ISSN 2521-3458 (Online)
ISSN 2521-344X (Print)

THE REHABILITATION JOURNAL

THE REHABILITATION JOURNAL

Volume 06, Issue 01, 2022

PUBLISHED BY
Health Education Research Foundation
Office No. 2, HE-12/F, I & T Center, G-6/1-4, Islamabad. Pakistan. www.trjournal.org

EDITORIAL TEAM

EDITORIAL

COVID-19; A Lesson / An Eye Opener

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Citation: Khushnood K, Sultan N, Awan WA. COVID-19; A Lesson / An Eye Opener. T Rehabili. J 2021:06(01); 268-269

doi: https://doi.org/10.52567/trj.v6i01.149, **soi:** 21-2017/re-trjvol06iss01p268

The pandemic of Coronavirus disease 2019 (COVID-19) has led to serious implications throughout the globe ranging from finance, education, social support to health. There is hardly any aspect left untouched by this fatality. It has also opened our eyes about unequal and unjust distribution of resources among the world where the deprived have seen the worse scenarios. The developed nations tried to cope this situation with their assets while the rest have either suffered or have emerged even stronger.

The major burden was definitely on the health services delivery and provision, where the scares means from equipment to space and man power have all played their role. The pandemic has opened the eyes of health policy makers and service providers who were living in deception and have never been ready for certain contagion. We have come to know that the medical services are never enough to deal with similar situation. COVID-19 has taught us the skill of how to be prepared and fight in a worse situation but unfortunately, we have learned this after losing many precious lives.

The changes in healthcare practices have also been modified. The infection control (IC) system which should have been a focus prior became a highlight after pandemic. The IC practices in hospitals (public and private sector) were not sufficient and adherence to them wasn't observed either. Even the majority of services providers and heath care professionals weren't aware of use of personal protective equipment (PPE); their use and sequences of donning and doffing, except for those working in intensive care units and isolation areas. Thanks to COVID-19 who taught us to be familiar with these things whether their use is un-common.

COVID-19 has also been a guide for people in rehabilitation who are prime part of recovery from all illnesses including this pandemic. COVID-19 was found to be a cause of multiple complications i.e. pulmonary, cardiac, neurological, musculoskeletal, psychological and social. Attention was also diverted to recovery in all the mentioned aspects which led to provision and improvements in tertiary care setups with focus on rehabilitation as a mode of full recovery. The stakeholders have started to be more focused on improving the mental and physical aspects of disease along with the physiological.

The rehabilitation and physical therapy services have not been spared from the pandemic. Where the physical therapy professionals were not ready and well trained to deal with contagious diseases and safety measures it put us in a bigger challenge. Many clinics and hospitals had scares availability of personnel protective equipment (PPE) which also lead to seriousness of situation. As for provision of physical therapy care direct contact with patients cannot be limited, and lack of knowledge on unavailability of PPE could put therapist's or the patient's life in danger.

Covid-19 opened the eyes and importance of teaching safety measures and donning and doffing of PPEs was learned with appropriate sequence. Although the well-organized hospitals were also working as per global standard protocols had least difficulty dealing with such issues. The physical therapists are trained to deal with such emergencies and critical situations but not being exposed to a pandemic and emergency like this has made the suppression of such reflexes in practice. The therapist learned to manage patients with optimum precautions making sure that the quality of care is not compromised. Several tele-rehabilitation models have also been develop and practiced to encounter the issue.[1, 2]

Hence we would take COVID-19 as an eye opener and as taught to be fair in the division of global resources and be prepared for a disaster that doesn't discriminate among developed and undeveloped nations. The efficient use of services and being aware of emergency and safe healthcare practices can save us from unpredictable disasters like COVID-19.

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RESEARCH ARTICLE

EFFECTS OF FIFA 11+ PROGRAM ON SPEED, AGILITY, POWER AND QUALITY OF LIFE AMONG CRICKET PLAYERS

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Received on: *29-08-2021*
Revision on: *08-02-2022*
Published on: *31-03-2022*

Citation
Hameed A,Munir M, Ratriq HB, Hassan Z. Effects of FIFA 11+ program on speed, agility, power and quality of life among cricket players T Rehabili. J. 2022:06(01);270-274
soi: 21-2017/re-trjvol06iss01p270
doi: https://doi.org/10.52567/trj.v6i01.65

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ABSTRACT

Background: The FIFA 11+ program is established protocol in the training of football players. Speed agility and power are also the crucial component of cricket performance. FIFA 11+ program may be the choice of training among cricketers. **Objective:** To determine the effects of FIFA 11+ program on speed, agility, power and quality of life among cricket players. **Methods:** A single blinded randomized controlled trial was conducted on n= 50 cricket players were recruited through non-probability convenient sampling technique from Pakistan sports board and coaching centre Lahore. The inclusion criteria were cricketers having age between 14 to 35 years and those never participated in FIFA 11+ program was enrolled in study. The participants were randomly allocated to two groups receiving six (6) sessions of Injury prevention program FIFA 11+ (Group A) and conventional stretching (Group B) respectively. The outcome measures were 30m sprint test for speed, T-drill test for agility, 5 jumps test for power and athlete Life Quality Scale. As the data was not normally distributed non-parametric tests were applied for with-in and between the group comparisons. **Results:** The mean age of participants was 20.19 ± 2.796 years. Both groups showed statistically significant improvement ($p<0.001$) in speed, agility, power, and quality of life. While comparing the groups, there was no significant difference ($p=0.264$) was observed in speed. But FIFA 11+ program showed more significant improvement in agility, power and quality of life as compare to conventional dynamic stretching group ($p<0.05$) after 3 weeks of intervention. **Conclusion:** FIFA 11+ program can be recommended as an effective approach towards improving the agility, power, and quality of life of in cricket players.

Key words: Agility, Dynamic stretching program, FIFA 11+, Power, Speed, athlete, cricket.

INTRODUCTION

The cricket provides great opportunity for mixing individual initiative and skill with team effort. In this era, the cricket is experiencing the continuous change and development that is re-evaluation of coaching techniques, tactics, and methods. There are some factors that determine the performance in Cricket including tactics, training, fitness, and skill. Physical and mental fitness together determines the level of performance.[1] The main performance skills for professional athletes consists of tactical, technical, mental and physical skills.[2] Speed may be defined as the ability of the person to perform continuous movements of the same form at a fast rate.[1,2]

The cricket includes different important performance related skills like agility, flexibility and speed in cricket is more focused in important match circumstances, for example, running between the wickets for batsmen and delivery during quick bowling. In this way, speed is normally crucial for fielder.[3] Therefore, the players should be expert in different fielding positions, cricket includes different important performance related skills like agility and flexibility, the infield positions requires more agility as the reaction time is lesser due to close position to the batsmen whereas the outfield positions requires more powerful throws of ball back to the infield.[3] A meta-analysis shows that FIFA 11+ is the important program for Injury prevention programs with an efficacy revealed that the dangers caused by damages can be lowered by 35%.[4] Additionally, In fast bowlers the conditioning of the musculature to withstand high joint loading and prevent injury is done through improving core and back extensor strength.[5,6]

Football Association along with Medical and Research Centre (F-MARC), FIFA 11, and FIFA 11+ injury prevention programs were developed by The Federation International Football Association (FIFA), along with Medical and Research Centre (F-MARC) together with Oslo Sports Trauma Research Centre (OSTRC) and the Santa Monica Orthopedic and Sports Medicine Research Foundation (SMSMF).[7, 8] The ultimate purpose of this training is to improve stability, coordination, agility, reactive neuromuscular control and strength of the leg and core muscles. The success of the FIFA 11+ training has been studied in a number of countries, including Canada,[9] Germany,[10] Nigeria,[8] Norway

and the USA.[11, 12] Injury prevention programs reduce injury risk by improving neuromuscular strength, agility and limb coordination with a combination of strength, plyometric and balance exercises.[13]

The FIFA 11+ program is used extensively to increase the athletic performance of soccer players but in cricket players there is lack of evidence in the literature. It was hypothesized that this program significantly improves physical fitness in cricketers. So the objective of the study was to find effects of FIFA 11+ in improving their speed, agility, power and quality of life in cricketers.

METHODOLOGY

A single blinded randomized clinical trial was conducted on n=48 cricket players from Pakistan sports board and coaching centre Lahore with permission to proceed for data collection, on behalf of Research and Ethics Committee (REC) is to inform that the submitted research proposal has been reviewed and conforms to the REC guidelines, IRB reference no REC/RCR & AHS/20/0408. The participants were selected through non-probability convenient sampling. A sample size of n=44 was calculated from epitools.[14] Attrition rate of 10% was supposed so the final Sample size was n=48, and n=50 participants were randomly allocated in injury prevention program (FIFA 11+) Group Stretching exercises group, through fish bowl method a total of n=48 participants were analysed as the n=2 participants declined to continue their follow up. (Figure 1)

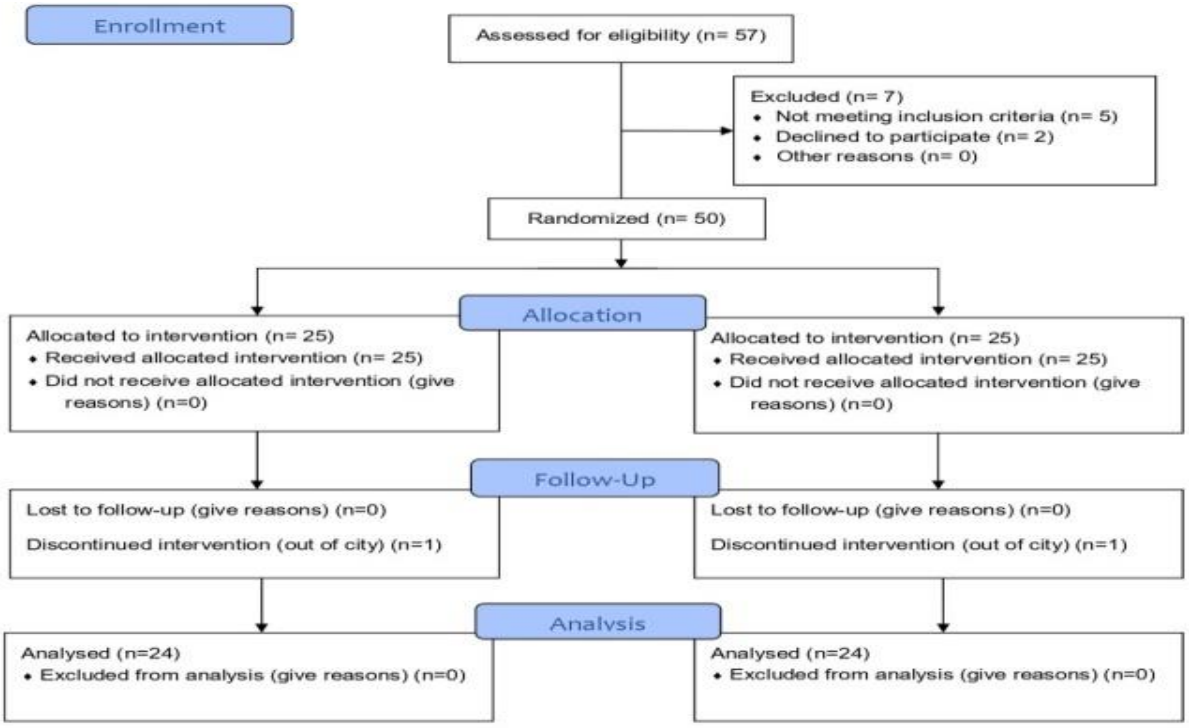

Figure 1: CONSORT diagram

The participants were selected through specific inclusion criteria which were domestic male cricket players between 14 to 35 years of age; those never participated in any injury prevention program. Participants having any previous fractures and surgery, any cardiovascular pathology, history of any lower limb pathology (prior 1 year) were excluded from the study. A written Informed consent was taken from the participants ensuring participants about confidentiality of the data. The data was collected by administering 30 m Sprint Test for Speed (r=0.77 to 0.98)[15] , T-Drill Test for Agility (r=0.63 to 0.98)[15], 5 Jump Test for Power (r=0.73 to 0.86)[16] and Athlete Life Quality Scale (r= 0.83)[17]. Group A received pre-training exercises the FIFA 11^{+} program for 20 minutes before training sessions and for 10 minutes as post-training exercises after training sessions, two times per week for 3 weeks. The program consists of 15 exercises focusing on core stability, strength training, balance exercises and plyometric, includes Jogging and active stretching of the muscles

actively, abdominal, and lower extremity resistance exercises and high-speed twisting practice are the three key components of this program.[18]

The group B received conventional static stretching protocol followed by a dynamic stretching protocol. Each protocol consisted of 15 minutes each. The static stretching and dynamic stretching exercises were repeated 2 times on each leg. These exercises were performed for duration of 30 seconds with 10-second recovery period among each exercise. The targeted muscles were plantar flexors, adductors, hamstrings, hip extensors and quadriceps.

In both groups, as a baseline intervention, subjects performed at least a 5-minute self-paced general warm-up comprising of low intensity to moderate intensity aerobic exercise including 3 minutes of forwarding jogging, 1minute of side stepping, and 1 minute of jogging backwards. The assessment was done at the baseline and after three weeks. As the data was not normally distributed, non-parametric tests including Wilcoxon Signed Ranked test for with-in group changes and Mann Whitney U-test for between groups comparison was used. The correlation was used to determine the effect size. The data was analysed on Statistical Package of Social Sciences (SPSS) Version 21.0. The level of significance was set at $p<0.05$.

RESULTS

The mean age of participants was 20.19 ± 2.796 years. The age range was 15-26 years. The with-in group changes showed that Both groups improved significantly with large effect size in FIFA 11+ Program and Dynamic Stretching Protocol respectively, regarding speed (z=-4.031, p<0.001, r=0.58 and z=-3.74, p<0.001, r=0.53),, agility (z=4.30, p=0.001, r=0.62 and z=-4.22, p<0.001, r=0.61), power (z=-4.28, p<0.001, r=0.61 and z=4.19, p<0.001, r=0.60) and quality of life (z=-4.292, p<0.001, r=0.62 and z=-4.296, p<0.001, r=0.62). (table 1)

Table 1: with in group changes in both groups

Study variables	Groups	Baseline	After 3rd week	p-value
		Median(IQR)	Median(IQR)	
SPEED	FIFA 11+ Program	3.15	3.00	0.000***
	Dynamic Stretching Protocol	3.05	3.00	0.000***
AGILITY	FIFA 11+ Program	11.00	10.30	0.000***
	Dynamic Stretching Protocol	11.05	10.90	0.000***
POWER	FIFA 11+ Program	12.32	12.77	0.000***
	Dynamic Stretching Protocol	12.32	12.45	0.000***
AQOL	FIFA 11+ Program	38.00	55.50	0.000***
	Dynamic Stretching Protocol	37.50	48.00	0.000***

Significance level: p<0.05, p<0.01**, p<0.001****

When comparing the both group it was observed that the group received FIFA 11+ program showed more improvement with large effect size in agility (U=67.5, p<0.001, r = 0.65.), power (U = 94.0, p<0.001, size r = 0.57) and quality of life (U = 94.5, p<0.001, r=0.56) as compare to group received dynamic stretching protocol. While no significant difference between the groups regarding speed (U=234.5, p=0.264) after 3rd week of training. (table 2)

Table 2: Group A (FIFA 11+ Program) Vers. B (Dynamic Stretching Protocol) for speed, agility, power, AQOL

Study variables	Groups	Baseline		After 3rd 2week	
		Median(IQR)	p-value	Median(IQR)	p-value
SPEED	FIFA 11+ Program	3.15	0.466	3.00	0.264
	Dynamic Stretching Protocol	3.05		3.00	
AGILITY	FIFA 11+ Program	11.00	0.418	10.30	0.00***
	Dynamic Stretching Protocol	11.05		10.90	
POWER	FIFA 11+ Program	12.32	0.992	12.77	0.00***
	Dynamic Stretching Protocol	12.32		12.45	
AQOL	FIFA 11+ Program	38.00	0.820	55.50	0.00***
	Dynamic Stretching Protocol	37.50		48.00	

Significance level: p<0.05, p<0.01**, p<0.001****

DISCUSSION

The study objective was to determine the effect of injury prevention program (FIFA 11+) on speed, agility, power and athlete quality of life (QOL).The result of the study rejected the null hypothesis for agility, power and athlete QOL, while accepted for the speed. According to the results of the study both groups showed significant improvement in speed, agility, power and quality of life among cricket players. However, between the group comparison showed significant difference in both groups except speed which was equally improved In both groups. Agility, power and quality of life were more improved in the group received injury prevention program FIFA 11+.

Nawed, Alvina, et al. enlightened that their trial provides the insight suggesting that vertical jump and sprint speed were significantly improved in the FIFA 11+ program group compared to the control group ($p<0.05$).[19] No statistically significant difference in agility parameters ($p>0.05$) was found between the groups. The results of above-mentioned study conflicts with the present study as improves agility, power and quality of life among cricket players *p*-value (< 0.005) and doesn't show any significant changes in speed as *p*-value 0.264.

