Lab. Science	22	13.82±4.2		
Dentistry	3	8.67±1.2		
Nursing	149	12.14±3.5		
Pharmacy	12	15.33±2.3		
Educational Qualifications				
Degree	178	13.09±4.3	0.303†	0.282
Diploma/Cert	82	13.54±3.8		
PG degree				
Yes	63	14.27±4.1	0.512 †	0.002*
No	197	12.48±3.7		
Working exp (yrs)				
2-9	109	9.60±2.9	0.729††	0.149
10-17	97	10.34±3.3		
18-25	44	11.21±3.7		
26 & above	10	11.89±4.5		
Rank				
High	71	14.02±4.0	0.589††	0.001*
Middle	64	14.11±3.3		
Low	125	11.82±4.1		

*= the mean difference is significant at 0.05 level

Table 3 depicts the mean scores and significant level on knowledge of effect of exercise on HIV infected persons among the participants.

Table 4: LSD Post hoc test for knowledge of effect of exercise on HIV infected persons among different professions

Comparison between Professions		Mean Difference	Signifi-cance
Physiotherapy	Medicine	0.941	0.457
	Med. Lab Sc	0.982	0.489
	Dentistry	6.133	0.013*
	Nursing	2.659	0.029*
	Pharmacy	0.533	0.738
Medicine	Physiotherapy	-0.941	0.457

Date of Communication: Oct. 13, 2013
Date of Acceptance: Dec. 27, 2013

	Med. Lab Sc	-0.041	0.964
	Dentistry	5.193	0.019*
	Nursing	1.718	0.002*
	Pharmacy	-1.474	0.209
Med Lab Sc	Physiotherapy	-0.982	0.489
	Medicine	-0.041	0.964
	Dentistry	5.152	0.025*
	Nursing	1.677	0.049*
	Pharmacy	-1.515	0.257
Dentistry	Physiotherapy	-6.133	0.013*
	Medicine	-5.193	0.019*
	Med Lab Sc	-5.152	0.025*
	Nursing	-3.474	0.110
	Pharmacy	-6.667	0.006*
Nursing	Physiotherapy	-2.659	0.029
	Medicine	-1.718	0.002*
	Med Lab Sc	-1.677	0.049*
	Dentistry	3.474	0.110
	Pharmacy	-3.192	0.005*
Pharmacy	Physiotherapy	0.533	0.738
	Medicine	1.474	0.209
	Med Lab Sc	1.515	0.257
	Dentistry	6.667	0.006*
	Nursing	3.192	0.005*

*** = the mean difference is significant at 0.05 level**

Table 5: LSD Post hoc test on knowledge of effect of exercise on HIV infected adult in different designation/rank

Designation/Rank		Mean Difference	Significance
High rank	Middle Rank	0.084	0.923
	Lower Rank	2.199	0.002*
Middle rank	High rank	0.084	0.923
	Lower Rank	2,283	0.003*
Lower Rank	High rank	-2.199	0.002*
	Middle Rank	-2.283	0.003*

*** = the mean difference is significant at 0.05 level**

Tables 4 and 5 represent the post hoc tests to determine where significant differences exist among professional groups and ranks.

Discussion

This study to the best of our knowledge and based on literature reviews seems to represent the first attempt to publish a work on the knowledge of effect of exercise on persons living with HIV among health care professionals, notwithstanding substantial studies by various scholars on the effect of exercise on HIV/AIDS. Data from the study showed that majority (57.3%) of the participants were nurses. This is not surprising, because in most (if not all) public hospitals in Nigeria, nurses constitute the highest workforce among other health care professionals. Nurses are also the most populated health care professionals in Nigeria, probably due to the nature and relative short periods of their training in many public health institutions in the country. The findings from the study revealed male preponderance compared to their female counterparts. This may be attributed to the fact that most health care professions (except nursing) in our environment are dominated by men. This male predominance in our study could also be as a result of socio-cultural and religious factors which may restrict women to public or work life as shown in previous studies *[(Akinpelu et al., 2011; Maduagwu et al., 2012)* in Borno State, Nigeria, where this present study was conducted. Majority (75%) of the participants in this study were aged between 30 and 49 years. This could be deduced from the fact that this age group is the peak age of productivity and strength of any work force in most organizations. Only 27.7% of the health care professionals had very good knowledge on the subject despite an established ARV clinic at UMTH. This could be as a result of the belief that exercise may suppress the immune functions and thus increase HIV replication *(Stanley et al., 1996).* However, current evidence shows that moderate intensity exercise can reduce

Date of Communication: Oct. 13, 2013
Date of Acceptance: Dec. 27, 2013

HIV replication *(Veljkovic et al, 2010)* and does no harm to the immune system, but rather has boosting and favorable effects on immune, cardiorespiratory and psychological functions, as well as body composition and metabolic status of HIV infected persons *(O'Brien et al., 2008; Hand et al., 2009; Tiozzo et al., 2013).* Significant difference (p=0.00) existed between the mean scores of the male and female health care professionals in favour of the former. The reason for this may be difficult to infer, it could be that men seek information more than women, especially in our environment, where women are saddled with domestic chores, which include child bearing and up-bringing, and home making among other things. This is similar to the findings of *Tsuda et al. (1982)* in a study on knowledge of physiotherapy at a high school in the United States of America, where males were found to have significant higher knowledge than their female counterparts. It could also be as a result of the male preponderance in our study. Mean score of the participants who had postgraduate degrees was significantly higher (p=0.02) compared to non holders. This is expected, as the former, by the virtue of their additional educational background are expected to be more grounded in knowledge and information that relate to health. The mean scores for nurses and dentists were quite low compared to each of the other health care professionals. Post hoc test showed no significant difference (p=0.11) between the two professional groups based on their mean scores. The mean scores of the other four professions showed various degrees of significant differences when compared with either dentistry or nursing as follows: physiotherapy vs dentistry vs nursing (p=0.013; p=0.029), pharmacy vs dentistry vs nursing (p=0.006; p=0.005), laboratory science vs dentistry vs nursing (p=0.025; p=0.049) and medicine vs dentistry vs nursing (p=0.019; p=0.002). The reason for these low mean scores by these two professional groups (especially the dentists) may be difficult to ascertain. It may be partially explained based on the ground that most nursing training institutions in Nigeria are located at public hospitals rather than universities. Based on this, many nurses may not know or understand the roles of physiotherapists who are trained in the universities, and have fundamental and indebt knowledge on exercise related issues. The same reason may be applied to dentists, most government universities in Nigeria, have dental schools, while only few universities train physiotherapists. This may imply that only few dentists know and understand the roles of physiotherapists as experts in exercise related matters. These views are based on the fact that most Nigerian trained health care professionals erroneously perceive physiotherapy profession as synonymous to exercise. Therefore, to such health care professionals, knowing the roles of physiotherapists is as good as having knowledge of exercise. This assertion corroborates the observation made by *Adekunle et al. (2004)* that other health care professionals in Nigeria are not fully aware of the role of physiotherapy in the management of HIV/AIDS. These reasons may account for sparse referrals between dentists and physiotherapists at the teaching hospital where the study was conducted. Another possible reason that might have accounted for the lowest score

Date of Communication: Oct. 13, 2013
Date of Acceptance: Dec. 27, 2013
SJIF IMPACT FACTOR 2013=4.65

by dentists may be as a result of the very low number (three) that participated in the study. Pharmacists' mean score was the highest, probably due to their knowledge base on antiretroviral drugs and the adverse effects of these drugs. This mean score, although did not depict any significant difference when compared with each of the other three health care professional groups (physiotherapy, medicine and medical laboratory science). This infers that these four professional groups have relative similar knowledge on the effect of exercise on persons living with HIV. Physiotherapists would have been expected to have the highest mean score as a result of the nature of their training and knowledge on physical activity and exercise. The reason for the physiotherapists' lower mean score compared to that of the pharmacists is not astounding. *Oyeyemi et al. (2008)* observed that Nigerian physiotherapists were neither comfortable nor willing to manage persons living with HIV/AIDS. In another study in 2011, *Oyeyemi et al. (2011)* concluded that Nigerian physiotherapists showed unsatisfactory knowledge of universal precautions and AIDS pathophysiology, and many of them felt uncomfortable and showed low ethical disposition when it comes to caring for persons living with HIV/AIDS. This observation may not be peculiar to Nigerian physiotherapists alone. In Canada, *O'Brien et al. (2006)* reported that few physiotherapists work with persons living with HIV. *Worthington et al. (2005)* also in Canada had earlier observed that most physiotherapists never managed persons living with HIV, were uncomfortable with the idea and reported not receiving HIV training in their rehabilitation degree programs. Laboratory scientists and doctors frequently come in contact with persons living with HIV due to the nature of their jobs, hence their higher scores compared to nurses and dentists. Also frequent referrals and contacts between doctors and physiotherapists during the course of training and duty might have played a significant role on the doctors' higher mean score. Post hoc test on knowledge of effect of exercise on HIV infected persons among health care professionals in different designation/ranks showed no significant difference ($p=0.923$) between those on high and middle ranks. Significant differences existed between high and low ranks, and middle and low ranks ($p=0.002$ and $p=0.003$ respectively). This may be as a result of years of working experience as well as higher education. The more the years of professional practice in health care, the higher the rank and hence the more knowledgeable one becomes in health related issues. Also, the higher the educational level, the higher the rank and thus, because of the educational background, the higher the knowledge.

Conclusion: In spite of the presence of functional and heavily populated ARV clinic at the hospital where this study was conducted, more than a quarter (26.1%) of the health care professionals lacked good knowledge on the beneficial effect of exercise on persons living with HIV. This is somehow astounding and hence unacceptable and needs to be remedied through organized enlightenment programs. Also, there is a need for greater education to increase the knowledge base and role of physiotherapy in the total care and treatment of persons living with

Date of Communication: Oct. 13, 2013
Date of Acceptance: Dec. 27, 2013
SJIF IMPACT FACTOR 2013=4.65

HIV/AIDS which could be well enhanced by including a comprehensive HIV/AIDS curriculum as part of physiotherapy degree training in Nigeria. It is envisaged that the study may inspire scholars from developing countries, especially Nigeria to carry out studies on the effect of exercise on individuals living with HIV as being done in most developed nations of the world. This study also showed the need for concerned health care policy makers in Nigeria to incorporate physiotherapists in ARV clinics as obtained in other countries. This will enhance team work as well as total HIV care and management in the country.

Limitations: The obvious limitation of this study is rooted in the fact that discussion was primarily based on the observed findings from the study. The reason for this may be attributed to the present paucity of both empirical and anecdotal data on knowledge of effect of exercise on HIV-infected individuals. Hence, our study may serve as a bedrock and precursor for future studies on the subject. Also the inequality in the proportions of the health care professional groups that participated in the study might have skewed the result and hence, the findings of the study. Therefore, the need for future studies to minimize this disparity during recruitment of participants.

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Date of Communication: Oct. 13, 2013
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Mechanical Power of Leg Extensor Muscles in Male Boxing Players

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Abstract

The present study was conducted on nineteen male boxing players (age: 16.37±1.34 years) comprising of inmates of Sports Training Centre and Centre of Excellence scheme of Sports Authority of India, training at NS NIS Patiala (India). The aim of the study was to find the status of mechanical power variables of leg extensor muscles in male boxing players and to find the relationship between them. The experimental protocol developed by *Bosco et al (1983), Mcguigan et al (2006)* were used to measure the mechanical power variables of leg extensor muscles in male boxing players. Karl Pearson's coefficient of correlation was calculated with the help of SPSS version 9.0 software. The results of this study indicate that there was a highly significant correlation between the squat jump flight time, squat jump height, countermovement jump height, countermovement flight time, Eccentric Utilization Ratio (EUR), Elasticity Index (EI) and peak power (0-15sec), peak power (45-60sec) and Mean Power (0-60sec).

Key words: Mechanical Power, Vertical jump test, Leg Extensor Muscles, Muscular Power.

Introduction

Despite the increasing popularity of boxing, only a few studies have been conducted on the biomechanics of this sport. Compared with athletes engaged in other sport disciplines, boxers had similar explosive power as wrestlers and basketball players *(Fleck, 1983).* Coaches and trainers are greatly interested in developing training techniques designed to improve power performance of the legs and vertical jump ability *(Blattner & Stuart, 1980).* Muscle force and lower extremity strength have a significant influence on executing competitive performance i.e. different technical-tactical demands in many sports *(Ivanovic et al., 2011).* As a result, adequate preparation of leg extensors is highly important especially in sports which involve different jumping techniques, frequent changes of direction in the frontal and lateral plane, numerous high and long jumps *(Čoh, 2010; Čoh and Babić, 2010).* Many researchers *(Zatsiorsky, 2006; Dopsaj et al., 2010)* claim that diagnostics on physical preparation and athlete selection within the contractile abilities, verified with the basic parameters, i.e. using the level of maximal force development or explosive force, are very important for monitoring the effects of the training process from the aspect of basic indicators of contractile characteristic development. Strength is the ability to produce maximal force, which is considered a basic motor ability and contributes to high performance in most physical activities and sports for prevention of injury *(Coyle et al, 1981, Pangrazi, 1999).* Numerous studies of young athletes indicated that specific training in track and field, gymnastics, swimming, soccer, basketball improve vertical jumping performance, explosive

Date of Communication: Jul.10, 2013
Date of Acceptance: Nov. 25, 2013
SJIF IMPACT FACTOR 2013=4.65

strength of upper and lower limbs. Soccer *(Gorostiaga et al, 2002),* basketball *(Foley, 1988, Klizning, 1991*), volleyball *(Mills et al, 2005),* and tennis training *(Huff, 1972, Liemohn, 1983)* improve the explosive strength of lower limbs.

Very few studies have examined the effect of boxing training program on fitness characteristic in young athletes. Boxing is a very dynamic team sport, requiring continuous alterations of intensity and kinetic actions, and it is characterized by a great number of side movements, jumps, throws, and body contacts all of which strictly depend on muscular strength. Previous studies have reported that the high performance in many sporting endeavors is characterized by the ability to display high amounts of muscular power. Power is the product of muscular force and velocity or as an instantaneous value during a given movement. The latter, often referred to as peak power (PP), is typically associated with explosive movements such as sprinting, jumping and may be an important variable associated with success in a given discipline. The measurement of Peak Power by strength and conditioning-coaches is an important consideration in the training process. Changes in PP throughout the annual plan may be indicative of training status or adaptation to the workload and could be used to plan or adjust the training program based on the athlete's performance. The knowledge of mechanical power components of lower extremities of athletes can be of great interest for coaches and sport scientists to optimize explosive strength of the selected players. Therefore, the aim of the present study was to find the status of mechanical power of leg extensor muscles in male boxing players.

Materials & Methods

Nineteen male boxing players (inmates of Sports Training Centre and Centre of Excellence scheme of Sports Authority of India, training at NS NIS Patiala, /(India) mean age of 16.37±1.34 years; height of 176.32±7.84 cm; body mass of 62.32±12.24 kg participated in the study. They were briefed of the purpose of the study and the experimental protocol *(Bosco et al., 1983, Mcguigan et al., 2006)* and the risks involved were also explained to each player and voluntary consent was taken from them. Each volunteer was first subjected to physical examination that included measurements of corporal data like date of birth, age, training age, height, body mass and sports discipline. The participants performed an adaptation process previous to the vertical jump test so that error could be minimized. The vertical jump test measurement system consisted of a portable hand-held computer unit connected to a contact mat (Swift Performance, New South Wales, Australia). It has been previously reported that the system is reliable compared with a force platform ***(****Cronin et al., 2001****).***

Vertical Jump Tests: Three jumps Squat jump (SJ), Counter movement jump (CMJ) and Continuous vertical jump Test for 60 seconds (CVJT) were performed according to the experimental protocol *(Bosco et al., 1983, Mcguigan et al., 2006).*

Explosive strength and endurance variables: In this study, Eccentric Utilization Ratio (EUR) was calculated

Date of Communication: Jul.10, 2013
Date of Acceptance: Nov. 25, 2013

from vertical jump height (CMJ/SJ) or peak power (CMJ/SJ) by using *Sayers et al (1999)* peak power formula. Muscle Elasticity index was calculated from the jump height reached in CMJ and SJ Jumps (CMJ – SJ *100 / SJ) *(Sayers et al., 1999).* The explosive strength and endurance variables were power peak (PP), mean power (MP) and fatigue index (FI). Concerning the CVJT (continuous vertical jump test), the PP was estimated by the mechanical power produced in the first 15 seconds of a 60-second work. The MP was estimated by the amount of work during a 60-second continuous effort. For PP and MP, the results were expressed in watts/kg (W/kg), as per the equation given by *Bosco et al. (1983).* The fatigue Index (FI) was calculated as the difference between the power peak (work produced in the first 15 seconds) and the mean power generated in the last 15 seconds of a continuous vertical jump work of 60 seconds relative to first 15 seconds peak power. The result was expressed in percentage (%).

Test procedure and data collection:

The participants were told to perform a 15-minute routine warm-up before performing the tests through stretching, running, coordination exercises and consecutive jumps (two sets of five vertical jumps). Three squat jumps (SJ) and three counter movement jumps (CMJ) were performed in random order on a jump mat connected to an electronic timer without the aid of an arm swing; this was standardized by having participants hold their hands on their hips. Two minutes rest period between attempts was established. The SJ involved the subject flexing the knee to approximately 90 degree maintaining the position for 3 seconds, and then jumping on the command ‘‘go.’’ The CMJ was performed under the same conditions but involved flexion of the knee followed immediately by extension of the legs. Test was executed following the original protocol for both jumps *(Sayers et al., 1999).* On the next day, again the participants performed a 15-minute routine warm-up before the tests through stretching, running, coordination exercises and consecutive jumps (two sets of five vertical jumps). The participants were told to perform the continuous vertical jump Test (CVJT) during a work performed at maximal effort, with no pauses between jumps for 60 seconds. The subjects were told to keep chest in vertical position, with no excessive advance to avoid influence in the results; as well as to keep knees in extension during the flight, remaining with hands around waist. The participants were given stimulus to jump the highest as possible during the tests.

Statistical Analysis:

Mean and standard deviation for all the attributes age, height, body mass and biomechanical transients related to vertical jumps were calculated. Karl Pearson’s coefficient of correlation was calculated with the help of SPSS version 9.0 software and the level of significance was kept as $p<0.05$.