Sahin, N. E. Ş. E., et al. concluded that their study on FIFA 11+ program shows comprehensive improvement in specific performance such as agility.[20] The agility pre-test result was found 6,358 ± 0, 27 seconds and post-test was found 6,121 ± 0, 34 seconds. A significant difference was found between agility test values ($p<0,05$).The FIFA 11+" is a comprehensive warm-up program is an appropriate and effective program for improving performance such as agility in young basketball players2. Authors proved that FIFA 11+ was able to improve dynamic balance and agility[3].

Chaouachi, Anis, et al. elaborated that their current study did not show noteworthy impairments in sprint time linked with preceding static stretching or dynamic stretching.[21] Static stretching following a dynamic warm-up in team sports does not lead to significant decreases in performance in explosive measures of sprint, agility and jumping performance5. The above-mentioned study coincided with this study as there was no significant improvement in the speed among cricket players associated to dynamic stretching protocol as *p*-value 0.264. Many researches shows that static stretching can impair power, strength and speed[22,23]. The findings of current study contradict with this as there was a significant improvement in speed, agility, power and quality of life following stretching program as *p value* is <0.001.Sarika, S et al. has made an effort to evaluate the acute effects of combined stretching methods on flexibility, Speed, & agility in cricket players.[3] The current finding displayed noteworthy improvement after combined stretching method than conventional stretching. It determined that combined stretching methods i.e., combined static dynamic and combined dynamic static together improve flexibility, speed & agility than conventional stretching throughout the warm up sessions. The current study coincides with the above-mentioned study as there was significant improvement in speed, agility and power using dynamic stretching protocol as *p value* is <0.001.

Due to the present pandemic situation across the country some limitations occurred to this study as FIFA 11+ could not be implemented for a complete training session (6 months) as described in many studies to have a better efficacy and results. Other variables like weight, height, BMI was not recorded which may affect the results. Also, owing to the athlete's unfamiliarity with practicing cool down and thus a potential propensity, especially when stressed, to not participate properly on every event, proper supervision of the program following training was required.

CONCLUSION

This study found that FIFA 11+ program implication has a significant impact on the improving Agility, Power and quality of life of cricket players.

while the effects of this intervention may not be limited to cricket, they may indicate the need for and importance of developing similar programs for other sports like Rugby, Hockey and Basketball etc. that neglect IPPs. Further studies should be conducted on participants with all age groups, with different sports especially including speed as a performance factor to have a better understanding about its improvement.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

EFFECTS OF INSPIRATORY MUSCLE TRAINING ON FUNCTIONAL CAPACITY AND QUALITY OF LIFE IN PULMONARY HYPERTENSIVE PATIENT

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Received on: *17-09-2021*
Revision on: *28-02-2022*
Published on: *31-03-2022*

Citation; Bano S,Kausar F, Amanat S, Shafique S, Muneeb HN, Mehmood Q Effects of inspiratory muscle training on functional capacity and quality of life in pulmonary hypertensive patient T Rehabili. J. 2021:06(01);275-279
soi: 21-2017/re-trjvol06iss01p275
doi: https://doi.org/10.52567/trj.v6i01.77

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ABSTRACT

Background: Exercise intolerance is present even in the early stages of pulmonary arterial hypertension (PAH) and is associated with poor prognosis. Respiratory muscle dysfunction is common and may contribute to exercise limitation. **Objective:** To determine the effects of inspiratory muscle training (IMT) in pulmonary hypertensive patient. **Methodology**: A randomized control trial was conducted at Services Hospital Lahore after approval from Medical Superintendent. A total of n=18 subjects were randomly allocated into two groups, both group received deep breathing exercise (DBE) and 2nd group received additionally Inspiratory muscle training (IMT) with pressure threshold Inspiratory muscle training device. All participants received 12 sessions in two weeks; the duration of each session was of 20 minutes. The outcome variables were functional capacity and quality of life (SF-36). In functional capacity, of the blood pressure (BP), heart rate (HR), partial pressure of oxygen (SpO_2), distance walk (6min walk test) and level of dyspnea were recorded The data was evaluated at baseline and after 12th session. **Results:** The mean age of patients was 58.11±7.11 years, with 9 male and 9 female. After 2 weeks, the general health, social activities and energy were significantly ($p<0.05$) improved in experimental group. But no significant difference ($p\geq0.05$) was observed between the group regarding activity limitation, physical and emotional health items of quality of life (SF-36). When comparing the Blood pressure and heart rate, no significant difference was observed between the groups, after 2 weeks of intervention ($p\geq0.05$). While SpO_2,6 MWT and dyspnea score was significantly ($p<0.05$) improved in experimental group as compare to control group. **Conclusion:** The Deep breathing and inspiratory muscle training both are equally effective with respect to improving the quality of life but IMT is more efficient as compared to Deep breathing for improving dyspnea and it also improves the pulmonary functional and exercise capacity.

Keywords: Breathing exercises, dyspnea, inspiratory muscle training, pulmonary hypertension, quality of life.

INTRODUCTION

Pulmonary hypertension (PH) is a progressive condition that is diagnosed as the mean pulmonary arterial pressure (PAP) is ≥25 mm Hg at rest.[1] PH represents with pathological changes in the lungs vasculature that lead to vasoconstriction and consequently the increase of pulmonary vascular resistance (PVR). This progressive vasoconstriction causes an increase in PAP, with the right ventricle (RV) overloading and resulting in right heart failure and eventually death.[2] The early stage of PH may remain asymptomatic; but major symptoms of its progression are fatigue, dyspnea, syncope and angina that may result in decreased exercise capacity and quality of life (QoL).[3]

Severe functional limitations in patients with PH, is due to dyspnea that make them unable to follow a physical exercise program and even their daily living activities (ADL).[4] As cardiopulmonary changes are marked as major contributor to these limitations, symptoms worsen gradually if the changes in respiratory muscles occur.[5] Several mechanisms responsible for peripheral and respiratory muscle changes include muscle disuse, inflammation, insulin resistance, decreased cardiac output, altered autonomic nervous system (ANS) response, and hypoxemia. Because of this there may be alterations of the type of fibre, muscle atrophy, decreases capillary network and oxidative capacity of muscle along with reduced muscle excitability.[6] According to literature, as a result of changes in respiratory muscles, patients with PH demonstrate reduction in maximal expiratory pressure (MEP) and maximal inspiratory pressure (MIP) by 25%.[7] When compared with healthy individuals, there is 28% decrease of MIP if PH is associated with left heart disease.[4,8]

Along with the drug therapy to treat PH, several studies have evaluated the effects of physical exercises on PH.[9-13] James R et al in 2019 found that supervised exercise training is a prognostic

factor for survival and improved quality of life in patients with Pulmonary Hyper tension.[9] Lenna Waller et al in 2020 concluded that aerobic, anaerobic and respiratory muscle training improves functional capacity indicated by VO_2peak and 6 MWT.[10] Keusch S et al in 2017 provided the evidence that physical training improves the quality of life, maximal oxygen capacity (VO2peak) and benefits in exercise capacity.[11] In patients of chronic conditions such as chronic obstructive pulmonary disease (COPD) and heart failure (HF), Hoeper MM in 2013 and Mainguy V in 2010 concluded that the use of inspiratory muscle training (IMT) has markedly improved the strength of respiratory muscle and hence the functional capacity. [12, 13] Inspiratory muscle strength training (IMST) involves an exercise program which uses the diaphragm and accessory respiratory muscles to repeatedly inhale against resistance.[14]

Upto the researcher's knowledge, there was lack of integrating exercise program that focuses on light-intensity endurance, strength, and respiratory training for pulmonary hypertension. So the current study was performed to determine the effect of respiratory training with IMT device in treatment of pulmonary hypertension that may affect the strength of inspiratory muscles and functional capacity and to increase awareness for the use of pulmonary exercise and rehabilitation strategies in pulmonary hypertension in combination with medicines.

METHODOLOGY

This randomized control trail was conducted from January 2021 to April 2021 at Services Hospital Lahore (RCRS-RE-MS-PT/Fall 20/044). The sample size was n=18, collected through convenient sampling techniques. The clinically stable patients of both gender, with age between 40-70 years, diagnosed with Pulmonary Hypertension (PAPm ≥ 25mmHg and PAOP <15mmHg) were included in the study. While patients with COPD, left heart failure, severe ischemic heart disease, cor-pulmonale, and any associated orthopedic and cognitive disorders were excluded.

The n=18 participants were randomly allocated into group A, receiving deep breathing exercises (DBE) and group B, receiving additionally pressure threshold Inspiratory Muscle training via lottery method.(Figure 1). Both groups received a total of 12 sessions in two weeks. For deep breathing exercise, patients performed pursed lip and diaphragmatic breathing with 10 repetitions of each twice a day. During diaphragmatic breathing, they were instructed to inhale as deeply as they could while their abdomen expanded, and to exhale as slowly as they could while their abdomen contracted, in a self-paced rhythm. For pursed lip breathing, patients were instructed to inhale deeply and exhale the air with lips partially closed slowly.

Additional inspiratory muscle training to Experimental group was performed using a Threshold Inspiratory Muscle Training Device (Philips) at a resistance generating a pressure corresponding to 50% of the initial Maximum inspiratory pressure (PImax) for each session Two sets of 30 breaths with 5–10 min of rest between each set with a total session of 20 minutes 6 days in a week for 2 weeks using pressure threshold device that utilizes a spring- loaded one-way controller that places reliable struggle on the inspiratory muscles. Patients are instructed to emphasize the use of their diaphragm and to ensure that their abdomen "sticks out" during each inspiratory manoeuvre.

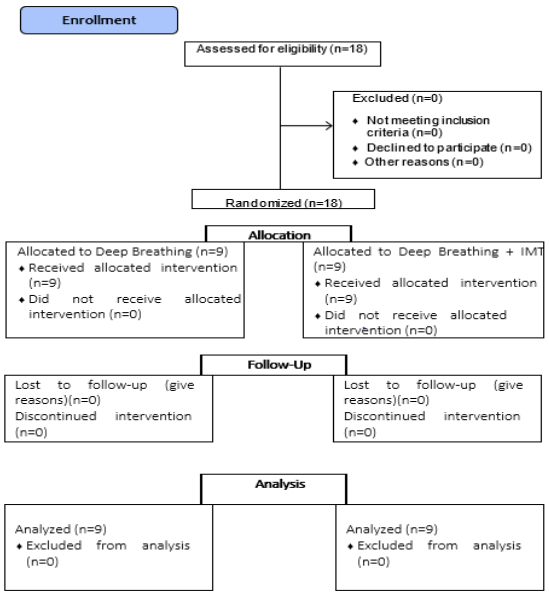

Figure 1: CONSORT diagram

After taking the consent from patients, Quality of life and functional capacity of the patients were evaluated with SF 36 (r=0.778) [15] and 6MWT(r=0.94)[16] respectively before and after 2

weeks of intervention. Data was analysed using SPSS 21.0.

After checking the normality of data with Shapiro-Wilk test, parametric tests were used for analysis with paired sample t-test for within group analysis and independent sample t-test for between group analyses, as the data was normally distributed. The level of significance was set at p<0.05.

RESULTS

The mean age of patients was 58.11±7.11 with 9 male and 9 female. The mean age of n=6 males and n=3 females patients in control group was 52.67±6.764. While the mean age of 3 males and 6 females patients in Experimental group was 58.22±11.56.

For within group analysis of SF-36 for control group and experimental groups, the results shows that there were statistically significant changes in all the sections of SF36, 6 MWT, systolic BP and dyspnea score before and after treatment (p<0.05). While no change in BP Diastolic after 2 weeks of intervention in both groups (p≥0.05). The Heart rate (HR) was statistically improved in control group (p<0.001), while no significant change in experimental group (p=0.073). While the SpO_2 was significantly improved in experimental group (p<0.001), but no significant change in control group (p=0169) after 2 weeks (Table 1)

Table 1: Within group analysis for quality of life and functional Capacity

		Group A (DBE)		Group B (DBE+IMT)	
		Mean±SD	Sig	Mean±SD	Sig
Quality of Life					
General Health	Pre	37.52±12.041	.000***	31.72±5.52	.000***
	Post	51.66±13.29		65.08±9.47	
Limitation of Activities	Pre	38.27±5.77	.000***	30.22±4.71	.000***
	Post	51.33±7.38		59±14.28	
Physical health	Pre	31.38±10.05	.000***	31.05±7.01	.000***
	Post	51.97±9.14		57.3±7.20	
Emotional health	Pre	37.22±7.77	.041*	31.66±4.52	.000***
	Post	69.63±37.91		58.61±12.26	
Social activities	Pre	25.05±7.37	.003**	25.88±6.91	.000***
	Post	43.67±10.22		58.08±11.15	
Energy and emotions	Pre	33.11±7.70	.000***	29.33±6.69	.007**
	Post	44.41±8.67		43.83±10.94	
Functional Capacity					
BP Systolic	Pre	137.22±6.55	0.03*	140.33±8.48	.000***
	Post	147±7.87		147±7.87	
BP Diastolic	Pre	75.66±5.33	.362	75±6.18	.325
	Post	77.33±6.12		77.33±6.12	
HR	Pre	109.22±4.40	.000***	112.55±6.24	.073
	Post	118.33±3.60		116.88±4.67	
SpO2	Pre	78.77±2.27	.169	77±2.91	.000***
	Post	80.33±3.39		85.66±2.64	
Distance Walked	Pre	362.22±62.85	.000***	393.33±63.24	.000***
	Post	410.77±53.85		515±68.55	
Dyspnea	Pre	6.11±1.69	.001**	6.33±1.93	.000***
	Post	4.44±1.13		3±1.65	

Significance Level: p<0.05, p<0.01**, p<0.001****

Table 2: Between Group comparison of Quality of Life & Functional Capacity

	Group A (DBE)	Group B (DBE+IMT)	
	Mean±SD	Mean±SD	Sig
Quality of Life			
General Health	51.66±13.293	65.08±9.47	0.025*
Limitation of Activities	51.33±7.38	59±14.28	0.172
Physical health	51.97±9.14	57.3±7.2	0.188
Emotional health	69.63±37.91	58.61±12.26	0.419
Social activities	43.67±10.22	58.08±11.15	0.000***
Energy and emotions	44.41±8.67	43.83±10.94	0.046*
Functional Capacity			
BP (systolic)	147±7.87	147±7.87	1
BP (diastolic)	77.33±6.12	77.33±6.12	1
Heart rate (HR)	118.33±3.60	116.88±4.67	0.474
SpO_2	80.33±3.39	85.66±2.64	0.002**
6MWT	410.77±53.85	515±68.55	0.002**
Level of dyspnea	4.444±1.130	3.000±1.658	0.046*

Significance Level: p<0.05, p<0.01**, p<0.001****

While comparing the both groups after 2 weeks, the general health (p=0.025), social activities (p<0.001) and energy (p=0.046) were significantly improved in experimental group. But no significant difference was observed between the group regarding activity limitation, physical and emotional health items of quality of life (SF-36). When comparing the Blood pressure and heart rate, no significant difference was observed between the groups, after 2 weeks of intervention (p≥0.05). While SpO_2 (p=0.002), 6MWT(p=0.002) and dyspnea score (p=0.046) was significantly improved in experimental group as compare to control group. (table 2).

DISCUSSION

The purpose of current study was to determine the effects if inspiratory muscle training to improve functional capacity and quality of life in patients of pulmonary hypertension. The patients were treated for 2 weeks and were assessed before and after the intervention with respect to 6 MWT and SF 36. The null hypothesis was rejected; IMT showed an improvement in characteristics of inspiratory muscle resulting in improvement in total distance walked, dyspnea and HRQoL in Pulmonary Hypertension (PH) patients.

The current study showed significant improvement in functional capacity and 6MWT in patient receiving IMT, similar results were proposed by Derek Tran B App Sc et al [17] in 2021 and concluded that the IMT group improved maximum inspiratory pressure (PImax) and 6-minute walk distance as compared to control group but no change in peak oxygen uptake between-groups was observed. Lena Waller et al in 2020 confirmed that combination of both the aerobic and anaerobic; along with the respiratory muscle training induces the strongest improvement in functional capacity and increases the quality of life. [10] Results of these both studies favor the findings of current study in which the group receiving IMT improved in functional capacity along with SpO_2 and dyspnea as compared to the group which was receiving deep breathing exercises measured on 6-minute distance

André Luiz Lisboa Cordeiro in 2016 evaluated the effectiveness if IMT in patients undergoing cardiac surgery and revealed the similar results like current study inspiratory muscle training is beneficial in the field of increasing inspiratory muscle strength and overall functional capacity.[18] Melda Saglam et al. in 2015 also found the comparable results that IMT decrease the level of hyperventilation in patients, improve the respiratory muscle power and enhances the functional capability in patients having pulmonary arterial hypertension.[19] Derliz Mereles et al in 2006 endorsed the results of current study and concluded that low-dose exercise and respiratory muscle training are promising adjunct to medical treatment in patients with severe PH.[5]

Ferreira JB et al [20] in 2013 said that IMT validated beneficial outcomes on systolic and diastolic blood pressures. Claire M et al[21] in 2017 studied the effect of daily inspiratory muscle training in lowering blood pressure and vascular resistance with the treatment duration of 6 weeks and concluded that there is reduction of blood pressure and vascular resistance but no change in heart rate was observed. Similar results were observed in current study for heart rate but for blood pressure, no significant improvement was observed in systolic and diastolic blood pressures as the duration of treatment was not long enough to produce significant change. So Inspiratory muscle training is safe for patients and feasible and improves key prognostic outcomes that relate to improve the survival rate. As there was time constraint and patients were discharged from hospital as soon as they were stable, long-term follow up was not possible to observe long term changes and to evaluate its impact on improving the other parameters and quality of life.

CONCLUSION

The Deep breathing exercises along with inspiratory muscle training gives more promising results in increased exercise capacity and better quality of life. It is recommended as a safe and potential adjunct therapy in pulmonary hypertensive patients with improved survival outcomes. It is further needed to evaluate the effect of IMT on diaphragmatic function and in acute and chronic PH separately so an integrated programme may develop that focuses on light-intensity respiratory training.

Acknowledgement

I am thankful to my Creator Allah Subhana-Watala to have guided me throughout this work at every step and for every new thought which you setup in my mind to improve it.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

PREVALENCE OF KNEE OSTEOARTHRITIS AND QUALITY OF LIFE AMONG MIDDLE-AGED ADULTS OF PAKISTAN

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Received on: 21-09-2021
Revision on: 09-03-2022
Published on: 31-03-2022

Citation; Basheer F, Memon AG, Shah S, Latif D, Afzal MF, Memon SA. Prevalence of knee osteoarthritis and quality of life among middle-aged adults of Pakistan T Rehabili. J. 2021:06(01);280-283
soi: 21-2017/re-trjvol06iss01p280
doi: https://doi.org/10.52567/trj.6i01.80

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ABSTRACT

Background: Osteoarthritis (OA) is a common and disabling constant Musculoskeletal Disorder that causes significant weight on individual, Health Care Systems, and social economy. With the maturing of the populace and the commonness of undesirable way of life practices, the predominance and disease burden of OA are expanding day by day. **Objective:** To find the prevalence of knee osteoarthritis and quality of life among middle-aged adults. **Methodology:** A descriptive cross-sectional survey was conducted at the major hospitals and physical therapy clinical setups of Pakistan from April to July 2019 (4 months) after approval of IRB/ERC (SRMCH/MS/20/12/41) Suleman Roshan medical college hospital, Tando Adam**.** The total sample was n=300 selected using non-probability convenience sampling. The middle-aged adults (40-65 years) having moderate to severe knee pain**,** both male and female were included. According to the American college of rheumatology the criteria for assessing OA by using history, physical examination, and radiographic findings: pain in the knee and one of following over 50 years of age, less than 30minutes of morning stiffness crepitus on active motion and osteophytes and quality of life assessed according to WHOQOL-100 score. The results of the study are presented as frequency, percentages, and mean ±SD. The data were analysed through SPSS 21.**Results:** The mean age of the study participants (n=300) was a 48.96±6.804 year. The majority of the participants were female (n=208) and the remaining n=92 were male. The prevalence of OA in the middle aged adults (n=300) n=170 (56.7%). There was significantly reduced QoL among patient having knee OA (37.19±23.22 ver 42.51±22.69, p<0.05) as compare to those having knee pain without Knee OA. **Conclusion:** The prevalence of knee pain in middle-aged adults is high and their quality of life is moderately affected.

Key words: Knee, Middle-aged, Osteoarthritis, Prevalence, Quality of life.

INTRODUCTION

Osteoarthritis is a condition influenced principally by older adults. In 2010 there were about 250 million people who had knee osteoarthritis worldwide it was 3.6% of the population.[1,2] It is stated that in 2004 the OA causes globally moderate to severe impairment in 43.4 million people.[3] Sedentary lifestyle is one of the significant reasons for joint inflammation. Lack of physical activity or sedentary lifestyle also caused knee pain, which leads to OA. Individuals with knee OA further limit mobility to avoid pain during activity.[4] Prevalence of knee pain and symptomatic knee osteoarthritis approximately doubled in women and tripled in men over 20 years. [5,6] According to a study in American people the age of 45 or above the prevalence of symptomatic osteoarthritis is 20% in women and 10% in men.[7] But the prevalence for radiographic OA may be between 27% and 80% and the risk factors were an increase in age BMI>30, after menopause in females having a family history or any trauma to the knee joint.[8,9]

OA was related with mental features, for example, torment anxiety, Depression as well as emotional episodes in OA patients. findings likewise showed that male OA patients were more inclined to the advancement of positive influence contrasted with female OA patients. Serious Depression was seen as in 135(93.8%) male patients Compared to 97(91.5%) females. The outcomes are in accordance with equal investigations done around the world. Curiously, 72.5% mental horribleness, similar to Depression, has been seen in female OA patients.[10,11] According to the ABS 2017-18 National Health Survey (NHS) individuals matured 45 and done with osteoarthritis are less inclined to see their wellbeing as brilliant or awesome contrasted and individuals without Osteoarthritis. Individuals with Osteoarthritis were 2.1 times as liable to depict their wellbeing as poor (11%) contrasted and those without Osteoarthritis (5.0%)[12] Patients with knee OA had essentially more unfortunate QoL contrasted and sound controls. Additionally Western Ontario and McMaster WOMAC can be utilized as a delicate measure for handicap of patients with knee OA[13] Knee OA limits the development of patients in 80%

of cases and 25% find themselves unfit to play out the assignments of day to day existence. These Disabilities, basically connected with torment, appeared by trouble in Walking, climbing steps, to the exhibition of family errands or while sitting upstanding and change is joined by a lessening in personal satisfaction and a significant mental effect.[14]

There are studies conducted previously on older adults, but middle-aged adults there is paucity in the literature. For that researcher interested to find prevalence and QoL among middle-aged adults patient having a knee pain.

METHODOLOGY

This descriptive cross-sectional survey was conducted at different clinical setups of Hyderabad, Tando Adam, and Tando Muhammad Khan city from April to July 2019 (4 months) after approval of IRB/ERC (SRMCH/MS/20/12/41) Suleman Roshan Medical College Hospital, Tando Adam, Sindh. The total sample was n=300 selected using Non-probability convenience sampling and the sample size was calculated via the Raosoft tool with a confidence level of 95 and a 5% error margin. The middle-aged adults (40-65 years)[15] having moderate to severe knee pain, both male and female were included. Patients with leg length discrepancy and recent fractures or any trauma were excluded from the study. The data was collected through A self-structured questionnaire which includes age, gender, education level, employment status, and family history. The Knee Injury and Osteoarthritis Outcome Score KOOS questionnaire were also used in this study to find QoL.

According to the American college of rheumatology, the criteria for assessing OA are by utilizing history, physical assessment, and radiographic discoveries: torment in the Knee and one of following north of 50 years old, under 30minutes of morning firmness Crepitus on dynamic movement and osteophytes.[16] The quality of life of patients was likewise evaluated utilizing the KOOS knee survey. The outcomes of the research are presented as frequency, percentages, mean ±SD and p-value. The data were analysed through SPSS 21.

RESULTS

The mean age of the study participants (n=300) was 48.96±6.804 years. The majority of the participants were female (n=208) and the remaining n=92 were male. The detailed demographics can be seen in table 1.

Table 1: Demographics of participants with Knee pain

Variables	Construct	N(%)	Knee OA	Knee Pain
Gender	Male	92(30.7)	57(62)	35(38)
	Female	208(69.3)	113(54.3)	97(45.7)
Occupation	Job Holder	35(11.7)	22(62.9)	13(37.1)
	Housewife	167(55.7)	85(50.9)	82(49.1)
	Teacher	41(13.7)	28(68.3)	13(31.7)
	private business	57(19.0)	35(61.4)	22(38.6)
BMI	Under weight	8(2.67)	2(25)	6(75)
	Normal weight	91(30.3)	48(52.7)	43(47.3)
	Overweight	81(27)	42(51.9)	39(48.1)
	Obese Class I	76(25.3)	49(64.5)	27(35.5)
	Obese Class II	36(12)	23(63.9)	13(36.1)
	Obese Class III	8(2.6)	6(75)	2(25)

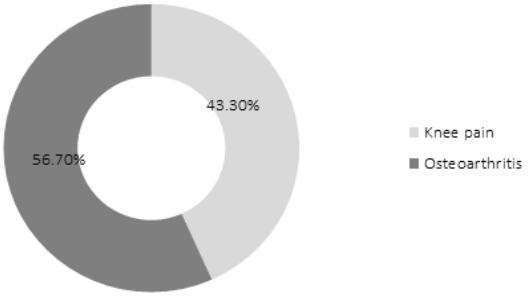

Figure 1: Prevalence of Knee OA in the participants

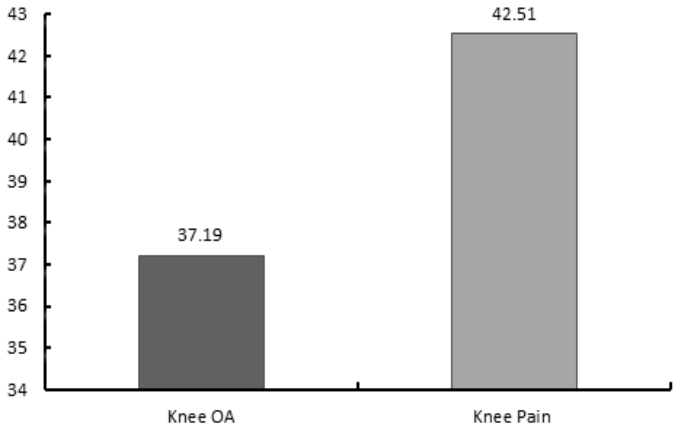

Figure 2: QoL Score (KOOS) of Study participants having Knee Pain and Knee OA

The prevalence of knee OA in middle-aged adults (n=300) was n=170 (56.7%) and remaining n=130(43.30%) having knee pain without OA. (Figure 1).The significantly reduced QoL among patient having knee OA (37.19±23.22 ver 42.51±22.69, $p<0.05$) as compare to those having knee pain without Knee OA. (Figure 2).

DISCUSSION

The aim of the this survey was to find out the prevalence of Knee and quality of life among middle-aged adults. The results indicated that Knee OA is highly prevalent in a middle-aged adult with a moderately compromised quality of life.

A study conducted by Thorstensson et al and to determine the natural course of osteoarthritisin middle aged subjects having knee pain and concluded that knee pain in middle aged subjects could be the first sign of osteoarthritis.[17] An epidemiological study conducted in middle aged subject and concluded that 14% of middle aged subjects had moderate to severe chornic pain of back or knee.[18] A study conducted on urban elderly population of Chandigarh using the clinical criteria for an estimation of osteoarthritis knee, reported a prevalence of 34%.[19]

In this research we found prevalence of gender-based male having Knee of OA 57(62%), Knee pain 35(38%) and in female, knee OA 113(54.3) and Knee Pain 97(45.7%) The prevalence of gender based knee torment was 60.5% among ladies and 38.6% among men.20,21 A Previous report showed that Osteoarthritis was more normal in females than males, as 74 out of 100 patients were female (74%) and 26 patients were male (26%). This distinction might be clarified by the absence of actual work, portability, social issues particularly in our area, and a higher commonness of corpulence among ladies as a rule, which is reliable with the information from different investigations.[19] In May 2014 a research was conducted in the orthopedics department of Victoria hospital Bahawalpur, 72% of patients out of 100 were diagnosed with OA.52(81.25%) were females and 20(55.6%) were males among them. In 60 obese patients, osteoarthritis was found in 56 patients.[10]

The current study also showed that knee pain is common in over weight and obese patients. A Study led in Iran, that the most highest prevalence pace of knee torment was in subjects with a BMI higher than 30 (31.6%) and BMI 25-30 (24.5%).[22]

The main effect of weight on the musculoskeletal framework is related to osteoarthritis Obesity is an all-around perceived worldwide epidemic. The results of our study showed that osteoarthritis is more common in obese individuals. Out of 300 individuals, 170 (56.67%) had osteoarthritis and 120 (40%) were overweight. Thus there is a significant association between osteoarthritis and obesity. A study was done at Southampton University, which observed the heaviness of 525 males and females having age of 45 or more to the seriousness of knee OA. The outcomes showed that the danger of advancement of knee OA increments continuously all through the BMI classes, and the people having BMI 36 or more prominent have a 14 times higher risk of causing knee OA when compared with those who have normal BMI.[23]

A sedentary lifestyle is one of the major causes of arthritis. Our study shows that quality of life was affected by Knee OA, finding shows a significant association between QoL and Knee OA. An old study was conducted to find out the sedentary behaviour and physical function, objective Evidence from the Osteoarthritis Initiative. The study demonstrated a strong relationship between the most sedentary behaviour group and worse physical function in adults with knee OA.[18]

The main impediment of the current review is that it was done in a solitary area of Pakistan. More KOA patients from different commonplace clinics might have been enlisted to work on the generalizability of the findings.

CONCLUSION

The prevalence of knee pain in the population over the middle-aged who participated in the study was high. It has marked that there is a huge gap in the literature to determine the impact of knee OA on the quality of life and health of the middle-aged population. Future studies should be followed on a larger scale to assess the prevalence of knee OA in other ages and other cities of Pakistan should also include in the study.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

EFFECTIVENESS OF ELONGATION LONGITUDINAUX AVEC DECOAPTION OSTEOARTICULAIRE IN CORRECTING FORWARD HEAD POSTURE

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Received on: *23-09-2021*
Revision on: *08-02-2022*
Published on: *31-03-2022*

Citation; Khalid N, Waqqar S, Khalid M**,** EFFECTIVENESS OF ELONGATION LONGITUDINAUX AVEC DECOAPTION OSTEOARTICULAIRE IN CORRECTING FORWARD HEAD POSTURE. T Rehabili. J. 2021:06(01);284-289
soi: 21-2017/re-trjvol06iss01p284
doi: https://doi.org/10.52567/trj.v6i01.82

Nandisha Khalid[1]: data collection, Statistical analysis, Article draft
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Maria Khalid[2]: Revised and accountable for all aspects

ABSTRACT

Background: Forward head posture, is a deviation of spinal vertebrae from their respective places, which causes anterior translation at head and gives a poking chin with associated sign and symptoms. Conventional physical therapy and manual therapy techniques are effective in correction of forward head posture. **Objective**: To determine the effectiveness of Elongation Longitudinaux Avec Decoaption Ostéo Articulaire (ELDOA) in correcting forward head posture. **Methodology**: Single group Interrupted time series quasi experimental design was conducted in outpatient Department (OPD) of Islamabad Physiotherapy & Rehabilitation Centre Bahria Town, from August 20 to January 21 consisting of n=44 male and female participants of 30 to 40 years age. All participants received three sessions per week for 4-weeks after selection through convenience sampling technique. The assessments were done at baseline, 1st, 4th and 12th post treatment day. The assessment was done using tragus to wall distance and shoulder to wall distance via measuring tape for forward head posture, cervical range of motions (ROMs) with inclinometer and pain using Numeric Pain Rating Scale (NPRS). Data analysis was done via SPSS-22. Results: A total of n=21 male with the mean age of 35.96±3.22 years and 23 female with a mean age of 36.22±3.20 years were treated. The tragus to wall distance significantly improved ($p<0.05$) from 16.55±0.4 to 12.69 ±0.3 cm, 17.57±0.4 to 13.76±0.4 in sitting and standing respectively with ($p<.05$)and shoulder to wall distance improved from 13.65cm to 9.0 cm with ($p<.05$) at post 12th treatment day. The Pain and Cervical ROMs also showed statistically significant improvement after 12th session ($p<.05$). **Conclusion**: Elongation Longitudinaux Avec Decoaption Ostéo Articulaire (ELDOA) exercises were found to be effective in the correction of forward head posture.

Keywords: ELDOA, Forward Head Posture. Flexibility,Neck pain.

INTRODUCTION

Forward head posture (FHP) can occur because of many reasons, out of which, persistent abnormal neck posture outstands all other. The head being continuously sustained in a forward position that can cause musculoskeletal disorder.[2-3]

The upper cross syndrome that is present in FHP, muscular tightness is one of it's the common problem. The FHP is portrayed by hyperextension of the upper cervical (C1-C2) and flexion of lower C-spine (C3-C7). This abnormal position is most often kept up by patients in reaction to a wrong posture, causing a deep structural as well as functional influence on the different areas of body.