Results & Discussion

Table 1: Mean±SD of Age, height & body mass of male boxing players (n=19)

Age, yrs	Height, cm	Mass, kg
16.37±1.34	176.32±7.84	62.32±12.24

Date of Communication: Jul.10, 2013
Date of Acceptance: Nov. 25, 2013

Table 2: Mean±SD of Mechanical power variables of the three vertical jump tests of male boxing players

Squat Jump (SJ)		Counter Movement Jump (CMJ)				Continuous Vertical Jump test 60 seconds(CVJT) Mechanical Power (w/kg)			
JH (cm)	Flight Time (Sec)	JH (cm)	Flight Time (Sec)	EUR	EI	PP (0-15 sec)	PP (45-60 sec)	MP (0-60 sec)	FI
22.74 ± 3.65	0.432 ± 0.03	26.47 ± 3.24	0.461 ±0.03	1.116 ± 0.07	17.57 ± 11.26	16.86 ± 2.62	10.67 ± 2.26	13.57 ± 2.25	36.39 ±11.96

JH - Jump Height; FT-Flight Time; EUR-Eccentric Utilization Ratio; EI-Elasticity Index; MP- Mechanical Power; PP-Power Peak; MP- Mean Power; FI - Fatigue Index

Table 3: Correlation Matrix for various mechanical power variables of the three vertical jump tests of male boxing players

	AGE	HEIGHT	WEIGHT	SJ HEIGHT	SJFT	CMJJH	CMJFT	EUR	EI	PP15	PP45	MP60
HEIGHT	.126	-										
WEIGHT	.324	.800**	-									
SJHEIGHT	.078	.211	-.125	-								
SJFT	.129	.174	-.154	.990**	-							
CMJJH	.124	.182	-.174	.853**	.851**	-						
CMJFT	.139	.241	-.109	.908**	.906**	.974**	-					
EUR	-.104	-.360	-.362	-.542*	-.529*	-.078	-.225	-				
EI	-.010	-.147	-.049	-.660**	-.646**	-.184	-.315	.933**	-			
PP15	.031	-.139	-.228	.178	.156	.318	.232	.275	.174	-		
PP45	.219	-.209	-.440	.351	.350	.446	.395	.130	-.031	.562*	-	
MP60	.016	-.241	-.470*	.227	.206	.377	.283	.310	.136	.811**	.877**	-
FI	-.253	.176	.345	-.227	-.245	-.185	-.208	.098	.208	.188	-.698**	-.347

***significant at the 0.05 level; ** significant at the 0.01 level**

JH - Jump Height; FT-Flight Time; EUR-Eccentric Utilization Ratio; EI-Elasticity Index; MP- Mechanical Power; PP-Power Peak; MP- Mean Power; FI - Fatigue Index

The results of the present study (Table 3) demonstrate a close relationship between the various mechanical power variables of the three vertical jump tests (Squat jump, Counter movement jump and Continuous vertical jump test for 60 seconds) of male boxing players. Highly significant correlation was observed between the squat jump height and squat jump flight time, counter-movement jump height and counter-movement jump flight time at 0.01 level of significance. Significant negative correlation was observed between the squat jump flight time, squat jump height and Eccentric Utilization Ratio (EUR), at 0.05 level of significance. Highly significant negative correlation was observed between the squat jump flight time, squat jump height and Elasticity Index (EI), at 0.01 level of significance. Highly significant correlation was observed between the Eccentric Utilization Ratio (EUR) and Elasticity Index (EI) at 0.01 level of significance. Significant correlation was observed between the Peak Power (0-15sec) and Peak Power (45-60sec) at 0.05 level of significance. Highly significant correlation was observed between the Peak Power (0-15sec) and Mean Power (0-60sec) at 0.01 level of significance.

Date of Communication: Jul.10, 2013
Date of Acceptance: Nov. 25, 2013

SJIF IMPACT FACTOR 2013=4.65

Highly significant correlation was observed between the Peak Power (45-60sec) and Mean Power (0-60sec) at 0.01 level of significance. Highly significant negative correlation was observed between the Peak Power (45-60sec) and Fatigue Index (FI) at 0.01 level of significance.

Francisco et al., (2010) reported average squat jump height 15.8±4.2cm, flight time 357±44.4msec, countermovement jump height 16.9±4.8cm, flight time 369.0±49.9msec and elasticity index 7.1±3.2 (age 11.32±1.82 years) in their study on male table tennis players. Whereas in the present study the average value of squat jump height 22.74±3.65cm, flight time 432±30msec, countermovement jump height 26.47±3.24cm, flight time 461±30msec and elasticity index 17.57±11.26 was observed. The Eccentric Utilization Ration (EUR) has been suggested as a useful indicator of power performance in athletes. *McGuigan et al., (2006)* reported the average value of Eccentric Utilization Ration (EUR) of 1.03±0.20 for male soccer players, 1.00±0.17 for softball male players, 1.03±0.20 for football male players & 1.01±0.20 for rugby male players, while in the present study the average value of EUR 1.116±0.07 has been observed. In the present study the average Mean Power (0-60sec) recorded during the vertical jump test for boxing players (age 16.37±1.34 years) was 13.57± 2.25 w/kg whereas *Bosco et al. (1983)* found that average Mean Power (0-60sec) for school going Boys (age 17.3±0.8 years) was 22.2±1.8 w/kg. *Jefferson et al., (2007)* reported the average Peak Power (0-15sec) of 27.76±3.78w/kg, Mean Power (0-60sec) 19.56±2.59w/kg & fatique index (%) (FI) 48.60±7.01 in male volleyball players (age 19.01±1.36 years). In an another study by *Jefferson et al., (2006)* of the Intermittent vertical jump tests (IVJT), they reported the average Peak Power (0-15sec) as 24.68±2.70w/kg, Mean Power (0-60sec) 18.79±2.23w/kg & fatique index (%) 57.50±9.51 for the male handball and basketball players (age of handball players 25.74±4.71years & basketball players 18.60±0.77years). Whereas the in the present study the value of average Peak Power (0-15sec) 16.86±2.62w/kg, Peak Power (45-60sec) 10.67±2.26w/kg, Mean Power (0-60sec) 13.57±2.25w/kg & fatique index (%) 36.39±11.96 has been observed.

Conclusion: Based on the above considerations, the reported jumping test might offer the possibility of evaluating the mechanical power of the leg extensor muscles during explosive stretch-shortening type exercises, which involve both metabolic and mechanical behaviour of skeletal muscles. The measurement of Peak Power by strength and conditioning-coaches is an important consideration in the training process. Changes in Peak Power throughout the annual plan may be indicative of training status or adaptation to the workload and could be used to plan or adjust the training program based on the athlete's performance.

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Review Study on the Effect Surface Spinal Stimulation on Autonomic Nervous System in Spinal Cord Injury Patient

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Abstract

Background: Spinal cord injury is a disabling condition can lead to various autonomic disturbances of thermoregulatory dysfunction, autonomic hyperreflexia, vasomotor dysfunction, and bowel and bladder dysfunction. Different treatment techniques have been used for its management. In the present study, surface spinal stimulation has been used to find the effect on bladder, on skin resistance and skin temperature through comparing pre and post- treatment on a male with spinal cord injury.

Method: A 29-year-old-male suffered complete spinal cord injury at level D12 during a car accident. The case was diagnosed and treated for compression fracture of D11-D12 with paraplegia with bowel and bladder dysfunction. The subject was administered surface spinal stimulation with a carrier frequency of 2500 Hz, beat frequency 20 Hz applied continuously for 45 min with two adhesive rectangular electrodes of size (4.5x 9cm) placed on each side of supine 5cm apart over T10- L2 level paravertebrally. *Results and Conclusion:* The present study found that surface spinal stimulation with medium frequency current of beat frequency 20 Hz was effective in improving detrusor pressure, bladder sensations, infused fluid volume and bladder capacity of the patient with spinal cord injury. Electrical stimulation over the paravertebral region also demonstrated improvement in the skin resistance, but had no significant effect over skin temperature.

KEY WORDS: **Surface spinal cord stimulation, Autonomic nervous system, Thermoregulation, Skin resistance, Bowel and bladder control.**

Introduction

Spinal cord injury (SCI) is a global epidemic, and was considered as "untreatable ailment" decades ago. This disabling condition causes paralysis of voluntary musculature which leads to reduced mobility as well as impairment of vocational and self care activities. *(Sunder, 2010).* According to the Indian statistics, about 20 percent of all spinal injuries lead to neurological deficit in the form of paraplegia following thoraco-lumbar spine injuries, or quadriplegia following cervical spine injuries *(Maheshwari, 2006).* The causes of injury could be direct or indirect spinal trauma which causes damage to the cord and the symptom may vary according the level of injury. Cord involvement following neurological lesion could be complete or incomplete. After spinal cord injury, patient presents with primary and secondary complications depending upon the level and type of injury. These complications could be musculo-skeleton and autonomic disturbances.

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The common autonomic disturbances following spinal cord injury are thermoregulatory dysfunction, autonomic hyperreflexia, vasomotor dysfunction, bowel and bladder dysfunction. The Autonomic Nervous System (ANS) plays a key role in the regulation of many physiologic processes, mediated by supraspinal control from centers in the central nervous system. Disruption of spinal cord decreases the ability to sympathetically control blood pressure and to regulate body temperature, most likely due to the impairment of autonomic and somatic nervous systems *(Hutchinson, 1875).* This condition is described as partial poikilothermia; ability to increase heat production by shivering is decreased. The ability of the body to sweat and to vasodilate the skin is impaired in the area below the spinal lesion *(Attia et al., 1983).* The vasomotor changes following SCI include disturbance or complete loss of internal thermal regulatory responses, causes of this is bladder or rectal distension, pressure sores, urinary stones, bladder infection, urethral or bladder irritation and environmental temperature changes.

Bladder dysfunction has been reported as a serious medical complication following spinal cord injury. There are two main type of bladder dysfunction observed after spinal cord injury, either the patient is unable to store the urine or experiences failure to empty it. The failure to store the urine is detrusor hyperreflexia, often seen in patients above L1, and is characterized by both detrusor and sphincter overactivity, with both contracting reflexively when stretched. This built higher pressures in bladder leads to incontinence, incomplete emptying and reflux. Second type of bladder dysfunction is detrusor-sphincter dyssynergia—impaired coordination between bladder contraction and sphincter relaxation—is also a common finding in patients with SCIs.