Therapeutic exercise i.e. stretching, strengthening and myofascial release improve the incorrect biomechanical patterns and position of cervical spine through targeting the sub occipital muscle.[4] Stretching exercises of shoulder and thoracic region Increase in the elasticity of the levator scapulae and scalene muscles that has been used as a basic intervention for forward head posture correction.[5-8] Moreover, Stretching exercises are recognized for enhancement in sports performance, injury prevention, restores and maintain range of motion.[9] Some researchers have proven stretches to bring a great improvement in posture, with enhancement in neck mobility and pain relief.[4, 10-11] Elongation Longitudinaux avec Decoaption Ostéo Articulaire (ELDOA) is an active form of decompression give space to target joint by putting tension on specific fascia chain[12] through body's own muscle contraction and reduce pain.[13] ELDOA facilitates local proprioception of the targeted segment, which improves orientation perception, thereby enhancing the capability to self-correct any postural discrepancy.[14] This general effect of ELDOA, person gets the awareness to self-correct abnormal posture.[15] In 2016, a study conducted by Clement indicated that ELDOA decreased physical tension and anxiety along with improvement in range of motion and flexibility.[16] Literature also supports that ELDOA is effective in improving pain, muscle length and functional status.[17]

Stabilization and strengthening exercises of different frequency and application methods are used to treat the issues associated with forward head posture. Muscular elasticity improvement is vital for posture correction. ELDOA has effectively dealt with lumbar issues through increase in

muscle elasticity. But, its effects on cervical region and its associated conditions are not clearly understood .This study is conducted to assess the effectiveness of ELDOA on cervical region. The study hypothesis was that the ELDOVA significantly improve the forward head posture. So the objective of study was to determine the effectiveness of Elongation Longitudinaux Avec Decoaption Ostéo Articulaire (ELDOA) on forward head posture.

METHODOLOGY

A single group interrupted time series quasi experimental study was conducted in Islamabad Physiotherapy & Rehabilitation Centre, after getting ethical approval from ethical research committee of Riphah College of Rehabilitation & Allied Health Sciences (Ref#00771) from August 2020 to January 2021. Participants were selected through non probability convenience sampling technique. The paired sample formula was used to calculate the sample size by using Numeric pain rating scale (NPRS)[16]value the power of study was 0.80 with adjusted 0.5 level of significance. The calculated sample size was n=44.

The both male and female participants aged between 30-40 years, having limited cervical range of motion (ROM) (Flexion: less than 80◦, Extension: less than 70◦, Rotation: less than 90◦ both sides., Lateral flexion: less than 20◦)[18], pain more than 3 on NPRS scale with FHP, and developing kyphosis that was ruled out by using acromion to wall test in which patient is unable to touch occiput and shoulder to wall > 5 cm. Participants having complaint of dizziness, had surgical history of spine or upper extremity , any upper extremity bony deformity, severe osteoporosis, cervical radiculopathy, any pathology/ infection in spine or upper limb, trauma of upper extremity, malignancy of upper extremity or thorax and obesity were excluded from the study. Data was collected from the participants after getting informed consent and measurements were taken on self-structured questionnaire i.e., included demographic, neck pain, cervical ranges, shoulder to wall distance, and tragus to wall distance (cm) in sitting and standing.

The ELDOA positions for cervical region were given three days/week for four weeks as shown in figure 1. The NPRS, inclinometer, tragus to wall distance and shoulder to wall distance were used as assessment tools. Assessments were done at baseline, 1st, 4th and 12th day post treatment as shown in Fig (2).

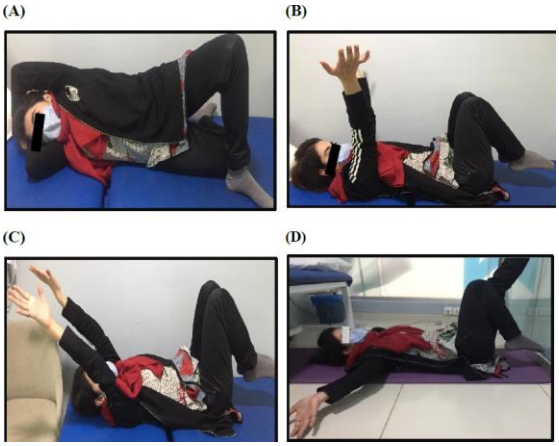

Figure 1: (A) Decoarctation of C0/C1/C2, (B) Decoarctation of C4/C5, (C) Decoarctation of C5/C6, (D) Decoarctation of C6/C7

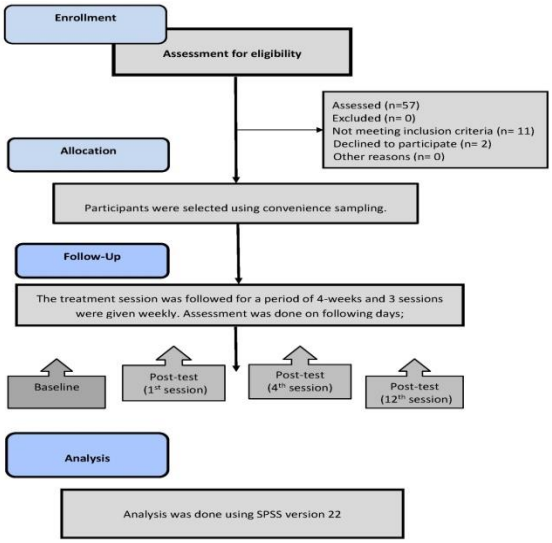

Figure 2: Flow chart

Cervical ROMs including flexion, extension, rotation of both sides and side flexion of both sides (right and left) were measured through inclinometer. Measuring Tape was used to record the tragus and wall distance in (cm) , with considering the normative value 10 to 1055 cm in females and male respectively. A systematic review conducted in 2018 supported TWT as a reliable, valid, and simple clinical indicator of FHP .[19] It has a reliability between 0.93 and 0.95. Distance between acromion and wall (normally, shoulders should touch the wall with a distance lesser than 5cm between wall and shoulder while in standing relaxed position) was measured[20-21] and recorded in sitting and standing position to assess developing of kyphosis and forward head posture. NPRS scale

was showed to the participant to mark the current pain intensity. This scale has high reliability (0.95-0.96) and validity (0.86-0.96).[20]

Hot pack was applied around the cervical region for 7 minutes following which the participants were explained a specific series of body movements. Four ELDOA positions were once showed to the participants and then they were asked to make those positions, once they made the positions, stopwatch was set to one minute for each position. Participants were continuously given verbal commands to correct the position and maintain it for 1 minute. This technique was applied thrice a week for four weeks; it took 20-25 minutes on each treatment day to complete the session.

A one-way repeated-measure analysis of variance (ANOVA) with post-hoc analysis was used for normally distributed variables and for non-normally distributed variables Friedman with Wilcoxon-signed rank test was used to measure the effects of ELDOA in FHP correction. Data analysis was done through SPSS version 22.

RESULTS

Out of total participants, 21 were male and 23 were female with a mean age of 35.96±3.22 and 36.22±3.20 respectively. The male and female participants' mean of body weight was 73.86±5.56 and 66.87±5.80 in Kilograms. Mean height in inches were 65.13±1.60 in male and 69.24±3.60 in female. BMI mean of study participants were 25.25±1.20 in male and 24.39±1.73 was in female.

To observe the continuous change in outcomes used repeated measures ANOVA with Greenhouse-Geisser and Friedman with Wilcoxon-signed rank test using Bonferroni correction. That determined cervical ranges were statistically significant different with large effect size between time points i.e., at baseline and 12th session. Post-hoc test using Bonferroni correction revealed that ELDOA caused statistically significant improvement in ranges from baseline to 12th session.

Table1. One- way ANOVA Analysis to measure ELDOA effect in FHP correction

Variable	Mean ±SD	F(df)	sig	np 2
TWT (sitting)(cm)				
Baseline Post 1st session Post-test (4th session) Post-test (12th session)	16.55±0.4 15.55±0.3 13.88±0.3 12.69±0.3	140.56(1.34,56)	0.00**	0.77
TWT (standing)(cm)				
Baseline Post 1st session Post-test (4th session) Post-test (12th session)	17.57±0.4 16.74±0.4 14.86±0.3 13.76±0.4	109.4 (1.33,56)	0.00**	0.72
Cervical right lateral flexion				
Baseline Post 1st session Post-test (4th session) Post-test (12th session)	16.54±0.3 18.94±0.5 23.68±0.6 25.87±0.8	114.48(1.47, 61)	0.001**	0.73
Cervical left lateral flexion				
Baseline Post 1st session Post-test (4th session) Post-test (12th session)	17.37±0.3 19.91±0.5 24.43±0.8 27.41±1.0	83.13(2.01, 84)	0.001**	0.66
Cervical flexion				
Baseline Post 1st session Post-test (4th session) Post-test (12th session)	47.48±2.2 51.12±1.9 55.29±1.8 58.29±1.7	33.01(1.63, 68)	0.000***	0.44

Statistical test=One- way repeated measure ANOVA, Level of significance: p<0.05 p<0.01**, p<0.001** p<0.000***,np^2= effect size (df) =F statistics (degree of freedom), TWT= Tragus to wall test.*

Similarly, tragus to wall distance (cm) in sitting was normally distributed so repeated measure ANOVA

was used. Repeated measure with Greenhouse-Geisser correction determined that mean of tragus to wall distance (cm) in sitting and standing was statistically significant from baseline to 12th session with large effect size. Post-hoc test using Bonferroni correction revealed that ELDOA caused statistically significant improvement in sitting and standing tragus to wall distance from baseline to each level of assessment ($p<0.05$).

Friedman and Wilcoxon signed rank statistical test indicated pain and shoulder to wall distance were having significant improvement in each level from baseline to 12th session ($p<0.05$).

Table 2. Friedman and Wilcoxon signed rank Analysis to measure ELDOA effect in FHP correction

Variable	MR	Median (IQR)	Z	sig
NPRS				
Baseline	6.86	7(2)	-4.2	0.000***
Post 1st session	5.73	6(3)	-5.1	
Post-test (4th session)	4.16	5(3.75)	-4.8	
Post-test (12th session)	3.14	3(4)	-5.5	
Cervical Extension (degree)				
Baseline	43.62	41.05(21.15)	-4.9	0.000***
Post 1st session	45.85	43.80(18.68)	-5.5	
Post-test (4th session)	50.58	50.40(19.03)	-5.5	
Post-test (12th session)	53.51	54.50(16.77)	-5.8	
Shoulder to wall distance (cm)				
Baseline	13.65	14(2.60)	-5.5	0.000***
Post 1st session	12.41	13(2.75)	-5.3	
Post-test (4th session)	10.41	10(3.45)	-5.1	
Post-test (12th session)	9.10	8(4.60)	-5.5	
Cervical Rotation Right side				
Baseline	41.49	42(11.75)	-5.3	0.000***
Post 1st session	45.82	44.35(10.75)	-5.8	
Post-test (4th session)	49.93	49.94(12.15)	-5.7	
Post-test (12th session)	52.22	50(12.6)	-5.8	
Cervical Rotation left side				
Baseline	44.75	44(15.9)	-4.8	0.000***
Post 1st session	47.26	45(12.6)	-5.8	
Post-test (4th session)	51.19	50.2(12.3)	-5.5	
Post-test (12th session)	53.59	52.8(12.7)	-5.8	

Statistical test= Friedman and Wilcoxon signed rank test, Level of significance: p<0.05 p<0.01**, p<0.001** p<0.000***,MR= Mean rank, IQR=Inter quartile range. Z value is reporting = Baseline to 1s, 1st to 4th, 4th to 12th & baseline to 12th session difference*

DISCUSSION

The aim of study was to determine the effectiveness of Elongation Longitudinaux Decoaption Osteo-Articulaire (ELDOA) on forward head posture. The null hypothesis of presents study was rejected which showed that ELDOA is effective in improving forward head posture.

The assessment measures were NPRS to assess the pain intensity, measuring tape to measure anterior translation of head through tragus to wall and shoulder to wall distance. Cervical ROMs were measured through inclinometer.

A study on n=30 female patients with prolapsed intervertebral disc pain was conducted to measure the effects of ELDOA alone and combined with core muscle strengthening in other group.[22] It is indicated 6 weeks ELDOA alone or in combination with core muscle strengthening treatment protocol found effective for pain management.[22] The results of the present study also showed that individuals were receiving 4-weeks ELDOA treatment program cause pain reduction. But the past study showed mean difference of 0.97 between visit 1 and 6th week. While the present study shows a mean difference of 3.73 from baseline to 12th session i.e. on the 4th week. This suggests that ELDOA brought earlier pain relief in cervical compared to lumbar region, which can be because of the fact that Prolapsed Intervertebral Disc (PIVD) is a more painful condition which can also require surgical

correction; whereas in present study forward head posture is studied which is a milder condition and can show brisk recovery after a treatment. So, it can be concluded that ELDOA brings fast relief in patients with mild conditions.

A Randomized controlled trial was conducted by Momena Shehzad et al. in 2020 with n=40 patients for 6 weeks, both male and female with the age of 30 to 70 years.[17] In the past study ELDOA reduced pain from 7 at baseline to 3 on NPRS at 6th week, while in the current study mean difference from 0 week to 4th week was 3.73, which suggests 4 weeks ELDOA is beneficial only for pain reduction in FHP patients.

Secondly, a previous study indicated the effects of ELDOA on muscle length and showing variation in ranges. The Piriformis muscle length was gained after intervention.[12, 17] These findings are also harmonious with present study results, as ELDOA effectively improved cervical ranges.

Fascia stretching improves level of functioning and reduce pain. In current study after the 4 week administration of ELDOA technique on cervical region pain was reduced. [22]

In a quasi-experimental study by Clement in 2016 reported that ELDOA improves flexibility, body posture and range of motion, while it decreases pain generally. Besides that, these exercises also decrease physically built tension and anxiety.[16] The results of this study are also constant with the findings of the current study that ELDOA has improved forward head posture by decreasing tragus to wall distance (pre-treatment it was 15.57 which reduced to 13.76) after administration of ELDOA, shoulder to wall distance also decreased from 13.65 to 9.10.The previous and current study support the effectiveness of general effects of ELDOA i.e. it improves postural discrepancies and flexibility through decoarctation.[16] The limitation of this study it has no control group and randomization that effect the generalizability of study results.

CONCLUSION

It is concluded that ELDOA exercises are effective in correction of forward head posture. This correction was made through reduction in cervical pain intensity, improving cervical ROM and reducing in tragus and shoulder to wall distance. It is recommended to more objectively measure the effectiveness of ELDOA in correcting forward head posture with strong experimental form of impact evaluation for both in short and long term

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

DENIS BROWNE SPLINT SHOE, EXERCISE AND ITS ASSOCIATION WITH RECURRENCE CLUBFOOT IN CHILDREN

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Received on: 05-11-2021
Revision on: 26-02-2022
Published on: 31-03-2022

Citation; Hayat S, Ahmed A, Ramzan M, Kafeel S,Asghar E,Khurshid S Denis browne splint shoe, exercise and its association with recurrence clubfoot in children. T Rehabili. J. 2021:06(01);290-293
soi: 21-2017/re-trjvol06iss01p290
doi: https://doi.org/10.52567/trj.v6i01.101

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ABSTRACT

Background: Clubfoot is an intricate deformity of ankle and foot involving bony mal-alignment, adduction of forefoot, and hind-foot varus, cavus, and equines caused by contracture of soft tissues. The many factor contribute to relapse of clubfoot, are neglected when advise the Proper pan of care. **Objective:** To find the association of clubfoot recurrence with no proper exercise and improper fitting of Denis Browne splint shoe. **Materials & Methods:** A cross sectional study was conducted at PIPOS Rehabilitation Service Program (PRSP), Peshawar. The data was collected from a sample of n=300 patients in Pakistan Institute of Prosthetic and Orthotic Science. The non-probability convenient sampling technique was used for data collection. The duration of the study was 6 months (April 2019 to October 2019). The male and female recurrent clubfoot children whose are either infant or till the age of 6 and registered in PRSP. The data collection was done through an international club foot registry form and self-structured questionnaire. The results are presented in term of descriptive statistics and chi-Square test was also performed to assess club foot and other variable association with each other. **Results:** The result showed n=110(37.3%) participants reported they had no proper fitting of Denis Browne Splint shoe (DBS) and n=97(32.3%) showed they underwent no proper exercise follow up. There was significant association of club foot recurrence with improper fitting of DBS ($p<0.001$) and no proper exercises ($p=0.02$). **Conclusion:** The study indicated that without proper exercises and in appropriate fitting of DBS may lead to recurrence of club foot.

Keywords: Congenital talipes equinovarus, clubfoot, denis browne splint, ponseti method

INTRODUCTION

The congenital talipes equinovarus (CTEV) commonly referred to as Clubfoot transpires in about 1 to 2 individuals per 1000 live births.[1] Clubfoot is an intricate deformity of ankle and foot involving bony malalignment, adduction of forefoot, and hind-foot varus, cavus, and equines caused by contracture of soft tissues.[2] The affected foot, calf and leg may be smaller than the other. In its cases, there's a 50% chance that to have this deformity in both sides. This appears later as a problem during walking if the deformity isn't treated and affects the activities of daily living (ADL).[3]

It is still uncertain as to what is the cause of clubfoot. Some cases are related to myelomeningocele or distal arthogryphosis. There is a 33% chance of this deformity in twins if the other identical one has it. During an ultrasound exam, the diagnosis can occur or after the birth. For decades, clubfoot had been treated mainly by extensive complex surgical methods.[1] Globally, 90% correction rate is observed in this deformity. Generally, casting ranging from 5 to 6 times and a percutaneous Achilles tenotomy are necessary for its treatment. Henceforth, primary treatment is most often done utilizing Ponseti method.[4] Even though Ponseti method has a success rate of 90-98%.[4-7]

The relapse tendency of clubfoot is really high as they are hard to detect and develop gradually. It is argued that the improper implementation of correction method is not the cause of recurrence but rather its initiated by the same pathology owing to which the deformity occurred in the first place [8]. The range is from 10 to 50% for clubfoot recurrence rates. A fully corrected clubfoot relapse has yet to be explained by the researchers as they have not made any success in doing so. [9]

Very little is known about the risk factors involved and relapses etiology which influences the caretakers to interrupt protocols relevant to bracing, although recurrence seems to be associated with bracing noncompliance. Healthcare, family, and cost for the child are some factors that can be inevitably linked to recurrence.[10,11] It is essential and significant for healthcare

professionals to know of the factors and their identification which result in clubfoot recurrence, as it can aid in developing and enabling them to take appropriate measures, allocate resources and support for the family and the children at risk. Based on evaluation of clinic, the deformity recurrence was diagnosed. [12,13]

In KPK, Pakistan, there are several clubfoot homes and setup like Club Foot home PRSP Peshawar, Club Foot Home LRH Peshawar and Club Foot Home Paraplegic centre Peshawar located in Physical rehabilitation. But many the club foot patients are coming back to PRSP Peshawar as a recurrence case. No such study is done to find no proper utilization of Debis brown splint and exercise as risk factors associated with recurrence of clubfoot. The primary focus of this research study was to determine the association between club foot recurrence and Debis brown splint and exercise among patient in KPK, Pakistan.

METHODOLOGY

This cross-sectional analytical study was carried out at PIPOS Rehabilitation Services Program (PRSP) during the April 2019 to October 2019 after getting approval from advanced study & research committee (ASRC) of ISRA institute of rehabilitation sciences, Islamabad. A total of n=300 male and female children with clubfoot recurrence age equal to and less than 6 years were included in the study. The non-probability convenient sampling technique was used for data collection. The inclusion criteria of the study were male and female recurrent clubfoot children whose are either infant or till the age of 6 years and registered in PRSP. While exclusion criteria was clubfoot patients with post-polio paralysis and with cerebral palsy. The written informed consent was taken from the parents of clubfoot patients. The data collection was done through an international club foot registry form and self-structured questionnaire. The data was presented as mean, standard deviation, frequency (n) and percentages (%). The association between factors and club foot recurrence measured through Chi square test and level of significance was set at $p<0.05$. The statistical package of social sciences (SPSS) ver. 22 was used for data analysis.

RESULTS

The n=195(65%) male and n=105(35%) female were part of this study, n=209 (69.7%) of them were from Infant to 1-year category while n=81(30.3%) of them were from 2-6 years of age. The demographic distribution of the participants can be seen in figure 1.

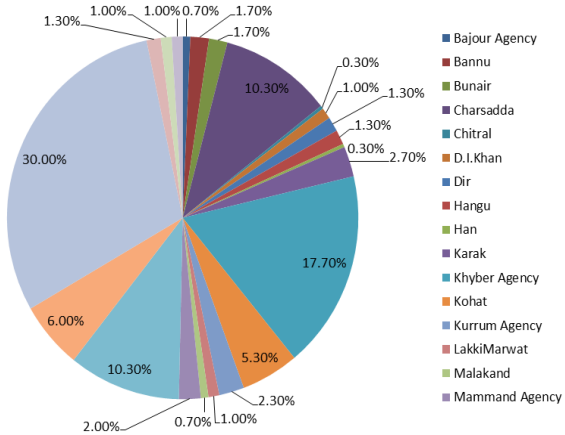

Figure I: Geographic distributions of Participants (N=300)

The results showed that among 300 patients, n=110(36.73%) of patients had not properly fitted/utilized Denis brown splint after the treatment as n=97(32.3%) patients didn't went through no proper exercises after the treatment. The majority participants n=110 (36.7 %) were suffering from bilateral club foot. Club foot Recurrence was significantly associated with improper DBS fitting ($p<0.001$) and exercises ($p=0.02$). The corresponding frequency distribution can be seen in table 1.

Table 1: Association of Club Foot Recurrence with Improper DBS fitting and exercises (N=300)

Factors	Category	N (%)	Bilateral	Left	Right	*X2*	*p-value*
DBS not properly fitted	Yes	110 (36.7 %)	47(42%)	49(43.8%)	16(14.3%)	2	0.00
	No	188 (62.7%)	63(33.5%)	57(30.3%)	68(36.2%)		
No proper exercises done	Yes	97 (32.3%)	27(27.8%)	34(35.0%)	36(37.1%)	2	0.02
	No	203 (67.7%)	83(40.8%)	72(35.4%)	48(23.6%)		

Significance level: p<0.05, p<0.01**, p<0.001****

DISCUSSION

The primary focus of this research study was to determine the factors of recurrence of clubfoot patient in KPK, Pakistan .The results showed that out of 300 clubfoot recurrence patients, 65% were males and 35% were females. Out of the total included patients, 63.3% were suffering from unilateral clubfoot deformity while 36.7% were suffering from bilateral clubfoot deformity. Among the total recruited participants, 37.3% didn't use DBS properly, 32.3% could not ensure proper exercise and 30.3% had CTEV associated deformities.

The present study results regarding cross tabulation among clubfoot side and no proper exercises done factors that were selected to be the cause of clubfoot recurrence shows that an association exist between clubfoot side and no proper exercise done because the significance value for these two from chi square test was found to be >0.05. the current study findings was consistent with the previous longitudinal study with five year follow up conducted by Zoe little et al among 172 clubfoot patient treated at tertiary hospital by Ponseti method. They found that clubfoot recurrence was vastly associated with poor evertor activity (p<0.01) so they recommend in their study that evertors muscle activity assessment should be added to the regular clinical evaluation in order to support with individualizing patient's management plans.[14] Our study findings was also supported by one of the previous prospective cohort study between August 2009 and November 2019 findings carried out among clubfoot patients who undergoes Ponseti method. After the Ponseti method participants were dividing into two groups. One group was assigned to use brace while other group was assigned home plan stretching program. After the follow up they found that second group showed more satisfaction with the treatment so they conclude that the deformity's relapse related to the brace's non-adherence following Ponseti method might be lessened by replacing the brace with our home-followed every day stretching exercises.[15]

The current study finding was also supported by another study conducted by RA Sheta Between August 2009 and June 2019. They found that bracing non-adherence has been recognized as a key source for management failure and recurrence. It was also conclude that exercise practice not only reduces the necessitate for bracing and diminish the expenditure for the affected individuals but also give tremendous clinical and radiographic excellence outcomes, analogous to the individuals using the Denis Brown brace.[16]

Results regarding cross tabulation among clubfoot side and DBS improperly fitted factors that were selected to be the cause of clubfoot recurrence shows a significant association between clubfoot side and DBS improperly fitted (P=0.05). The current study finding is in line with the previous study conducted by S.T. Mahan et al in 2017 among patients with idiopathic clubfoot who underwent previous treatment and experienced recurrence. They conclude in their study on the basis of age who sustains recurrence that patients with less than two years with clubfoot relapse are more likely to be associated with lack of brace wearing as compared to children more than two years age.[17]

Over the time with Ponseti method at PRSP, many children have been treated which has substantially reduced the number of clubfoot cases, yet, clubfoot recurrence even after successful treatment remains a problem. Apart from these three factors observed in this study, numerous potential risk factors had also been studied by researchers for clubfoot recurrence.[18-21] For parents especially, knowing the factors that could warn about the increased risk of clubfoot recurrence after its treatment would be very valuable in counseling caretakers about the anticipated development of treatment. The only reliable indicator for clubfoot recurrence had been intolerance and orthosis noncompliance so far. [22]

There some other factors which are not included in the study i.e. children BMI, socioeconomic status, that may contribute in recurrence of cub foot in children.

CONCLUSION

The study indicated that without proper exercises and in appropriate fitting of DBS may lead to recurrence of club foot. It is recommended that appropriate fitting of DBD and proper exercises or rehabilitation protocol must be ensured to avoid recurrence of club foot in children. A prescription of brace wear and its continuous use was another

important characteristic to keep in mind for parents that are counselled.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

IMPACT OF PEDIATRIC DYSPHAGIA AWARENESS PROGRAMME ON NURSES

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Received on: 01-12-2021
Revision on: 24-02-2021
Published on: 31-03-2021

Citation; Bibi S, Kiyani MN, Ijaz T Impact of pediatric dysphagia awareness programme on nurses. T Rehabili. J. 2021:06(01);294-297
soi: 21-2017/re-trjvol06iss01p294
doi: https://doi.org/10.52567/trj.v6i01.112

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ABSTRACT

Background: Pediatric dysphagia is a common consequence of many structural and neurological problems after birth. In a Health care setting, Nurses can only screen out pediatric dysphagia if they had knowledge of swallowing difficulties **Objective**: To determine the impact of pediatric dysphagia awareness program among nurses. **Methodology:** A Quasi experimental study was conducted at Railway Hospital Rawalpindi hospital from January 2021till august 2021. The convenient sampling technique was used for data collection during the period of February 2021 till May 2021. The nurses having working experience of more than two years in pediatric ward. The total sample size was n= 19, out of which n= 14 were females and n= 5 were males. The study was conducted in two phases .In 1st phase, questionnaire was developed and the content validity for items & content validity for scale was tabulated. In 2nd phase webinar of one hour was conducted and self- developed questionnaire was used for pre and post analysis. Analysis was done through SPSS 20. **Results**: Results of the current study indicates that, "There was a significant improvement in awareness of nurses about pediatric dysphagia after attending the webinar (96.055 ± 11.8593) (117.227 ±5.377, p<0.05). **Conclusion**: Research study concluded that an awareness programme about pediatric dysphagia improved the knowledge of nurses working with pediatric population.

Keywords: Awareness programme, nurses, speech therapist, pediatric dysphagia

INTRODUCTION

Pediatric dysphagia is defined as any impairment in sucking and eating or disturbance in coordination of any oral, pharyngeal and oesophagus swallowing phases in children. Early detection of dysphagia in infants and children is important to prevent or minimize complications.[1] Acquiring a healthy diet for body growth is essential to fulfil nutritional demands for a healthy and sustaining a good long life.[2]According to centre of Disease control and prevention (CDC) ,around 0.9% of children are having swallowing difficulties ,who are in age range of 3to 17years.[3] 25% to 45% of feeding and swallowing difficulties are reported in normally developing children (4).According to researches approximately 1% of children suffer from swallowing difficulties and the rate of Pediatric dysphagia (PD) is higher in children with cerebral palsy, traumatic brain injury, and airway malformation.[5,6]

The major sign and symptoms of PD include aspiration, coughing, choking, drooling, shortness of breath, vomiting, refusal to eat and penetration in supraglottal area. These conditions can lead to life threatening situations.[7, 8, 9]

In a Health care setting, Nurses can only screen out the pediatric dysphagia if they had knowledge of swallowing difficulties in children. Nurses are the very important part of the multidisciplinary team and their awareness can readily minimize the consequences of pediatric dysphagia.[10] Lack of knowledge about swallowing problems can be the reason of missing out or delayed dysphagia referral to SLP which can lead to life threatening conditions. The knowledge of signs & symptoms and its management can help nurses to screen out feeding problem immediately.[11]

A research review on Evidenced-Based Nursing Protocols for Dysphagia Assessment' suggests that nurses are in the front line to observe dysphagia sign & symptoms as most of the time food and medication are given to the patient in their presence. During the mealtime if the nurses observe any of the following symptoms ,like coughing ,choking, frequent throat clearing ,food refusal by the patients ,heart burn, lump feeling in throat ,changes in oxygen saturation level during or after swallowing ,frequent temperature spikes and prolonged meal time ,then the nurses can quickly refer and manage the patient accordingly.[12]

To minimize consequences of PD, early diagnosis and effective management is very necessary. The nurses are among the main members of a multidisciplinary team. Keeping in view the research evidence and existing literature, it is indicated that our medical facilities have lack of resources, limited budget and lack of knowledge. The conduction of awareness sessions in such

scenarios is inevitable. For this reason, the present study will be focused on conduction of the awareness webinar, and analyze the impact of this webinar on the role of nurses in pediatric dysphagia.

METHODOLOGY

A Quasi experimental study was conducted at Pakistan Railway Hospital after approval from the Research Ethical Committee of Riphah international university (With Ref #Riphah/RCRS/REC/00976). The non –Probability, convenient sampling technique was used for data collection. The nurses having working experience of more than two years in pediatric ward was included. The total sample size was comprised of n=19 nurses

The study was divided into two phases. In the 1st phase, self- structured questionnaire was developed, which was used for the analysis of the difference in pre & post assessments. The questionnaire was composed of 25 items related to sign, symptoms and management of pediatric dysphagia. Likert scale was used for the response analysis with 1 indicates strongly disagree while 5 indicates strongly agree respectively. The content validity index for scale, S-CVI was 0.88.

In the next phase, a webinar about pediatric Dysphagia was arranged for the nurses. It was one hour awareness programme which include the information regarding the sign & symptoms and management .It also covers the role of nurses regarding management of Pediatric dysphagia. A thorough data analysis was conducted by using the SPSS 20, by applying the paired sample t-test on a normally distributed data, to find the impact of awareness programme on Nurses.

RESULTS

A Total n=19 nurses were included in this study, among them 74% were females (n=14) and 26% (n=5) were males. In the selected sample, 42 %(n=8) were Masters in Nursing (MSN), 32% (n=6) were having Bachelors in Nursing (BSN) remaining 26% (n=5) were having certified nursing assistants (CNA) certificates.

The demographic data is showed in figure 1.The figure 1, illustrates about the working experience of nurses working with pediatric population. The below figure shows that 48% of nurses having work experience in nursing field lie between 5-10 years and 37% of nurses having experience between 2-5 years. Whereas 15% of nurses experience range is more than 10 years.