Primary goal of bladder management is to empty the bladder under low pressure to prevent renal failure and maintain continence, treatment should be acceptable to the individual. Management of bladder includes periodic complete emptying of bladder with clean intermittent catheterization which is one of the effective ways to manage the patient with detrusor hyperreflexia and incontinence. Common approaches for bladder management include behavioral therapy, catheters, pharmacotherapy and electro-stimulation. Electrical stimulation over the sacral afferent nerves has reported to reduce incontinence and hyperactivity of bladder *(Young et al., 2002).* Sacral anterior root stimulation, S3 neuro-modulation, pudenendal nerve stimulation, anal or vaginal and more general surface spinal stimulation have been evaluated for various conditions, such as stress incontinence, irritative syndrome and to reduce external urethral sphincter spasm *(Amarenco, 2003).*

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Date of Acceptance: Dec. 28, 2013

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Spinal cord stimulation through epidural and surface electrodes was first used for the management of intractable pain, later it has also been for the rehabilitation of multiple sclerosis and other chronic neurological disorders. The workers working with the patients with multiple sclerosis generally observe that the main benefits of spinal cord stimulation are in bladder function *(Abbate et al., 1977).* Following spinal stimulation clinical and urodynamic improvement in the bladder dysfunction has been reported in spinal cord injury *(Richardson and McLone, 1978),* cerebral palsy *(Campos et al., 1978)* and in multiple sclerosis. Apart from the effect on bladder, little attention has been given to the other effects that spinal stimulation may have upon the autonomic nervous system. It was reported that patients with peripheral vascular diseases experience sensation of warmth and alternations in blood flow in the skin after spinal stimulation *(Tallis et al., 1983).* Researcher considers that surface spinal stimulation can influence the function of bladder, skin resistance and skin temperature. The present study was to aimed at finding the effect of surface spinal stimulation on bladder, on skin resistance and skin temperature through comparing pre and post values of urodynamics testing, galvanic skin response and Infra-red thermometer.

Case Report:

A 29 years old male, met with a car accident on April, 2011. His present chief complaints were inability to walk independently, irritation and difficulty in passing the urine. After the accident the patient was taken to the nearest hospital at Shimla. After emergency acute care, patient was referred to NIMS hospital, Mohali. The CT scan and MRI revealed spinal cord injury and D12 compressed fracture. The patient was diagnosed with T12 compressed injury with lower limb paraplegia and bladder and bowel involvement. The patient underwent fixation at D11-L1 level and kept in the hospital for 15 days. He received physiotherapy treatment session from NIMS and Ivy hospital, Mohali. The subject was catheterized for initial 3 months and after that patient was advised to use clean intermittent catheterization after self-voiding. Patient has been taking pruflox (600 mg) to avoid urinary tract infections and medicine for constipation. At rehabilitation centre of Ivy hospital, patient received passive range of motion exercises and stretching for hamstrings, quadriceps and calves. He did standing and walking in parallel bars with hip-knee-foot orthosis (HKFO), balance training on swiss ball and posture training in front of mirror. Patient also did exercises to improve his functional status.

On examination, the vitals of the patient were normal. No abnormality of skin was observed, mid-pitting odema over both ankles was observed. Patient had old scars and marks of stitches were

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Date of Acceptance: Dec. 28, 2013
SJIF IMPACT FACTOR 2013=4.65

seen over nose and forehead. Patient had developed tightness of left dorsiflexors and foot drop deformity on right side. Patient was able to walk with HKFO and walker under supervision, but was able to use wheelchair independently. The patient was cooperative, alert and well oriented to time, place and person. The higher mental function and cranial nerves were normal. The superficial sensation of light touch, temperature, pin prick and deep sensations were intact upto L4 level. Superficial anal and bulbocavernous reflex were absent. The deep reflexes i.e. biceps, triceps, supinator reflexes were intact and knee jerk, ankle jerk and plantar reflex were absent. The patient had flexor spasm and was caused by any noxious stimulation to the feet.

Materials & Methods

The patient was intructed to lie in the supine position and eight skin temperature measuring sites were marked over the lower limb. Skin temperature was recorded with the help of hand held thermometer (IRL 300, Kusam-Medico), at the distance of 10-15 cm. Cystometric values of prior to surface spinal stimulation, cystometric values of infused fluid volume (IV), detrusor pressure (Pv), first sensation (FS), first desire (FD), normal desire (ND) and bladder capacity (BC) were measured. The actual and basal galvanic skin responses were recorded using galvanic skin meter (GBF-2000, Medic Aid) via applying probes over the 2nd and 4th toe of right foot for 10 to 15 minutes. The surface spinal stimulation with a carrier frequency of 2500 Hz, beat frequency 20 Hz was applied continuously for 45 min with two adhesive rectangular electrodes of size (4.5x9cm) placed on each side of supine 5cm apart over T10-L2 level paravertebrally *(Wang et al., 2000).* Then post-surface spinal stimulation values of cystometric values, GSR and infrared thermometer were recorded in the patient after electrical stimulation.

Results:

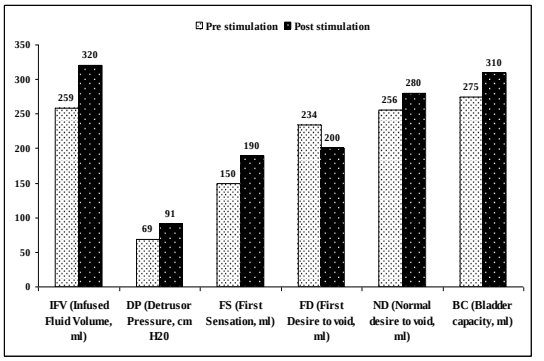

Figure 1: Comparison of Mean Value of Cystometric Variables at Pre- Intervals within the group

Table 1: Staistical comparison of skin temperature measured from thigh area.

Comparison	PRE Vs POST	
	t value	P value
RTAn (°C)	-2.138	P < 0.05
LTAn (°C)	-2.500	P < 0.05
RTPs (°C)	-2.138	P < 0.05
LTPs (°C)	-2.138	P < 0.05
RTLa (°C)	-2.500	P < 0.05
LTLa (°C)	-2.138	P < 0.05
RTM (°C)	-2.138	P < 0.05
LTM (°C)	-2.138	P < 0.05

Date of Communication: Sep.17, 2013
Date of Acceptance: Dec. 28, 2013

SJIF IMPACT FACTOR 2013=4.65

The pre and post-stimulation values of three measures were compared. The infused fluid volume (IV) on cystometry of the patient before stimulation was 259 ml and after stimulation was 320 ml. The pre-stimulation detrusor pressure (Pv) of patient was 69cm H_2O, while post-stimulation value was 91cm H2O. The pre-stimulation first sensation (FS) was felt at 150 ml and post-stimulation first sensation was at 190 ml. The pre-stimulation first desire (FD) to void was at 234 ml and post-stimulation value was 200 ml. Pre-stimulation normal desire (ND) to void was 256 ml and post-stimulation value was 280 ml. Bladder capacity on pre-stimulation cystometry was 275 ml and on post-stimulation cystometry was 310 ml. The after stimulation cystometric values of IV, Pv, FS and BC were improved as presented in figure 1.

Table 2 : Staistical comparison of skin temperature of calf and foot areas.

Comparison	PRE Vs POST	
	t value	P value
RCA(°C)	-4.000	P < 0.05
LCA(°C)	-4.000	P < 0.05
RCP(°C)	-2.138	P < 0.05
LCP(°C)	-2.138	P < 0.05
RFD(°C)	-1.177	P > 0.05
LFD (°C)	-1.633	P > 0.05
RFP (°C)	-0.784	P > 0.05
LFP (°C)	-0.784	P > 0.05

The pre-stimulation values of actual galvanic skin resistance was76 kΩ and post-stimulation values was 246 kΩ. The pre and post-stimulation values basal galvanic skin resistance were 84 kΩ and 271 k Ω (figure 2). The pre-stimulation skin temperature over the thigh area of right leg were 31°C on anterior aspect, 33°C on posterior aspect, 32°C on lateral aspect and 30°C on medial aspect. The post-stimulation values of right thigh were 30°C on anterior aspect, 29°C on posterior aspect, 29°C on lateral aspect and 29°C on medial aspect (figure 3). The pre-stimulation skin temperature of left thigh were 31°C on anterior aspect, 31°C on posterior aspect, 30°C on lateral aspect and 30°C on medial aspect. The post-stimulation values of left thigh were 30°C on anterior aspect, 30°C on posterior aspect, 30°C on lateral aspect and 32°C on medial aspect (Fig.4).

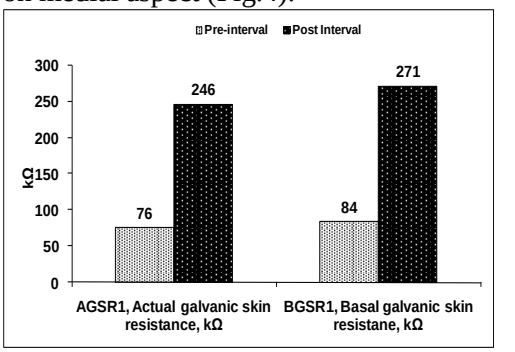

Figure 2: Comparison of Mean Values of AGSR (Actual Galvanic Skin Resistance) and BGSR (Basal Galvanic Skin Resistance) before and after stimulations.

The right foreleg pre-stimulation values 30°C on anterior aspect and 30°C over posterior aspect. The post-stimulation values of right foreleg were 29°C over anterior and 31°C over posterior aspect. Pre-stimulation values of left foreleg over anterior aspect 29°C, over posterior aspect 29°C and post-stimulation values of left foreleg over anterior aspect 30°C, over posterior aspect 30°C (Fig-5). The pre-stimulation value of right dorsal aspect 32°C, right planter aspect 32°C and post-stimulation value of dorsal aspect was 33°C and planter aspect

Date of Communication: Sep.1t, 2013
Date of Acceptance: Dec. 28, 2013

was 33°C. The pre-stimulation values of left dorsal aspect was 27°C, 29°C over left planter aspect and post-stimulation value of left dorsal aspect was 29°C and 29°C over left planter aspect.

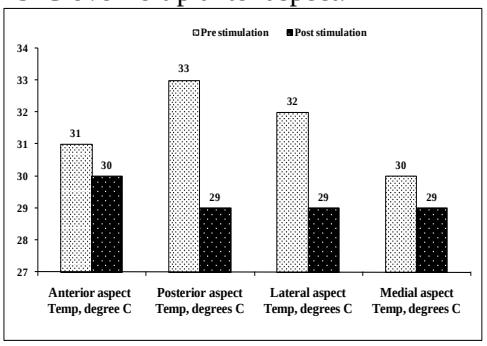

Figure 3: Comparison of Mean Values of Pre- and Post- stimulation Skin Temperature of Right Thigh

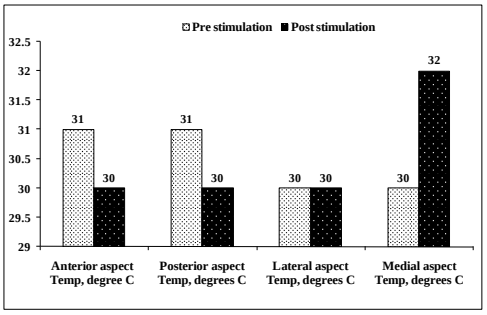

Figure 4: Comparison of Mean Values of Pre- and Post- stimulation Skin Temperature of Left thigh.

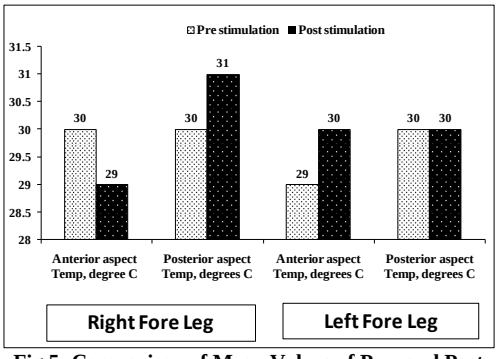

Fig 5: Comparison of Mean Values of Pre- and Post-stimulation Skin Temperature of right & left forelegs.

Discussion

The results of this experimental study demonstrated that surface spinal stimulation improved the cystometric values and skin resistance in spinal cord injury subject. The cystometric values of urodynamics are subjective tool, to assess bladder function. In present study, inhibitory effect of stimulation was observed over the bladder sensations, which increased bladder capacity. The results of the study were in accordance with two studies reported significant reduction of bladder sensations following electrical stimulation of tibial and pudendal nerve stimulation due to inhibitory effect of sacral afferent pathways in hyperreflexic bladder and by depolarization of somatic sacral afferent fibers *(Young et al, 2002; Amerenco et al, 2003).* The possible explanation for the findings was that the low frequency stimulation of 5 Hz, shown optimal inhibitory effect and high frequency current of 50 Hz, reported to achieve urethral closure *(Previnaire et al, 1998).*

Parasympathetic electrical stimulation may activate large diameter afferent fibers of paravertebral region, which may modulate the interneuronic activities of several spinal segments. The same method of electrical stimulation proposed to improve control of stretch reflex and to modulate the transmission of afferent or efferent impulses resulting from generalized desensitization of spinal pathways *(Wang et al., 2000). Brindley (1973)* reported that the smooth muscles

Date of Communication: Sep.17, 2013
Date of Acceptance: Dec. 28, 2013

of detrusor relax more slowly than the striated muscles of urethral sphincter, develop pressure gradient and cause micturition. Sympathetic skin changes are under the control of autonomic nervous system. The results of the present study shown improvement in GSR values following electrical stimulation and the reason for this may be anatomy of conductive pathway in the lower limb from spinal cord at lower thoracic cord (T9-10) *(Ogura et al, 2004).* The intact sympathetic conductive pathway may remains intact in the patient.

Post-stimulation results shown mild improvement in skin temperature and were supported by *Attia et al. (1983),* observed increase in the muscle temperature of 2.9°C, deep body temperature increase 36.9 ± 0.1°C in response electrically induced exercise for 30 min. The sentient skin areas are involved both in sensation and in the autonomic thermoregulatory responses. The possible underlying mechanism of increase skin temperature, below the interrupted autonomic dermatome level in SCI, were the presence of some local reflexes of vasoconstriction and dilation. The immediate increase in the skin temperature following stimulation can be due to the stimulation of A-delta and C-afferent fibers and local vasodilation over the skin. Increase in muscle and skin blood flow of foot occurred due to inhibition of alpha adrenergic vasoconstrictor fibers and stimulation of cholinergic vasodilator fibers *(Rhonda et al, 1995).*

On the basis of results and discussion, present study concluded that surface spinal stimulation has effect over cystometric values of urodynamics, skin resistance and skin temperature in subjects with spinal cord injury. The present study found that surface spinal stimulation with medium frequency current of beat frequency 20 Hz was effective to improve detrusor pressure, bladder sensations, infused fluid volume and bladder capacity of the patient with spinal cord injury. Electrical stimulation over the paravertebral region shown also improvement in skin resistance, but had no significant effect over skin temperature.

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Effect of Cardiac Rehabilitation on Blood Pressure in Stable Angina Patients

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Abstract

The purpose of this study was to investigate the effect on systolic and diastolic blood pressures after six-week cardiac rehabilitation programme in the stable angina patients. A randomly chosen thirty male patients (experimental group) of stable angina age ranged from 40 to 60 years were given a six- weeks cardiac rehabilitation programme and thirty male patients of stable angina (control group) age ranged from 40 to 60 years were not given any cardiac rehabilitation. The systolic and diastolic blood pressure was measured during TMT (before and after) the cardiac rehabilitation. Results showed a statistical significant improvement in the systolic and diastolic blood pressure after cardiac rehabilitation in the experimental group but the control group showed no significant improvement.

Key Words: Stable Angina, Systolic Blood Pressure, Diastolic Blood Pressure, Cardiac Rehabilitation, TMT

Introduction

In more than 90% of patients, stable angina is caused by a greater than 70% obstruction in at least one coronary artery. In less than 10% of individuals, a lesser degree of atheromatous obstruction, coronary artery spasm or small vessel disease is present. During periods of exercise to exertion, catecholamine release causes an increase in heart rate, an increase in the velocity and force of myocardial contraction producing an elevation in Blood Pressure (BP), and an increase in myocardial oxygen demand *(Khan, 2006).* In the presence of a significant coronary arterial stenosis, an oxygen deficit occurs. Myocardial ischemia increase catecholamine release, resealing in additional increase in heart rate and blood pressure, with further oxygen lack and the vicious cycle ensues. In addition the coronary arteries fill during the diastolic period, which is shortened during tachycardia. Blood factors, including lipoproteins and platelet functions, and arterial wall functions , with its effect on coagulation ,blood pressure and organ perfusion influence the processes of arteriosclerosis, atherosclerosis and thrombosis, which can had to CAD . Coronary artery disease, along with these other processes may result in angina, MI or death.

Materials and Method

A randomly sampled 60 patients of stable angina were evaluated for this study. They were divided into two groups- experimental and control, each was comprised of 30 patients. The experimental group was explained aerobic exercises for thirty minutes once a day for four days a week for six weeks. The intensity suggested for the exercises to

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SJIF IMPACT FACTOR 2013=4.65

these patients were calculated by Karvonen's formula.

For the first two weeks, THR = RHR + 31% (HR max – RHR)

for the second two weeks, THR = RHR + 35% (HR max –RHR)

and for the last two weeks THR = RHR +40% (HR max – RHR)

The control group was not given any cardiac rehabilitation programme and was allowed only leisure life style. The systolic and diastolic blood pressure was measured during TMT on the first day. The patients of both the groups had undergone two TMTs (one TMT on the first day and the other after 6 -weeks).

Results and Discussion

Table 1. Mean ± SD of Blood Pressure at standing & during TMT (before & after cardiac rehabilitation) of experimental group

Variables	CARDIAC REHAB.	STAGE		N	MEAN	SD
Systolic Blood Pressure	BEFORE	STANDING		30	135.7	9.52
			1	30	144.73	8.38
			2	30	154.2	7.45
			3	30	163.96	6.34
	AFTER	STANDING		30	133.2	9.12
			1	30	142.57	7.94
			2	30	150.7	7.03
			3	30	159.38	6.9
Diastolic Blood Pressure	BEFORE	STANDING		30	97.53	9.61
			1	30	103.2	6.74
			2	30	107.5	6.33
			3	30	112.07	5.2
	AFTER	STANDING		30	94.87	7.96
			1	30	100.3	5.58
			2	30	103.5	5.28
			3	30	107	4.3

Table 2. Mean ± SD of Blood Pressure at standing & during TMT (before & after cardiac rehabilitation) of control group

VARIABLE	CR	STAGE		N	MEAN	SD
Systolic Blood Pressure	BEFORE	STANDING		30	137.63	8.8
			1	30	147.57	8.26
			2	30	158.17	8.27
			3	30	166.47	5.7
	AFTER	STANDING		30	135.33	8.16
			1	30	146.53	7.97
			2	30	157.67	8.87

Date of Communication: Dec.7, 2013
Date of Acceptance: Jan. 23, 2014

			3	30	165.93	5.69
Diastolic Blood Pressure	BEFORE	STANDING		30	101.23	8.41
			1	30	106.37	5.84
			2	30	110.2	4.09
			3	30	114.57	3.59
	AFTER	STANDING		30	99.63	8.08
			1	30	106.4	6.02
			2	30	109	4.87
			3	30	113.9	3.6

Table 3. Comparison (paired t-test) of Blood Pressure during TMT (before (B) & after (A) 6-weeks of cardiac rehabilitation) of experimental & control groups

GROUP	Variable	STAGE	B/A Before/After	N	MEAN DIFF.	SD	t
EXPERIMENTAL	Systolic Blood	STAND	B/A	30	2.5	2.05	6.69
		1	B/A	30	2.17	2.44	4.87
		2	B/A	30	3.5	2.6	7.38
		3	B/A	30	4.59	3.62	6.82
	Diastolic Blood	STAND	B/A	30	2.67	3.69	3.96
		1	B/A	30	2.9	4.63	3.43
		2	B/A	30	4	6.12	3.57
		3	B/A	30	5.07	4.47	6.1
CONTROL	Systolic Blood	STAND	B/A	30	2.3	1.88	6.71
		1	B/A	30	1.03	2.41	2.34
		2	B/A	30	0.5	3.24	0.84
		3	B/A	30	0.53	3.06	0.95
	Diastolic Blood	STAND	B/A	30	1.6	2.48	3.52
		1	B/A	30	3.33	2.93	0.06
		2	B/A	30	1.2	2.48	2.34
		3	B/A	30	0.67	3.05	1.19