The mean scores of pre and post assessment about the level of awareness of nurses about pediatric dysphagia,The result showed that there significant increase (96.055 ±11.8593 ver. 117.227±5.377, $p<0.001$) in the Pediatric dysphagia awareness among nurse after attending the webinar. (Figure 1)

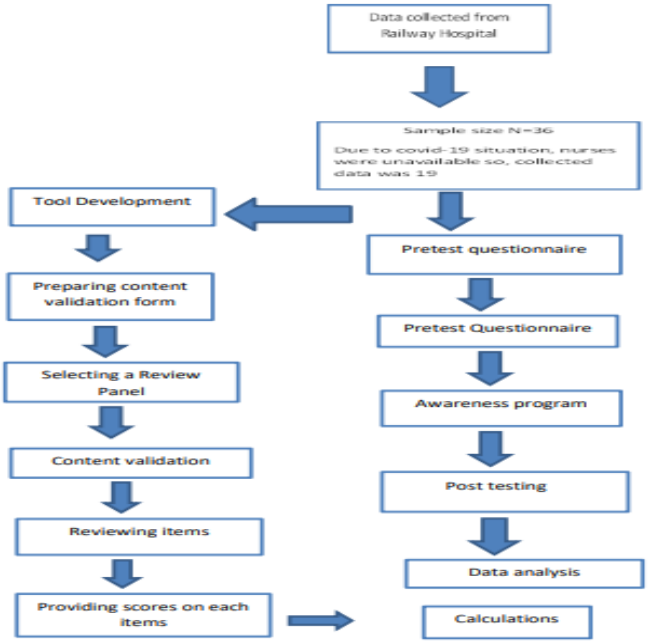

Figure 1: Flow chart

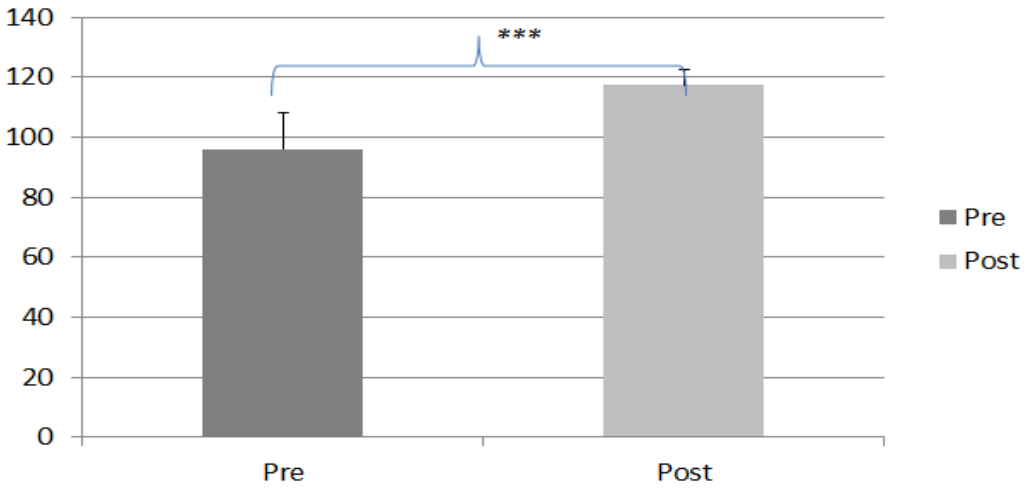

Figure 1: Pre & Post Changes

DISCUSSION

The objective of the present study was to determine the impact of awareness program on pediatric dysphagia among nurses. Nurses play an important role in identification of PD. Early identification can minimize the consequences of dysphagia on child later development. Similarly in one study it is indicated that in the management of patient with swallowing problems nurses plays a significant role.[16]

The existing literature also suggested that training should include the knowledge about administration of screening tests such as bedside swallow test or correct position of patient during mealtime.[15] A recent conducted in Pakistan, regarding Dysphagia screening and awareness among nurses of Rawalpindi and Lahore hospitals. The study results revealed that nurses had lack of knowledge and its screening also they don't have any awareness about the role of Speech and Language pathologist regarding diagnosis and management of Dysphagia.[13] A cross sectional study conducted in Saudi Arabia about knowledge and care practices regarding patients with dysphagia .The study results revealed that 78% of nurses have received less than one hour training in dysphagia and only 4% were aware about the role of Speech and Language Pathologist.[14] The identification and detailed evaluation of dysphagia can be made by the speech and language pathologist. The initial testing tools and protocols to screen dysphagia can be administered by the trained nurses. A skillful and knowledgeable nurse can play an important role at early step of problem.[15]

In present study, significant difference was found between the means of pre and post assessment which incredibly shows the difference between awareness levels among these nurses. In pre-assessment the results revealed that majority of nurses had lack of knowledge associated with PD. Similar results were reported by a study carried out to check the knowledge of dysphagia in nurses which also concluded lack of knowledge among nurses.[13]Similarly a survey was conducted in Namibia and its results confirmed that nurses have a lack of knowledge about the signs, symptoms and its management.[15]

The current study results, highlighted the fact that there is need to conduct awareness programme for nurses about pediatric dysphagia to reduce its adverse out come on child's later life. In one survey, the results showed that 12 to 54% of children are found to be malnourished, who are characterized to have feeding and swallowing problems.[17]Nurses have an important role in health care team; if they are fully trained they can do the screening in Peads ward. Training and awareness of nurses is significantly associated with the effective management and improvement in eating and swallowing difficulties symptoms. Furthermore, it has been found that higher knowledge of disorder is also associated with less experience of nurses.[18]

The present study results results were limited due to small sample size, self-structured tool and unavailability of nurses due to Covid -19 restrictions. The sample was collected from only one hospitals of Rawalpindi region.

CONCLUSION

The nurses who are an important team member of the multidisciplinary team have significantly low levels of knowledge about pediatric dysphagia. The webinar increases knowledge base of pediatric dysphagia among nurses, as there is a great difference in the pre and post assessment results. So it is recommended such webinars should be the part of nurses training.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

COMPARISON BETWEEN EFFECTS OF PASSIVE VERSUS SELF-MOBILIZATION OF SCIATIC NERVE IN PIRIFORMIS SYNDROME FOR RELIEVING PAIN AND IMPROVING HIP OUTCOMES

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Received on: 07-12-2021
Revision on: 03-03-2022
Published on: 31-03-2022

Citation; Salam A, Khalid A, Waseem I, Mahmood T, Mahmood W Comparison between effects of passive versus self-mobilization of sciatic nerve in piriformis syndrome for relieving pain and improving hip outcomes T Rehabili. J. 2021:06(01);298-302
soi: 21-2017/re-trjvol06iss01p298
doi: https://doi.org/10.52567/trj.v6i01.114

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ABSTRACT

Background: Piriformis syndrome is disorder which is neuromuscular, caused by sciatic nerve compression and lead to compromised Hip functions. This problem, as well as the management for the restoration of hip functions need to addressed. **Objective:** To determine the effectiveness of passive mobilization versus self-mobilization in managing pain and improving quality of life in patients with Piriformis syndrome. **Methodology:** A quasi-experimental study was conducted at Imran Idrees Hospital Sialkot from April to October 2019. The simple random sampling was used to collect n=30 subjects with pain in the gluteal region from >2 months, both genders in age of 30-50 years were included. The Passive Sciatic Mobilization was given in one group, while other group was only taught the self-mobilization of the sciatic nerve along with home plan. The Visual analogue scale and hip outcomes were measured at baseline, 2nd, 3rd, and 4th week using International Hip Outcome Tool (IHOT) Repeated measurement ANOVA for within-group and independent-sample t-test between groups were used. The level of significance was set at 95% ($p<0.05$).**Results:** The mean age of participants in self-mobilization was 41.20 ±5.79 and passive mobilization was 42.87 ±4.82. The mean of pain at baseline in experimental group was 4.86± 1.30 and reduced to 2.06 ± 1.09 after 4 weeks of passive mobilization and Hip functions at baseline was 131.73 ± 22.59 and improved to 232.00 ± 19.39. Between the groups comparison of pain and hip functions showing that both techniques were effective in reduction of pain and improving Hip functions but passive mobilization group has was dominant over the self-mobilization $p<0.001$ **Conclusion:** The passive mobilization of sciatic nerve was effective in the management of piriformis syndrome compared to the self-mobilization for improving pain and hip functions.

Key words: Hip joint, hip pain, nerve mobilization, piriformis syndrome, passive mobilization, sciatic nerve, self-stretching

INTRODUCTION

The piriformis syndrome (PMS) is a disorder that is neuromuscular in nature and caused when the sciatic nerve is compressed in the infra piriformis canal. [1] When there is tightness in the piriformis muscle it exerts pressure on the involved nerve leading to irritation and generating unpleasant sensations in the posterior part of the leg. Males' and females' prevalence of sciatic symptoms are not different but depends on the occupational status. A study conducted in Bangladesh, the prevalence of piriformis syndrome was found 3.7% for women and 5.1% for men.[2] Neural mobilization (NM) is used for certain neuromuscular conditions like carpal tunnel syndrome and back pain.[3] The researchers also concluded that NM is not beneficial as compared with other interventions. There are different methods using NM which includes sliding and tension methods.[4] lengthening of the involved nerve bed at one joint while shortening at other is known as sliding.[5] Sliding and tension techniques have proved to generate biomechanical effects and sliding play important role in reducing inflammation. While reduction in intraneural swelling and stoppage of circulation by changing pressure is the mechanism of nerve tension technique.[6] Self-mobilization methods for the sciatic nerve proved effective in patients with low back pain.[7] Neural mobilization along with conventional treatment was found out to be more effective in relieving pain than conventional therapy.[8] The piriformis syndrome was found to be non-disco genic origin and patients have normal neurological tests and straight leg raise can be negative.[9] Generally, degenerative changes in the joints and muscles lead to such issues. Furthermore, when physiotherapy manoeuvres to relieve the sciatic nerves are applied, expansion of the hamstrings are activated, soothing sciatic nerves, and having a beneficial outcome.[10] Accordingly, preparation systems for the sciatic nerves prescribed as a helpful strategy for patients

with constant low back because of expansion of the hamstrings and activating great outcomes that decrease oversensitivity and incitement of the sciatic nerves.[11] There are different treatments available for its management deep friction massage, soft tissue mobilization[12] and static stretching, but the use of passive, self-mobilization, stretching with Nerve mobilization was found quite better to relieve their sign and symptoms. This will help clinicians to manage pain and improve hip functions. We hypothesized if there is any significant effect of Passive with Self-Mobilization of Sciatic Nerve in patients with Piriformis Syndrome. The study aimed to determine the effectiveness of passive mobilization versus self-mobilization in managing pain and improving quality of life in patients with Piriformis syndrome.

METHODOLOGY

A quasi experimental study was conducted on n=30 subjects at Imran Idrees Hospital Sialkot. It was conducted from April to October 2019, after the approval of synopsis from Research committee of Riphah International University (RCR &AHS/REC-NMPT/S/019/014).The convenience sampling technique was used and pre-diagnosed patients having pain within lower extremity and involved hip while sitting, at least 2 months history of pain (score of more than 3 on Numeric pain rating scale), Lasegue sign (Straight leg Raise) positive, males and females in age of 30-50 years were included. While patients with any surgical history, limited range of motion of Hip with other joints, osteomyelitis of hip, hypersensitive skin, facet pathology, traumatic injury, and psychological disorders were excluded. All the participants were given the right to leave the study if they are not willing to participate. The n=30 sample size was calculated by the following formula keeping the power of study equal to 95% and level of significance equal to 5%., $n= (Z_{1-\beta} + Z_{1-\alpha/2})^2 \delta^2_{1+} \delta^2_2) / (\mu_1 - \mu_2)^{2,}$ where desired power of the study = β =95%, desired Level of Significance = α = 5%.

The assessment was carried for 42 patients using , Lasegue test which was used for lower lumbosacral nerve root irritation as it has high sensitivity (0.80-0.97) but has low specificity (about 0.4) as the test was also found to be positive in other cases too.[13] Freiberg suggested three indication for piriformis induced sciatic pain, that are; tenderness at the sciatic notch, positive Lasegue (straight leg raise) sign and improvement with nonsurgical treatment.[14] The visual analogue scale was used to assess the intensity of pain and participants selected a number from 0-10 describing their pain intensity.[15] International Hip Outcome Tool (IHOT) was used for the hip functioning. Test-retest reliability showed that Pearson correlations were greater than 0.80 for 33 of the 60 questions. The intra-class correlation statistic was 0.78 and the Cronbach α was .99. Face validity and content validity were ensured during development, and construct validity was shown with a correlation of 0.81 to the Non-Arthritic Hip Score.

A total of 42 participants were evaluated following inclusion criteria, where n=6 declined to participate. So 36 were allocated in two groups each, with n=18 in each group (consort flow diagram is attached). Before the start of treatment all the subjects were assessed at the baseline data and pain was assessed during straight leg raise through the VAS scale on the involved side. International Hip Outcome Tool (IHOT) was used to measure for hip functioning.

Passive neural mobilization for the time of nearly 12-15 min withholding for 30 seconds and then adding 1 min rest and Leg was raised passing 35 degrees for dural motion. The sciatic nerve fully stretched at 70 degrees, while pain after that point is usually from origin of hip, sacroiliac, or lumbar spine joints related to its origin. The one sided leg raise in straightening will cause traction on the sciatic nerve, as well as dura matter.[16] Adverse tension in nerves generates signs and symptoms from the Piriformis muscle (buttocks area) traveling into the sciatic nerve distribution. Hip adduction was added with Straight leg Raise for additional traction proximal to the sciatic nerve. The average session of treatment was 30-35 minutes.

Self-Mobilization treatment was also given to group and was asked to do the same manoeuvre as applied in the passive group. The self-mobilization was given mobilization of the sciatic nerve by themselves with conventional physical therapy included phonophoresis with an Intensity of 1.5 watts /cm^2 for 10 minutes and hot fomentation for 10 minutes. Pain and IHOT were recorded at baseline, after 1st, 2nd, 3rd, and 4th week for pain and hip functioning.

The data was entered in SPSS V.21.for the analysis. The participants demographic were presented in frequency tables. The normality test Shapir-Wilk's test was used data distribution, based on

approximate normal distribution parametric tests repeated measurement ANOVA was used for within group mean and independent sample t-test for between the groups for mean differences was used at significance p≤0.05 (95%CI)

RESULTS

The mean age of participants in self-mobilization was 41.20 ±5.79 and passive mobilization was 42.87 ±4.82. Out of 30 participants, 17(56.66%) were male and 13(43.33%) were females participants. Repeated Measurement ANOVA was used for comparison of IHOT and Pain score. The mean of pain at baseline 4.86± 1.30 and reduced to 2.06 ± 1.09 after 4 weeks of passive mobilization mean difference. The mean difference was 1.13 at baseline to 3.93 after 4 weeks of passive Mobilization with p<0.05. The similarly a hip function at baseline was 131.73 ± 22.59 and improved to 232 ±19.39 after 4 weeks of Passive sciatic nerve mobilization. The results showed that neural mobilization were effective in reduction of pain and improving hip outcomes in patients with piriformis syndrome with p<0.05. (Table **2).**

Table 2.Within comparison (Pain and IHOT)

Variables	Study Group	Duration	Mean ±SD	MD	p-value
Pain Rating	Passive Mobilization	Baseline	4.86± 1.30	1.13*	0.16[a]
		2nd week	4.13 ± 1.64	1.86*	0.00[b]
		3rd week	3.13± 1.12	2.86*	0.00[c]
		4th week	2.06 ± 1.09	3.93*	0.00[d]
	Self-Mobilization	Baseline	4.67± 1.39,	.46*	0.13[a]
		2nd week	4.66 ± 1.40	.66*	0.00[b]
		3rd week	3.86 ± 1.50	1.26*	0.00[c]
		4th week	3.33± 1.17	1.80*	0.00[d]
IHOT	Passive Mobilization	Baseline	131.73 ± 22.59	-11.33*	0.04[a]
		2nd week	145.2 ± 22.82	-37.86*	0.00[b]
		3rd week	202.26 ± 23.06	-68.40*	0.00[c]
		4th week	232.00 ± 19.39	-98.13*	0.00[d]
	Self-Mobilization	Baseline	138.4 ± 43.40	-2.80	0.65[a]
		2nd week	150.60 ± 44.90	-15.06*	0.00[b]
		3rd week	165.86 ± 38.90	-30.26*	0.00[c]
		4th week	176.86 ± 36.02	-41.26*	0.00[d]

[a]Baseline vs 2nd week, [b]2ndweek vs 3rd week, [c]3rd week vs 4th week, [a] Baseline vs 4th week
Significance Level: p<0.05, p<0.01**, p<0.001****

Table 3: Between the group comparison (Pain and IHOT)

Variables	Duration	Passive Mobilization	Self-Mobilization	Mean Difference	p-Value
		Mean± SD	Mean ±SD		
Pain Rating	Baseline	4.86± 1.30	4.67± 1.39	0.20	0.13
	2nd week	4.13 ± 1.64	4.66 ± 1.40	-.33	.00
	3rd week	3.13± 1.12	3.86 ± 1.50	-.73	.00
	4th week	2.06 ± 1.09	3.33± 1.17	-1.26	.00
IHOT	Baseline	145.2 ± 22.82	138.4 ± 43.40	6.80	0.89
	2nd week	131.73 ± 22.59	150.60 ± 44.90	21.06	.00
	3rd week	202.26 ± 23.06	165.86 ± 38.90	36.40	.00
	4th week	232.00 ± 19.39	176.86 ± 36.02	55.13	.00

Significance Level: p<0.05, p<0.01**, p<0.001****

Between the groups comparison of pain at baseline P=0.13 showing pre experimental equivalence but after 4 weeks the statistically significant difference at p =.00. Similarly hip functions showed p value >0.89 at baseline but after 4 weeks of Sciatic nerve mobilization that a statistically significant difference at P =0.00,showing that both techniques were effective in reduction of pain and improving Hip functions but passive mobilization was dominant over the self-mobilization.(Table 3)

DISCUSSION

This study focused on the effects of Passive Mobilization compared to self-mobilization of the sciatic nerve in patients with Piriformis syndrome for relieving pain and improving hip functions. The results of the study were quite evident in favour of the Neural Mobilization that it is an effective technique for reduction of pain and improving Hip functions at pre-test post-test p =0.00.These results in our study are in line with the findings , that neural mobilization and exercise based treatment acquires outcomes ,experimental gathering subjects than ordinary non-intrusive treatment, VAS in passive mobilization group is significant contrast with the self –mobilization.[17] Similarly the hip scoring was also improved ,hip function got better in passive mobilization group compared to self-mobilization .As the movement lead to suppression of pain receptors and exercise lead to increase in circulation which is effective in suppressing prostaglandins reduction in pain.[18]

The nerve mobilization effective in managing the lower back pain if it is caused by n Further self-assembly for therapy to increase physical capacities, according to research, self-activation can be effective for sciatica nerve compression.[19, 20] Hamstring stretches and nerve assembly are compelling mediations for patients with lower back, and nerve activation is better than hamstring extending in mitigating lower back torment of patients. In this way, both hamstring extending and nerve activation can be conveniently applied for the treatment of patients with Low back pain.[18] The current study used neural mobilization but another study stated that Neural mobilization can be more effective in combination with deep tissue masse techniques than that of alone mobilization.[21] In passive Mobilization group P value <0.05 showing a significant improvement in Hip functions and reduction of pain, showing that neural mobilization was effective in piriformis syndrome. This can be due to sciatic nerve mobilization, when used in conjunction with other preparation procedures, may aid in the recovery of sensitive tissues by revitalizing sensory system elements to flexibility and decrease affectability, as well as reducing sciatic nerve compression.[22] With the advancement and technology improvement, Instrument assisted soft tissue mobilization can be integrated with stretching exercise as it has short rehabilitation time.[23] But another study has stated that stretching exercise can also be combined with deep friction massage for its management which is more effective for improving pain and functional index in piriformis syndrome.[24] We have used neural mobilization, which is sciatic nerve stretching compared self-stretching ,significant improvement in outcomes were seen ,stating that supervised or passive stretching is more beneficial compared to self-stretching as the proper alignment during the stretch is considerable factor. The current study has shown that piriformis syndrome can managed with passive as well self-mobilization, but passive mobilization is a supervised method with proper stretch on targeted area, which proved to be more effective than self-mobilization. This was in line with another study in favour of stretching compared to soft tissue mobilization in piriformis syndrome leading to reduction of pain.[25]

The groups comparison of pain and hip functions showed p value >0.89 at baseline but after 4 weeks of passive Sciatic nerve mobilization that a statistically significant difference at P =0.00 showing that both techniques were effective but passive mobilization was superior to self-mobilization. We have concluded that with the neural mobilization compared to other conservative management is dominant for improving functions and reduction of pain symptoms,[26] but the current study stated that neural mobilization is effective but favours passive mobilization on self-mobilization.