Table 1 and Table 2 show the mean values of systolic blood pressure and diastolic blood pressure of the experimental group and the control group. It was observed that the systolic blood pressure and the diastolic pressure rise steadily in standing position from stage-1 to stage-3 of TMT in both the groups. As in both the groups subjects were hypertensive, the systolic blood pressure at stage-3 of TMT reaches a maximum limit. The range of systolic blood pressure at 120-129 mm/Hg is considered to be normal and 130-139 mm/Hg is considered high normal *(Dwyer and Davis 2005).* Thus, the results of this study can be

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Date of Acceptance: Jan. 23, 2014
SJIF IMPACT FACTOR 2013=4.65

described that all the subjects were above normal range irrespective of being under medications. Table 1 and Table 2 shows that there was a steady rise in the diastolic pressure in standing position from stage -1 to stage -3. A number of studies have shown that a doubling in the cumulative incidence of cardiovascular events in those with a high normal systolic blood pressure (120-139mm/Hg) as compared with those with a normal systolic blood pressure 120mm/Hg *(Vasan et al., 2001).* The diastolic blood pressure of both the groups was also rising from the stage-1 to stage-3 of TMT.According to ACSM the normal diastolic blood pressure is 80-84 mm/Hg, high normal 85-89 mm/Hg, stage 1 (Mild) hypertension 90-99 mm/Hg and stage 2 (moderate) 100-109 mm/Hg *(Dwyer and Davis 2005).* The increased prevalence of hypertension in metabolic syndrome is the increase in the concentration of free fatty acids that is associated with resistance to the action of insulin in peritoneal adipocyte, worsens inflammation, oxidative stress and endothelial function and increases systolic blood pressure and diastolic blood pressure *(Umpierrez et al., 2009).* The high range of diastolic blood pressure has been related with the increase in the peripheral vascular resistance due to atherosclerosis but may not be an accurate predictor of cardiovascular risk than systolic blood pressure *(Rosendorff, 2006).*

Table 3 shows the significant differences in the experimental group of before and after the cardiac rehabilitation during the stages of TMT and observed no significant differences in the control group. The systolic and diastolic blood pressure in standing position showed significant differences in both experimental group and control group. During exercise the sympathetic activation increases with increase in exercise. The sympathetic activation leads to tachycardia and ionotropic effect in the heart. This probably is due to the cardiac rehabilitation exercises administered to the experimental groups while no such rehabilitation given to the control group. In other words, up to stage 3 of this protocol, the blood pressure response seems to be physiologically justified. It may be further justified that the increment in exercise intensity may affect the blood pressure response of the subject.

During exercise there was a sympathetic activation which led to the vasoconstriction of the vessels of the peripheral large muscles. But due to the exercise of the muscles there was a vasodilatation. It is also observed that the subjects due to autonomic dysfunction there was an increase in peripheral resistance. It is the imbalance between these factors that led to increase the diastolic BP with the increase in the stages (1-3) during the TMT. The control group showed the maximum increased in the diastolic BP as these subjects had not

Date of Communication: Dec.7, 2013
Date of Acceptance: Jan. 23, 2014

undergone any cardiac rehabilitation and so had lesser vasodilatation. As the systolic blood pressure is an excellent marker of left ventricular function during exercise and systolic blood pressure is expected to rise during aerobic exercise; either graded (TMT) or steady state, constant load exercise(Dwyer and Davis 2005). The systolic blood pressure rise during exercise provides information about the hemodynamic response to increasing physical stress. Dynamic exercise provokes a large increase in the systolic blood pressure without much change in diastolic blood pressure *(McHam et al., 1999).* The Systolic blood pressure rise primarily reflects an increase in cardiac output during dynamic exercise. A high rise in systolic blood pressure during exercise may be a consequence of high exercise capacity. The systolic blood pressure may remain elevated for a longer time if sympathetic tone does not decrease and the vagal tone does not increase during post exercise period and may decrease more after exercise in fit and healthy person *(Palatini 1998).* It has been observed that most of the anti- hypertensive drugs usually lower only the resting systolic blood pressure and the beta-blockers attenuates the magnitude of the rise in systolic blood pressure during dynamic exercise as well as lowers the resting blood pressure *(Chick et al., 1988).* The diastolic blood pressure is determined mainly by cardiac output and peripheral vascular resistance. During exercise, cardiac output increases and peripheral vascular resistance decreases in response to vasodilatation of resistance vessels within exercising skeletal muscles. An increase in diastolic pressure is therefore may be a result of inappropriate high cardiac output or impaired vasodilatation of resistance vessels within the skeletal muscles. Hypercholesterolemia is strongly associated with impaired reactivity to endothelium dependent and endothelium independent vasodilators. Vasodilatation of resistance vessels in muscle during exercise is influenced by several endothelium independent mediators including nitric oxide, prostaglandins, adenosine and other metabolically linked vasodilators such as potassium and hydrogen ions. Hypercholesterolemia may inhibit the factors that causes vasodilatation and thus may cause an increase in diastolic pressure *(Brett et al., 2000).*

Conclusion: It was concluded that six-week cardiac rehabilitation shows a positive effect on the blood pressure i.e. a decrease in the systolic and diastolic blood pressure of the subjects in the experimental group than the control group.

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C.V.A and Calcanium Eversion with Hamstring Tightness -A Correlative Study

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Abstract

Muscle strain injuries are common, yet the mechanisms of injury remain vaguely defined. The hamstring muscle group is one of the most complex sets of muscles in the body and these muscles are highly abused. One factor that makes hamstring muscle so susceptible to injury is their anatomical arrangement being a biarticular muscle group means that they may be subjected to large length changes. There are number of clinically useful sets of myofascial chain. The suboccipital muscle, hamstring and calf muscle are included in same superficial back line so. addressing any of the structure in the chain may have positive effect of the entire line itself. This study tries to find out a correlation between hamstring tightness, C.V.A and Calcanium Eversion which are influnced by the muscles in the same superficial back line. Present study included 60 subjects who were divided into three groups according to their hamstring tightness. C.V.A and Calcanium eversion was calculated for each subject in a single session. Correlation was calculated by pearson correlation test. Finding of the present study showed that there is a positive correlation between hamstring tightness and Calcanium eversion and a negative correlation between hamstring tightness and C.V.A.

Keywords: Hamstring tightness, Superfecial Back Line, Calcanium Eversion, C.V.A, Active Knee Extension Test, Lateral Photographic Method.

Introduction

Muscle strain injuries are common, yet the mechanisms of injury remain vaguely defined. The hamstring muscle group is one of the most complex sets of muscles in the body, intricately involved in both locomotion and stability of the lower extremity. Unfortunately, however, these muscles are highly abused. One factor that makes hamstring muscle so susceptible to injury is its anatomical arrangement being a biarticular muscle group means that they may be subjected to large length changes. The hamstrings are often ignored in the weight room in deference to their stronger, more aesthetically appealing counterpart, the quadriceps. Hamstrings tightness is one of the most common problem which is faced by a majority of population be it an athlete or a sedentary worker. Nearly 85 million Americans suffer from Hamstring muscle tightness each year. Muscle tightness can contribute to uncoordinated and awkward movements thus increasing the potential for injury.

Tom Mayer has described a number of clinically useful sets of myofascial chain. According to this concept,the muscle may end at the attachment point,

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SJIF IMPACT FACTOR 2013=4.65

but the fascia continues along its way, linking up to other muscles in chains. They are of practical importance in helping draw attention to dysfunction pattern in lower limb which impact directly on structures in upper limb. The suboccipital muscle, hamstring and calf muscle are included in the same superficial back line. Suboccipital muscle tightness has an effect on neutral head posture. The Craniovertebral Angle is a simple and convenient descriptor of natural head posture (NHP). The position of the calcaneus is greatly determined by the Achilles tendon. A tight Achilles provides not only plantar flexion, but also eversion to the calcaneus. The purpose of the study was to find out if there was any correlation between forward head posture and foot pronation with hamstring tightness.

Materials & Methods

The study was conducted on 60 subjects who were randomly selected. Subjects were divided into three different groups with 20 subjects in each. Group allocation was done according to the hamstring tightness. *Variables***:** Independent Variable was Hamstring Tightness. Dependent Variables were CVA and Calcanium Eversion.

Procedure: On the basis of inclusion and exclusion criteria, 60 subjects were selected for the study. Age of the subjects ranged from 20-30 years. Informed consent and voluntary participation forms were taken from them. All the subjects were thoroughly explained of the measurements performed. The readings were taken in three main steps, in a single session. Hamstring tightness of dominant leg was measured using A.K.E test. C.V.A was calculated using lateral photographic method with the help of Coral Draw Software. Calcanial Eversion was also measured of the dominant side. Subjects were divided into 3 different groups on the basis of their hamstring tightness. Descriptive statistics and comparison of mean values observed in the groups was done by using SPSS 13 software. Results were calculated by using 0.05 level of significance. The variables (Hamstring Tightness, C.V.A and Calcanium Eversion) were correlated using Karl Pearson coefficient of correlation in all the groups.

Results & Discussion

TABLE 1: Mean and standard deviation of C.V.A and Calcanium eversion in all the groups

GROUPS	GROUP A	GROUP B	GROUP C
	Mean± SD	Mean± SD	Mean± SD
C.V.A	53.68±2.83	47.16±2.15	40.28 ±2.82
Calcanium Eversion	8.20±1.28	12.10±1.44	15.80 ±1.64

Table 1 & Fig 1 compares the mean values of CVA and Calcanium eversion among the three groups of subjects formed on the basis of their hamstring tightness.

Results pertaining to Karl Pearson correlation revealed that a significant correlation existed between Hamstring Tightness and C.V.A and Hamstring Tightness and Calcanium eversion. It also revealed that CVA and Calcanium eversion are negatively correlated. On the

Date of Communication: Oct.24, 2013
Date of Acceptance: Dec. 24, 2013

other hand a positive correlation was found to exist between Hamstring Tightness and Calcanium Eversion, whereas a negative correlation was observed between Hamstring Tightness and C.V.A (Table 2).

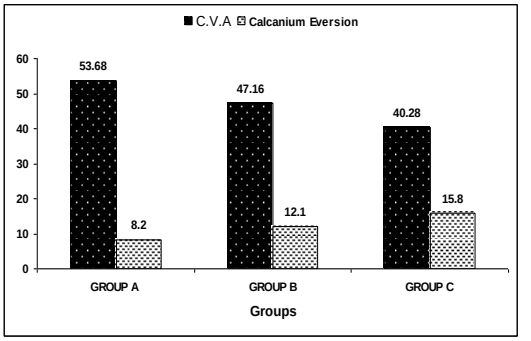

Fig 1: comparison of the mean values for all the variables between all the three groups.

TABLE 2: Correlation of Hamstring Tightness, C.V.A. and Calcanium eversion in the Group A

GROUP A	Hamstring Tightness Vs C.V.A.	Hamstring Tightness Vs Calcanium eversion	C.V.A. Vs Calcanium eversion
r value	-0.975	0.895	-0.874
P value	0.0001	0.0001	0.0001

TABLE 3: Correlation of Hamstring Tightness, C.V.A. and Calcanium eversion in Group B.

GROUP B	Hamstring Tightness Vs C.V.A.	Hamstring Tightness Vs Calcanium eversion	C.V.A. Vs Calcanium eversion
r value	-0.905	0.952	-0.913
P value	0.0001	0.0001	0.0001

Group B also demonstrated similar relationship trends as observed in group A. There is a significant positive correlation between Hamstring Tightness and Calcanium eversion, where as there is a significant negative correlation between Hamstring Tightness and C.V.A and CVA and Calcanium eversion (Table 3). Subjects belonging to the group C also revealed the existence of significant positive correlation between Hamstring Tightness and Calcanium eversion, where as a significant negative correlation between Hamstring Tightness and C.V.A and CVA and Calcanium eversion was witnessed (Table 4).

TABLE 4: Correlation of Hamstring Tightness, C.V.A. and Calcanium eversion for the subjects of Group C

Group C	Hamstring Tightness Vs C.V.A.	Hamstring Tightness Vs Calcanium eversion	C.V.A. Vs Calcanium eversion
r value	-0.964	0.909	-0.906
P value	0.0001	0.0001	0.0001

The purpose of the study was to find out if there was any correlation between forward head posture and foot pronation with hamstring tightness. Forward head posture was demonstrated by C.V.A and foot pronation by Calcanium eversion. The results of the study revealed that there is a positive correlation between hamstring tightness and foot pronation i.e. with the increase in hamstring tightness there is increase in Calcanium eversion. Whereas a negative correlation was observed to exist between hamstring tightness and C.V.A i.e. with the increase in hamstring tightness C.V.A decreases.

In postural control, both the suboccipital and hamstring musculature may be involved. It has been recently found that the application of a manual intervention over the suboccipital muscles induced an increase in hamstring

Date of Communication: Oct.24, 2013
Date of Acceptance: Dec. 24, 2013

flexibility. The continuity of the neural system theoretically links the dura mater, which anatomically is inserted into the suboccipital muscles and the hamstring musculature. This suggests an anatomical relationship between the hamstring muscles and the cervical spine.

As hamstring and calf muscles are included in the same superficial back line it is seen that if hamstrings are weak, calves will often try to make up for that weakness, which means the muscle gets overused, which in turn exacerbates calf tightness. In that same way, hamstring tension is rarely experienced in isolation; rather, if there is tightness in the hamstring muscles, there is also a good chance that one would have tightness in calf as well, due to the synergistic nature of the hamstrings and calves for much of our daily movements.

*Conclusion***:** The results of the study revealed that there is a positive correlation between Hamstring tightness and Calcanium Eversion i.e. with the increase in hamstring tightness Calcanium Eversion increases and a negative correlation exist between Hamstring Tightness and C.V.A in all the groups.

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Comparison of Vertical Jump Performance of Male Handball & Basketball Players

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Abstract

The present study was conducted on 30 male players (fifteen male basketball players; age: 16.40 ± 0.83 years & fifteen male Handball players; age: 15.80 ± 0.68 years) comprising of players training under the guidance of Punjab State coaches in Patiala (India). The experimental protocol developed by *Bosco et al., (1983)* and *Mcguigan et al., (2006)* were used to measure the vertical jump performance of male handball and basketball players. Test of significance of the differences was applied and data was judged at 0.01 and 0.05 level of significance. Results of this study show that the male basketball players performed better in vertical jump test parameters like the squat jump flight time, squat jump height, countermovement jump height, countermovement flight time, Eccentric Utilization Ratio (EUR), Elasticity Index (EI), Peak Power (0-15sec), Peak Power (45-60sec) and Mean Power (0-60sec), as compared to male handball players ,which may be due to the differnce in playing techniques and effect of training.

Key Words: **Vertical jump Performance, Peak Power, Muscular Power.**

Introduction

The vertical jump is an essential skill that is utilized in most highly competitive sports. Many training regimens strive to maximize vertical jump ability to improve an athlete's performance in their respective sports; the skill used to reach a point high above the ground from a jump can often determine the difference between success and failure, wins and losses *(Reiser et al., 2006).* In sports that require jumping and quick movements, there is a need for muscular strength and power *(Semler, 2011).* During the last few years, performing plyometric exercises in general *(Wilt, 1978)* and drop jumps *(Komi and Bosco, 1978),* also called depth jumps *(Wilt, 1978),* in particular, has become very popular in training. Improvements in vertical jumping performance after drop jump programmes have been reported in several studies *(Blattner and Noble, 1979; Steben and Steben, 1981; Clutch et al, 1983).* In order to increase vertical jumping, one needs to pay special attention to the factor of power which is one of the factors of physical fitness. Power is the product of muscular force and velocity or as an instantaneous value during a given movement. The latter, often referred to as peak power (PP), is typically associated with explosive movements such as sprinting, jumping and throwing and may be an important variable associated with success in a given discipline. The measurement of Peak Power by strength and conditioning-coaches is an important consideration in the training process.

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SJIF IMPACT FACTOR 2013=4.65

Changes in peak power throughout the annual plan may be indicative of training status or adaptation to the workload and could be used to plan or adjust the training program based on the athlete's performance. In high-level handball and basketball practice the vertical jump is very important for the shooters or defence actions. Therefore, the aim of the present study was to compare the vertical jump performance of male handball and basketball players.

Materials & Methods

Thirty male players (fifteen male basketball players; age: 16.40±0.83 years & fifteen male Handball players; age: 15.80±0.68 years, were briefed for the purpose of the study and the experimental protocol designed by *Bosco et al., (1983) & Mcguigan et al., (2006).* The subjects comprised of players getting training under the guidance of Punjab State coaches in Patiala (India). All the risks involved were also explained to each player and voluntary consent was taken from them. Each volunteer was first subjected to physical examination that included measurements of corporal data like date of birth, age, training age, height, body mass and sports discipline. The participants performed an adaptation process previous to the vertical jump test so that error could be minimized.

The vertical jump test measurement system consisted of a portable hand-held computer unit connected to a contact mat (Swift Performance, New South Wales, Australia). It has been previously reported that the system is reliable compared with a force platform ***(****Cronin et al., 2001).*

Vertical Jump Tests: Three jumps: Squat jump (SJ), Counter movement jump (CMJ) and Continuous vertical jump Test for 60 seconds (CVJT) were performed according to the experimental protocol reported by *Bosco et al., (1983) & Mcguigan et al., (2006).*

Explosive strength and endurance variables: In this study, Eccentric Utilization Ratio (EUR) was calculated from vertical jump height (CMJ/SJ) or peak power (CMJ/SJ) by using *Sayers et al (1999)* peak power formula. Muscle Elasticity index was calculated from the jump height reached in CMJ and SJ Jumps (CMJ – SJ *100 / SJ) as per *Sayers et al., (1999).* The explosive strength and endurance variables were power peak (PP), mean power (MP) and fatigue index (FI). Concerning the CVJT (continuous vertical jump test), the PP was estimated by the mechanical power produced in the first 15 seconds of a 60-second work. The MP was estimated by the amount of work during a 60-second continuous effort. For PP and MP, the results were expressed in watts/kg (W/kg), according to the equation described by *Bosco et al. (1983).* The fatigue Index (FI) was calculated as the difference between the power peak (work produced in the first 15 seconds) and the mean power generated in the last 15 seconds of a continuous vertical jump work of 60 seconds relative to first 15 seconds peak power. The result was expressed in percentage (%).

Test procedure and data collection: The participants were told to perform a 15-minute routine warm-up before performing the tests through stretching, running, coordination exercises and consecutive jumps (two sets of five vertical jumps). Three squat jumps (SJ) and three counter movement jumps (CMJ) were performed in random order on a

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jump mat connected to an electronic timer without the aid of an arm swing; this was standardized by having participants hold their hands on their hips. Two minutes rest period between attempts was established. The SJ involved the subject flexing the knee to approximately 90 degree maintaining the position for 3 seconds, and then jumping on the command ‘‘go.’’ The CMJ was performed under the same conditions but involved flexion of the knee followed immediately by extension of the legs. Test was executed following the original protocol for both jumps *(Sayers et al., 1999).* On the next day, again the participants performed a 15-minute routine warm-up before the tests through stretching, running, coordination exercises and consecutive jumps (two sets of five vertical jumps). The participants were told to perform the continuous vertical jump Test (CVJT) during a work performed at maximal effort, with no pauses between jumps for 60 seconds. The subjects were told to keep chest in vertical position, with no excessive advance to avoid influence in the results; as well as to keep knees in extension during the flight, remaining with hands around waist. The participants were encouraged to jump the highest as possible during the tests.