Limitations of the present study include small sample size and a narrow age range. Also, the follow-up of the patients was recorded so it could not be established that whether the effects continued to be the same or not. So it is recommended that further studies should be conducted with a large number of patients with a wide age range and to determine the long term effects of treatment.

CONCLUSION

The current study concluded that passive nerve mobilization is effective in pain reduction and improvement in Hip functions among patients with Piriformis syndrome compared to self-stretching with statistically significant effects.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

EMERGENCE OF URDU SPATIAL PREPOSITIONS TO ASSESS SYNTACTICAL IMPAIRMENTS IN PAKISTANI CHILDREN

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Received on: *23-01-2022*
Revision on: *10-03-2022*
Published on: *31-03-2022*

Citation; Shafqat F, Khan NR. Khan N, Adeel H, Haroon R Emergence of urdu spatial prepositions to assess syntactical impairments in Pakistani children T Rehabili. J. 2021:06(01);303-308
soi: 21-2017/re-trjvol06iss01p303
doi: https://doi.org/10.52567/trj.v6i01.127

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ABSTRACT

Background: Urdu syntax is diverse in nature and does not relate to parameters established for English syntax in many ways. Speech-Language Pathologists' (SLPs) assessments based on Ages of Acquisition (AoA) of spatial prepositions cannot be standardized for Pakistani Urdu speaking children until ages of emergence of these prepositions are determined in this population. **Objective**: to explore ages of acquisition of spatial prepositions in young Pakistani Urdu speaking children. **Methodology:** This cross-sectional survey explored AoA of spatial prepositions in a sample of N=370 (boys= 128, girls=242) young Urdu speaking children aged 24-48 months residing in Islamabad. Urdu prepositions checklist was given to the parents (mothers=242, fathers=32), teachers (n=63) and significant others (n=33), to fill in accordance with spontaneous speech of their children. Data were descriptively analyzed using SPSS version 21. **Results:** Urdu spatial prepositions اوپر /uːpər/ (Up/above/on) and نیچے /niːʧæ/ (down/below/under) were acquired in 24-26 months of age and by 42-48 months these were mastered by 89.3% and 88.6% of within age group participants respectively. Spatial prepositions acquired in 30-35 months were آگے /ɑːgeɪ/ (in front of), پیچھے /piːʧʰæ/ (behind) and ساتھ /sɑːθ/ (beside) with percentages 67.3%, 56.4% and 72.7% respectively. Preposition درمیان /ɖrmjɒn/ (between) was acquired in 42-48 months with response percentage 52.8%. AoA of preposition بیچ میں /biːʧ meɪ/ (in the middle of) can be considered as later than 48 months because even in highest age limit group i.e., 42-48 months only 49.3% participants acquired this preposition. **Conclusion:** The findings of current study indicate that acquisition of spatial prepositions follows same order in all children cross-culturally, but their age of acquisition can vary according to their locality and language input provided to them.

Keywords: Age of Acquisition, spatial prepositions, syntax, Urdu

INTRODUCTION

Looking at an air balloon going up a toddler says 'up'; putting her toys in a box she says 'in'; taking out toy from the box she says 'out'. In a world filled with greater happenings, these little remarks do not grasp much attention. However, people working or interested in acquisition of communication, find these first steps in language acquisition intriguing, and raise profound questions. The cross-linguistic similarities in language acquisition could be accounted to non-linguistic cognitive developments common to all children. Literature also suggests that cross-linguistic variation in spatial semantic structuring is much diverse than what had been previously thought.[1] Languages provide different conventionalized ways to construe spatial situations. English language speaking children show usage of prepositions like 'in', 'on', 'up', 'down', 'out' and 'off' during one-word stage.[2,4] The meanings of these little particles seem so straight forward that it is easy to assume them as reflection predicting conceptual construing of the world. Although all languages have their own ways to talk about the spatial positions and locations, for which speakers of English language use these words, but they do not necessarily have translation-equivalent meanings with morphemes.

Preposition (حرف جار) belongs to closed-word class of basic parts of speech and sits before (pre-positioned) its noun or a pronoun to express association with another word or element in the clause. Prepositions make one of the most problematic categories in the theories of syntax as they do not exist in all languages. They also occur as postpositions rather than prepositions in few languages as in Tamil, Hindi, Telugu.[5] In recent syntactic theories, classification of prepositions is based on functional or lexical features. Lexical prepositions give semantic meaning while functional prepositions are only meant to assign case. Yet the classification of same preposition can differ depending on its use e.g., preposition 'to' serves as a lexical spatial preposition in sentence 'I am going to school' and as a functional preposition in sentence 'Give it to me'. According to the stages

of language development proposed by Brown, acquisition of prepositions occurs by the age of 18 to 24 months with the beginning of phrase development among the first 20 words acquired by English speaking children.[3] These findings have enabled the researchers in communication sciences to compare the history and acquisition of components that make language. Diachrony in the English language reveals prepositions' use in spatial aspects before taking the functional form.[6] Phrase is the unit of grammatical correction consisting of one or several words. It may take the form of verb-, noun-, and prepositional phrase etc. Determination of prepositional phrase means that main word would be the preposition e.g., 'outside the house', 'at sunny day'.[7]

Urdu language is morphologically rich and carries several differences in form and use as compared to English language. In Urdu, single preposition 'اوپر' gives varied prepositional expressions in different contexts parallel to English prepositions: 'on', 'above', 'over' and 'up'. Same is true for prepositions 'under', 'below', and 'down' which have only one parallel word in Urdu i.e., 'نیچے'. Some examples of Urdu prepositions in sentences are mentioned with English translates in Table 1 attached in supplementary material.

Research on verbs acquisition in Urdu language revealed striking differences in ages of acquisition in comparison to English language which shows that such differences can also be observed in other categories of syntax acquisition.[8] Urdu is lingua franca of Pakistan and very extensive literature on Urdu language is available. Unfortunately, SLPs working with Pakistani Urdu speaking children have very little information available on Urdu syntax developmental milestones. Developmental ages for acquisition of prepositions hold a great worth to identify deviations in syntactic development because they are among first twenty words that a child acquires.[3] Delay, improper use, or non-emergence of prepositions in speech can be indicative of some communication disorder and can only get an objective base of screening and diagnosis when normative ages of acquisition of prepositions' development would be known. In current practices, norms of English language are used as the base of diagnosis and evaluation which disregard the morphological diversity of Urdu language which could not be justified by using normative data based on English language speakers.

Although prepositions are limited in number, but they undoubtedly act as vital markers to structure the sentence; they signify special relationships between objects, persons, and locations. In contrast to nouns, verbs and adjectives, propositions are closed class i.e., they do not accept new additions yet important part of communication. To the best of our knowledge, this study is a pioneering study to identify ages of emergence of Urdu prepositions in speech development of young Pakistani Urdu speaking children.

METHODOLOGY

This cross-sectional survey was conducted in unstructured and informal settings i.e., schools and homes in Islamabad using purposive sampling technique. A self-designed "Urdu Syntax Evaluation Questionnaire (U-SEQ)" was used as a data collection instrument.[9] In this study, section of U-SEQ evaluating use of spatial prepositions (حروف جار) in speech was considered. Checklist of seven prepositions was mentioned in preposition evaluation section of questionnaire. Participants were asked to mark prepositions that their child uses in his/her spontaneous speech. (table 1)

Subject children were from age range 2 to 4 years. Informed consent was assured, and questionnaires were filled by parents, significant others, and teachers of typically developed 2 to 4 years old children. Among teachers only those teachers were selected who had spent six or more months with the subject child. Participants were asked to return questionnaires in 2 to 4 days. This time span was given so that the questionnaire is filled after keenly observing the child for mentioned perspectives. After scrutiny of 420 questionnaires, those with incomplete information or deviations from normal development were excluded from the study and data of N=370 participants were chosen for analysis. Data were analysed descriptively using SPSS version 21.

Table 1: Comparison of Urdu and English Spatial prepositions

Prepositions in English	Sentences	حروف جار	جملے
On /ɒn/	Put your books on the table pʊt jɔː bʊks ɒn ðə teɪb(ə)l	**اوپر** /uːpər/	اپنی کتابیں میز کے اوپر رکھو apni kiʈaːbẽ mez ke uːpər rkʰo
Up /ʌp/	Put your hands up pʊt jɔː handz ʌp	**اوپر** /uːpər/	اپنے ہاتھ اوپر کرو apne haːθ uːpər kro
Above /əˈbʌv/	A bag fell from above ə bag fɛl frɒm əˈbʌv	**اوپر** /uːpər/	بستہ اوپر سے گرا basʈa uːpər se gira
Over /ˈəʊvə/	She put a blanket over her child ʃiː pʊt ə blaŋkɪt ˈəʊvə həː tʃʌɪld	**اوپر** /uːpər/	اس نے اپنے بچے کے اوپر کمبل اوڑھایا ɪs ne apne bʧeɪ ke uːpər kʌmbl oɽhaja
Down /daʊn/	Put it down pʊt ɪt daʊn	**نیچے** /niːʧæ/	اسے نیچے رکھو ɪse niːʧæ rkʰo
Under /ʌndə/	Put it under the table pʊt ɪt ʌndə ðə teɪb(ə)l	**نیچے** /niːʧæ/	اسے میز کے نیچے رکھو ɪse meɪz ke niːʧæ rkʰo
Below /bɪˈləʊ/	He has a mole below his lips hiː haz ə məʊl bɪˈləʊ hɪz lɪps	**نیچے** /niːʧæ/	اس کے ہونٹوں کے نیچے تل ہے ɪs ke honʈõ ke niːʧæ ʈil he
Between /bɪˈtwiːn/	Put the ball between the table and chair pʊt ðə bɔːl bɪˈtwiːn ðə teɪb(ə)l	**درمیان** /d̪rmjɒn/	گیند میز اور کرسی کےدرمیان رکھو gend̪ meɪz ɔːr kursiː ke d̪rmjɒn rkʰo
Beside /bɪˈsʌɪd/	Put the chair beside the table pʊt ðə ʧɛː bɪˈsʌɪd ðɪ teɪb(ə)l	**ساتھ** /saːθ/	کرسی میز کے ساتھ رکھو kursiː meɪz ke saːθ rkʰo
In front of /ɪn frʌnt ɒv/	He was standing in front of me hiː wɒz standɪŋ ɪn frʌnt ɒv miː	**آگے** /aːgeɪ/	وہ میرے آگے کھڑا تھا vo mere aːgeɪ kʰɽaː θaː
Behind /bɪˈhʌɪnd/	Book fell behind the cupboard bʊk fɛl bɪˈhʌɪnd ðəˈkʌbəd	**پیچھے** /piːʧʰæ/	کتاب الماری کے پیچھے گر گئ kɪʈaːb ʌlmaːri ke piːʧʰæ gɪr gaɪ
In the middle of ɪn ðə ˈmɪd(ə)l ɒv	The boat stranded in the middle of the sea ðə bəʊt ˈstrandɪd ɪn ðə ˈmɪd(ə)l ɒv ðə si	**بیچ** /biːʧ/	کشتی سمندر کے بیچ پھنس گئ kʌʃʈiː samnd̪r ke biːʧ pʰãs gaɪ

RESULTS

Demographic details of sampled participants across age, gender, and relationship of person with child who filled the questionnaire have been mentioned in Table 2. Age of acquisition of each preposition is considered when 50% or more respondents marked its presence in lowest age category.[10]

Table 2: Distribution of sample across age, gender and relationship with child

Age in months		Relation with child- *n* (%)				Total
		Mother	Father	Teacher	Others	
24-29	Girls	41 (43.2)	9 (90.0)	0	9 (50.0)	59 (48.0)
	Boys	54 (56.8)	1 (10.0)	0	9 (50.0)	64 (52.0)
	Total	95	10	0	18	123
30-35	Girls	17 (56.7)	5 (55.6)	7 (63.6)	2 (40.0)	31 (56.4)
	Boys	13 (43.3)	4 (44.4)	4 (36.4)	3 (60.0)	24 (43.6)
	Total	30	9	11	5	55
36-41	Girls	12 (37.5)	1 (50.0)	8 (50.0)	0 (0.0)	21 (40.4)
	Boys	20 (62.5)	1 (50.0)	8 (50.0)	2 (100.0)	31 (59.6)
	Total	32	2	16	2	52
42-48	Girls	44 (51.8)	5 (45.5)	13 (36.1)	5 (62.5)	67 (47.9)
	Boys	41 (48.2)	6 (54.5)	23 (63.9)	3 (37.5)	73 (52.1)
	Total	85	11	36	8	140
Total	Girls	114 (47.1)	20 (62.5)	28 (44.4)	16 (48.5)	178 (48.1)
	Boys	128 (52.9)	12 (37.5)	35 (55.6)	17 (51.5)	192 (51.9)
	Total	242	32	63	33	370

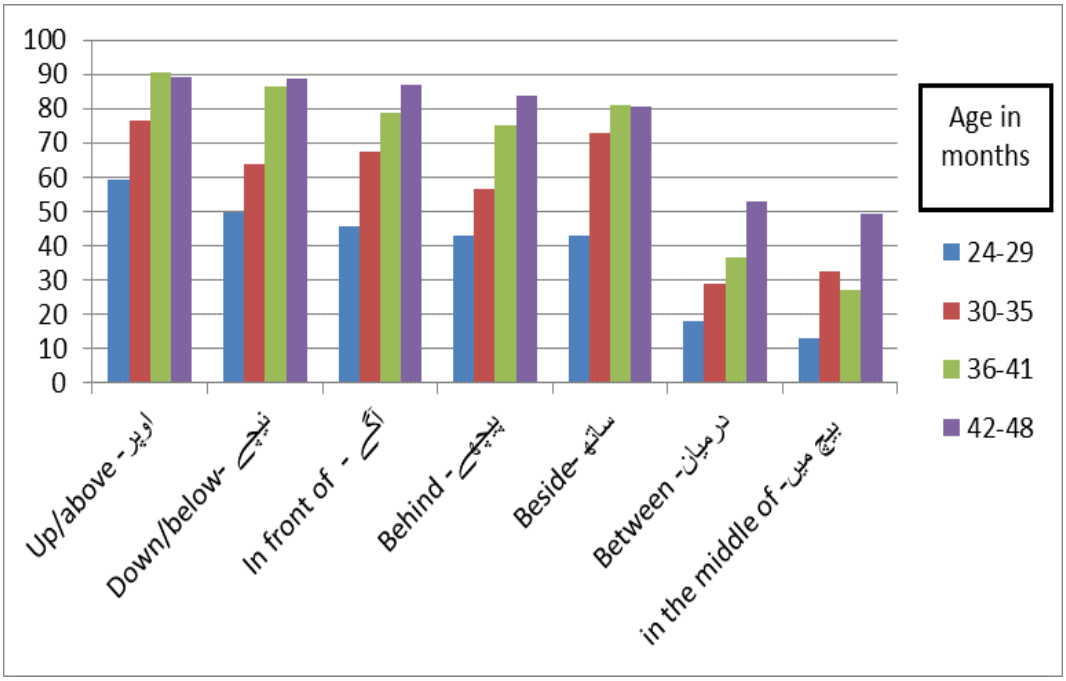

Figure 1: Percentage occurrence of Urdu spatial prepositions in spontaneous speech within each age group

The above figure illustrates that Urdu translates of preposition اوپر i.e., 'up/above/on' and نیچے i.e., 'down/below/under' were acquired in 24-26 months of age with 59.3% and by 42-48 months these were mastered by 89.3% and 88.6%. Urdu parallel forms of prepositions 'in front of (آگے)', 'behind (پیچھے)' and 'beside (ساتھ)' were acquired in 30-35 months with percentages 67.3%, 56.4% and 72.7% respectively. Preposition درمیان (between) acquired in 42-48 months with response percentage 52.8%. According to findings of this study, age of acquisition of preposition بیچ میں (in the middle of)' could not be established as even in maximum age limit group i.e., 42-48 months only 49.3% participants acquired this preposition. (figure 1) Distribution of responses across gender within each age range in mentioned in Table 3.