Statistics: Mean and standard deviation for all the attributes age, height, body mass and biomechanical transients related to vertical jump tests were calculated. Test of significance of the differences was applied and the level of significance was kept as $p< 0.05$.

Results

Table 1. Mean±SD of Age, height & body mass of male Basketball & Handball players

Discipline	Statistics	Age (years)	Height (cm)	Mass (kg)
Basketball (N=15)	Mean	16.400	181.867	64.600
	S.D.	0.83	6.29	8.61
Handball (N=15)	Mean	15.800	175.867	58.400
	S.D.	0.68	5.18	6.97

Table 2. Mean±SD and t-value of Vertical Jump performance variables of the three vertical jump tests of male Basketball & Handball players

Groups	Statistics	Squat Jump (SJ)		Counter Movement Jump (CMJ)		Continuous Vertical Jump test 60 seconds(CVJT) Mechanical Power (w/kg)					
		JH (cm)	Flight Time (Sec)	JH (cm)	Flight Time (Sec)	EUR	EI	PP (0-15)	PP (45-60)	MP (0-60)	FI
Basketball	Mean	32.533	0.516	35.000	0.533	1.056	7.810	19.902	14.249	16.814	27.989
	S.D.	4.36	0.03	4.28	0.03	0.04	5.02	3.74	3.52	3.17	13.76
Handball	Mean	25.467	0.457	28.800	0.484	1.100	13.967	15.815	11.769	13.607	23.573
	S.D.	3.87	0.03	3.12	0.03	0.06	9.36	3.13	2.70	2.41	18.66
	t-value	6.046**	5.970**	4.786**	4.572**	-2.480*	-2.712*	3.157**	2.947**	3.620**	.762

***significant at the 0.05 level; ** significant at the 0.01 level**

JH - Jump Height; FT-Flight Time; EUR-Eccentric Utilization Ratio; EI-Elasticity Index; PP- Peak Power; MP- Mean Power; FI - Fatigue Index

Table 1 shows mean age, height and mass of the basketball and handball players. Table 2 shows that the differences in the mean values of the various vertical jump performance parameters of male handball and basketball players were statistical significant.

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SJIF IMPACT FACTOR 2013=4.65

Francisco et al., (2010) observed that the average squat jump height 15.8±4.2cm, flight time 357±44.4msec, countermovement jump height 16.9±4.8cm, flight time 369.0±49.9msec and elasticity index 7.1±3.2 for male table tennis players (age 11.32±1.82 years). Whereas in the present study the average value of squat jump height was 32.53±4.36cm, flight time 516±30msec for male basketball players & mean squat jump height 25.46±3.87cm, flight time 457±30msec for male handball players, countermovement jump height 35.00±4.28cm, flight time 533±30msec for male basketball players & countermovement jump height 28.80±3.12cm, flight time 484±30msec for male handball players was observed. The Eccentric Utilization Ration (EUR) has been suggested as a useful indicator of power performance in athletes. *McGuigan et al., (2006)* observed the average value of Eccentric Utilization Ration (EUR) 1.03±0.20 for male soccer players, 1.00 ±0.17 for softball male players, 1.03±0.20 for football male players & 1.01±0.20 for rugby male players. In the present study the average Mean Power (0-60sec) recorded during the vertical jump test for basketball players was 16.81±3.17W/kg whereas *Bosco et al. (1983)* found that average Mean Power (0-60sec) for school going Boys (age 17.3±0.8 years) was 22.2±1.8 W/kg. *Jefferson et al., (2007)* found the average Peak Power (0-15sec) 27.76±3.78w/kg, Mean Power (0-60sec) 19.56±2.59w/kg & fatigue index (%) (FI) 48.60±7.01 for male volleyball players (age 19.01±1.36 years). In another study by *Jefferson et al., (2006)* of the Intermittent vertical jump tests (IVJT) observed the average Peak Power was (0-15sec) 24.68±2.70w/kg, Mean Power (0-60sec) 18.79±2.23w/kg & fatigue index (%) 57.50±9.51 for the male handball and basketball players (age of handball players 25.74±4.71years & basketball players 18.60±0.77years).

Conclusion: The analysis of data shows that the male basketball players performed better in vertical jump test parameters like the squat jump flight time, squat jump height, countermovement jump height, countermovement flight time, Eccentric Utilization Ratio (EUR), Elasticity Index (EI), Peak Power (0-15sec), Peak Power (45-60sec) and Mean Power (0-60sec), as compared to male handball players which may be due to the differnce in playing techniques and effect of training.

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Surgical Management of Periapical Lesion in the Maxillary Anterior Region Caused By Trauma in an Atheletic Child-A Case Report

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Abstract

The periapical lesions are the result of an inflammatory response to bacterial infection within the root canal. Conservative approach of treatment of any lesion is always preferred over surgery. Non surgical method involves cleaning and disinfecting the root canal system which reduces the bacteria and creates an environment in which periapical healing can occur. This has limited periapical surgery in very selected dental cases such as in those cases in which causative factors are located outside the root canal eg-bacteria colonizing the periapical tissues, cysts and foreign body reactions. Here a case report of a 17 year old boy who presented with maxillary anterior periapical lesion is presented and discussed. The patient gave a history of trauma to anterior teeth while playing cricket 8 years back. This case was managed by root canal treatment followed by periapical surgery.

Key Words: Periapical Surgery, Anterior Teeth, Trauma

Introduction

Traumatic injuries are one of the serious unanticipated events that results in pain, apical periodontitis, swelling and pscychological problems to the patient. Periapical lesions and pathologies are the outcomes of untreated traumatic teeth *(Grossman, 1967).* Treatment options available to treat such cases include periapical surgeries. First the treatment of choice is the management of periapical lesion with nonsurgical method by using calcium hydroxide as an intracanal medicament. But if the periapical lesion is large then periapical surgery is the choice *(Nair, 1998). Natkin et al (1984)* analyzed the data of various studies relating radiographic lesion size to histology. They concluded that if the radiographic size of the lesion was greater than 200 mm^2, the incidence of cyst was 100 % and if the lesion is separate from the apex with an intact epithelial lining it may not heal when treated nonsurgically. In the present case report pertains to a periapical lesion which was large and could be treated with periapical surgery only.

Case Report:

Figure 1: Discoloured & fractured teeth nos 11, 21.

A 17 year old boy reported to the department of Pedodontics and preventive dentistry with the chief complaint of pain and recurrent swelling in the upper front teeth region since 8 weeks. The patient gave a history of trauma to anterior teeth while playing cricket 8 years back. On

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clinical examinations the teeth nos 11, 21 were found to be discoloured and swelling was seen on the labial aspect of these teeth and the area was found to be tender to palpation and percussion (Figure 1). Teeth did not responded to thermal and electrical pulp tests indicating nonvital teeth. A discharging periapical sinus was seen apically between the roots of teeth nos 11 and 21. Based on the history, clinical examination, sensitivity test and radiographic examination a diagnosis of pulp necrosis with symptomatic periapical pathosis was made for right and left maxillary central incisor. Treatment was planned with a combined approach using orthograde endodontic treatment of nonvital teeth followed by surgical enucleation of the lesion. Isolation followed by access opening was done in 11 and 21 without local anaesthesia Biomechanical preparation followed by step back method was done using 2% sodium hypochlorite and normal saline as irrigant. Calcium hydroxide (vitapex, neo dental chemical products, Tokyo, Japan) was placed as an intracanal medicament for a week. Seven days later when the patient was completely asymptomatic, the root canals were obturated with gutta percha with lateral condensation method.

Figure 2: A large soft lesion involving the roots and the apices of right and left maxillary central incisor

Two days after the completion of the treatment the patient was asymptomatic so a full thickness mucoperiosteal flap was raised to expose the area of the periapical lesion by giving local infilteration on both bucal and lingual aspects of 21 and 11. A large soft lesion was revealed involving the roots and the apices of right and left maxillary central incisor (Figure 2). Already existing pathological cortical bone window was expanded until the underlying pathology was exposed adequately and curettage could be done easily. The periradicular lesion was fixed in 10% buffered formalin solution for histopathological evaluation. The roots of 11 and 21 were smoothened and resected at the apical end and retrograde filling with Glass ionomer filling was done. The bone cavity was irrigated with normal saline and the cavity was inspected to ensure that no residual lesion tissue was left behind. The flap was repositioned and sutured using 5-0 silk sutures.(Figure 3).

Figure 3: The repositioned and sutured flap after using 5-0 silk sutures

Postoperative instructions were given and antibiotics, analgesics and mouthwash were prescribed. The healing was uneventful and 6 months post operatively the patient was free of signs and symptoms.

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Discussion:

The response of trauma can be varied. Some pulps remain normal with no adverse effects whereas others become necrotic. The case report presented with trauma to teeth 10 years back in an athletic child while playing cricket which further lead to necrosis of the pulp. The necrotic pulp provided a good nutrition to pathogenic bacteria which further lead to the development of a periapical area above the apices of the traumatised teeth. Therefore root canal treatment was initiated followed by calcium hydroxide pushing in the canals since calcium hydroxide is a bacteriostatic agent *(Watson & Torabinejad, 2002). Sjogren et al, (1991)* founded that 1 week pushing of the calcium hydroxide in the canals kills the bacteria, so in the present case also calcium hydroxide was pushed for 1 week. Since the periapical lesion was very large and could not be healed with calcium hydroxide so periapical surgery was done in the present case.

Conclusion: In modern endodontic treatment the number of indications for endodontic periapical surgery is decreasing. Still it accounts to 3 to 10% of the endodontic practice. So, endodontic treatment with calcium hydroxide as an intracanal medicament is a viable approach for promoting periapical healing in nonvital teeth associated with periapical lesion. But the periapical surgery may be the only alternative when the tooth with periapical lesion fails to respond to calcium hydroxide as an intracanal medicament.

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