Table 3: Frequencies and percentages of spatial prepositions' acquisition across age groups and gender

		Urdu Prepositions *f* (%)						
Age in months	Gender	Up/above/on اوپر (Oper)	Down/below نیچے (neechay)	In front of آگے (aagay)	Behind پیچھے (peechay)	Beside ساتھ (sath)	Between درمیان (darmiyan)	In the middle of بیچ میں (beech main)
24-29	Female	36 (49.30)	27(44.30)	22 (39.30)	26(49.10)	20(37.7)	9(40.9)	6(37.5)
	Male	37(50.70)	34(55.70)	34(60.70)	27(50.90)	33(62.3)	13(59.1)	10(62.5)
	Total	73(59.3)	61 (50)	56(45.5)	53(43.1)	53(43.1)	22(17.9)	16(13)
30-35	Female	27(64.30)	22(62.90)	23(62.20)	18(58.10)	25(62.5)	10(62.5)	9(50.0)
	Male	15(35.70)	13(37.10)	14(37.80)	13(41.90)	15(37.5)	6(37.5)	9(50.0)
	Total	42(76.4)	35(63.6)	37(67.3)	31(56.4)	40(72.7)	16(29.1)	18(32.7)
36-41	Female	17(36.20)	17(37.80)	15(36.60)	15(38.50)	17(40.5)	5(26.3)	6(42.9)
	Male	30(63.80)	28(62.20)	26(63.40)	24(61.50)	25(59.5)	14(73.7)	8(57.1)
	Total	47(90.4)	45(86.5)	41(78.8)	39(75)	42(80.8)	19(36.5)	4(26.9)
42-48	Female	57(45.60)	58(46.80)	57(46.70)	59(50.40)	53(46.9)	42(56.8)	33(47.8)
	Male	68(54.40)	66(53.20)	65(54.30)	58(49.60)	60(53.1)	32(43.2)	36(52.2)
	Total	125(89.3)	124(88.6)	122(87.1)	117(83.6)	113(80.7)	74(52.9)	69(49.3)

DISCUSSION

In the current study it has been observed that preposition 'اوپر (up/on/above)' and 'نیچے (down/below/under)' were acquired by 59.3% and 50% of subject children respectively in youngest age group 24-29 months. Literature on English language suggests that child starts using prepositions 'up', 'down', 'in' and 'on' around 12-24 months.[11, 12] Preposition 'on' emerge early in children's utterances to describe support relations and simple containment e.g., 'ball on the table'. Existing evidence reflects that understanding of 'under' starts developing in 12 to 24 months and in 24-36 months child starts distinguishing between 'in' and 'under' in addition to acquisition of 'under' in spontaneous speech.[11] Different ages of acquisition for 'down' and 'under' indicate that although in Urdu language only one translate i.e., '/niːʧæ/ (نیچے)' is used but its acquisition of usage in different spatial situations parallel to 'under' 'down' and 'below' needs to be explored. In a study it was proposed that there is a structured semantic space that children and adults share for support and containment relations, but greater portion of this space is described by prepositions 'on' and 'in' in early development because other descriptions using lexical verbs are inhibited.[13] Besides this, developmental studies reflect that acquisition of these prepositions do not complete by the age of three years, which supports the notion that actual semantic space is far more intricate than it was considered in the pioneering studies of language acquisition, suggesting the organization of this space by language specific lexical contents rather than by pre-linguistic distinctions.[14, 15]

Average age of acquisition of prepositions '/ɑːgeɪ/ (in front of)', '/piːʧʰæ/ (behind)' and 'ساتھ (beside)' in this study was observed around 30-35 months. High percentages of '/ɑːgeɪ/ (in front of)' and '/sɑːθ/ (beside)' can be indicative of their precise average ages of acquisition soon after 24 months. These findings are indicative of early acquisition of these prepositions in Urdu language speakers as compared to English language speakers. Normative data on English language shows acquisition of 'behind', 'in front' and 'beside' in 36-48 months.[16,17] In the present study, age of acquisition of /ɖrmjɒn/ 'between' was seemed to be 42-48 months which is supported by English language literature where 36-48 months is its age of acquisition.[11, 18, 19] In the current study, response percentage of preposition /biːʧ/ (in the middle of) reached maximum limit of 49.3% in 42-48 months which cannot be determined as AoA according to criterion mentioned. Studies conducted on English language speakers support acquisition of preposition 'in the middle of' after 48 months in typically developing child.[17]

The child does not construct but identifies the concept from among a set of conceivable possibilities. There is huge compelling evidence that supports the role of non-linguistic cognition of spatial words by indicating their emergence over long period in a consistent order, both within and across children of same and different language learners respectively. Particularly, words referring topological and functional notions of containment e.g., 'in', support and contiguity e.g., 'on' and occlusion e.g., 'under' emerge first. [20] Later, words regarding proximity e.g., 'next to', 'beside' and 'between' appear. Finally, words showing projective relationships e.g., 'in front of, and 'behind' emerge.[21] Piaget and Inhelder (1967) established the order of acquisition of spatial concepts consistent with the aforementioned order by the use of non-linguistic tests.[20] A more straightforward hypothesis accounts for these sequential relations as new spatial notions develop non-linguistically, children discover existing forms used to express them in their native language.[22, 23] Consistent with these findings it was found that as early as the one-word stage, generalizations of words like 'out', 'off', 'up' and 'down' projects to varied events that resemble in trajectory of movement, abstracted across kinds made up of different entities.[24, 25]

CONCLUSION

Findings of the present study indicates that age of acquisition for Urdu spatial prepositions 'اوپر (on)' and 'نیچے (down)' is 24-26 months. Prepositions 'آگے (in front of)', 'پیچھے (behind)' and 'ساتھ (beside)' were acquired in 30-35 months. Spatial prepositions 'درمیان (between)' acquired in 42-48 months and 'بیچ میں (in the middle of)' did not meet the criteria of acquisition in any age group with maximum percentage of 49.3% in age category 42-48 months. Findings of the present study indicates

that acquisition of spatial prepositions follow same order in all children cross-culturally, but their AoA can vary according to their locality and language input provided to them. In future, the lowest age limit could be set at 18 months, considering the evidence of acquisition of prepositional phrases in this age according to Brown's stages of language development. Furthermore, direct observation and evaluation of speech samples of subject children can enable us to improve the internal validity of findings revealed in present study.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

IMPACT OF GENDER AND DEGREE OF HEARING LOSS ON SELF ESTEEM IN CHILDREN AND ADOLESCENTS

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Received on: *26-02-2022*
Revision on: *20-03-2022*
Published on: *31-03-2022*

Citation
Kiani HS, Salim H , Khan N, Shah KA, , Rana KK, Ultamish, Haroon R. Impact of gender and degree of hearing loss on self-esteem in children and adolescents T Rehabili. J. 2021:06(01);309-312
soi: 21-2017/re-trjvol06iss01p309
doi: https://doi.org/10.52567/trj.v6i01.139

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ABSTRACT

Background: Hearing impairment is considered as one of the major contributor of drop in low self-esteem of adolescents. Children and adolescents with significant hearing loss have difficulties like communication and social skills in different aspects of their quality of life which later on lead to anxiety, depression and social isolation. **Objective**: To find out the impact of gender and degree of hearing loss in children and adolescents not using hearing aid. **Methodology:** A cross sectional survey was conducted in Khyber Pakhtunkhwa. Total participants were 551 selected between 9-15 years age, with mild and moderate degree of hearing loss with no history of using hearing aid. The Rosenberg self-esteem scale was used to measure the self-esteem level. The data was analysed through multiple linear regression testing SPSS version 21. **Results:** The mean age of the study participants was 12.38±1.773 year. The degree of hearing loss and the gender were statistically significant predictor {F (df) =157.636(2,548), p<0.001, r^2 = .365} of the self-esteem in hearing impaired children. Hence, the age was not significant predictor on the self-esteem (β=.367, p=.228) **Conclusion**: The self-esteem in the children and adolescents with hearing impairment was affected by gender and degree of hearing loss, whereas age have no impact on the self-esteem.

Keywords: Adolescent, children, Hearing impairment, hearing loss, self-esteem.

INTRODUCTION

Self-esteem is an important factor of an individual's mental health. It actually represents a person's judgment regarding his/her own self. Low self-esteem leads to poor self-confidence and irrational negative thoughts which affects the overall personality of an individual. A term self-concept is also used as a synonym of self-esteem. .[1] Hence, Individuals who are positive have high self-esteem because eod their positive ideas they are more confident in what they do. People with low self-esteem mostly consider them self-less compete than others and develop inferiority complex. .[2] ,[3]

High levels of self-esteem are directly associated with the communication skills children who have hearing impairment and are using hearing aids are considered having high levels of self-esteem because their communication skills are developed whereas children and adolescents not using hearing aid have low self-esteem because of not developing proper communication Skills to communicate .[4] Children and adolescents having Hearing impairment face a lot of challenges in their life due to compromised communication skills they face bullying and isolation at schools and at home as well, this actually develop negative thoughts in them which by time develop low self-esteem in them. It is considered that degree of hearing loss also affects the mental health of hearing impaired children and adolescents; greater the level of hearing loss the more will be the chances of low self-esteem.[5, 6]

In a research it was noticed that gender differences in self-esteem changes with age.it was reported that boys are more positive thinkers and have high self-esteem as compared to girls of their age. [7, 8] The impact of gender difference on hearing impaired children is very obvious in different researches.[9, 10,] on the other hand a research was conducted in which preadolescent Pre-adolescent girls and boys with cochlear implants showed no difference in levels of self-esteem they scored equally at self-esteem scale.[10, 11]

Conclusively, there was limited literature on this topic in Pakistan. As the gender based differences exist as compare to developed countries, which may affect the self-esteem of hearing impaired children, the degree of hearing loss may also contribute to low self-esteem due to lack of social interaction. The objective of the study is to find the impact of gender and degree of hearing loss in children and adolescent not using hearing aid.

METHODOLOGY

A cross sectional study was conducted at different hearing clinics in Khyber Pakhtunkhwa in a time

period of 6 months from November 2020 – October 2021. The convenient sampling technique was used for data collection. The study was initiated after taking approval from Research and Ethics committee of Health Education Research Foundation. The sample size was n=551 children between 9-15 years, with mild and moderate degree of hearing loss but not using the any kind of hearing aid. However the children who had severe to profound degree of hearing loss and user of hearing aid as well as with normal hearing were excluded from the study. The Rosenberg self-esteem scale was used to measure the self-esteem level. The multiple linear regression test was applied to evaluate the impact of age, gender and degree of hearing loss on self-esteem in children and adolescents. Data analysis was made by SPSS 21 version.

RESULTS

The mean age of the study participants was 12.38±1.773 year. The gender distributions on the basis of level of self-esteem shows that the n= 67(12.16%) male and n=117(21.23%) female were with low self-esteem. The average self-esteem in males were n=185(33.58%) in female n=125(22.69%). The n=28(5.08%) were male with high level of self-esteem while the remaining n=29(5.26%) were female. The level of self-esteem shows that n=289 participants were with Moderate degree of hearing loss while the remaining n=262 were with Mild degree of hearing loss. For further detail see (Figure 1)

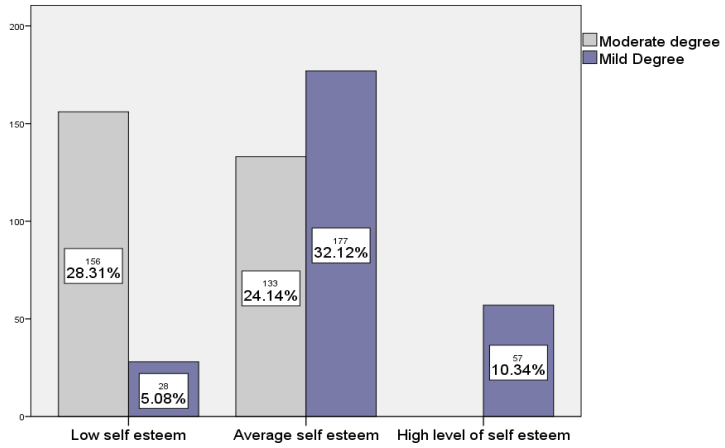

Figure: 1 Level of Self- Esteem

A multiple regression was run to predict Impact of age, gender and degree of hearing loss on self Esteem. The degree of hearing loss including Mild and Moderate degree and the gender are statistically significant predictor {F (df) =157.636(2,548), p<0.001, r^2 = .365} of the self-esteem in hearing impaired children. But the age was not significant predictor on the self-esteem (*β*=.367, p=.228) while in gender, the reference variable was female (*β*=-2.110, p<0.001), the male showed higher significant score of self-esteem (*β*=2.110, p<0.001) as compared to female. While considering the degree of hearing loss the mild degree (*β*=8.923, p<0.001) showed higher score which statistically significant as compared to moderate degree of hearing loss (*β*=-8.923, p<0.001).

Table 1: Impact of gender and degree of hearing loss on self Esteem

		Mean	Std.	B	Sig.	R^2	Adjusted R^2	F(df)	Sig.
Self. Esteem (17.42 ±7.646)	**Age**	12.38	1.773	.367	.228	.367	.363	157.636(2,548)	.000***
	Gender								
	Male	18.54	7.783	2.110	.000***				
	Female	16.26[a]	7.337						
	Degree of HL								
	Mild degree	22.13	3.885	8.923	.000***				
	Moderate degree	13.14 [a]	7.708						

****Significance level p<0.001*
[a]reference variable

DISCUSSION

The main objective of study was to find out level of self-esteem on age, gender and degree of hearing loss. It was hypothesized that there is significant effect of gender and degree of hearing loss on self-esteem. The age of HI children did not have any significant impact but gender and degree of hearing loss have significant impact on self-esteem. Previous studies showed associations between age and self-esteem persistence in children with hearing loss.[12],[13] Warner-Czyz et al. report more positive self-esteem for younger versus older children using CI. The Mean self-esteem score decreased by nearly 20% from preschool to older childhood and adolescence.[13] It was found that age-related reductions in self-esteem in children with hearing loss in mainstream educational settings, implying characteristic changes in childhood self-esteem endure across auditory status.[12] The possible reason because the children and adolescents are same they are young and have a negative impact about their health. They assume that they are different from the normal persons. They feel uncomfortable and always social withdraw; this is the main cause of their low self-esteem but the current study showed that there is increase in self-esteem as the age increases. Because as the age increases they become use to or adopt the problems which they faced for a long time. They develop their communication skills to participate in a group conversation and avoid communication breakdowns and cope up with it.[14],[15],[16]. The non-significant result of the study may be due to homogeneity in age of the study participants.

The current study showed gender based comparison that the female have low self –esteem as compared to the male. Female assume hearing loss always as a hurdle to them. They have negative feeling about their hearing loss and assume that they are inferior to others, therefore not communicate to other in fear of going wrong. The second main is the cultural values, boys are the more dominant and they have freedom to every excess as compare to female.[8]

The girls give more importance to their social activities, life and want to be accepted by people and concern about being disliked. The girls experience negative self-esteem, if there social activities and physical appearance is compromised.[17] On the other hand boys have more positive self-esteem as compare to girls and do not give importance to the activities except their social life. [7, 8, 11, 18]

A study reported that the esteem, until the age of 12 remain the same in both gender. But during puberty, there is mark decline, around two fold, in self-esteem in girls due to bio psychosocial changes. [11] The further reduction in girls' esteem levels, which might stem from higher importance of physical appearance for girls versus boys in preadolescence, continue through age 16 and decrease thereafter. It was reported in a study that pre-adolescent girls and boys using hearing aids as compare to their normal peers, rate their self-esteem equally. [7] Another study suggested that there are contradicting trends in hearing peers, as girl using cochlear implant (CI) shows more positive self-esteem as compare to boys. They usually fell more confident after using the CI. [10]

The current study showed the self-esteem level on the basis of degree of hearing loss. The individuals with moderate degree hearing loss have low self-esteem than the mild degree HL. The degree of hearing loss mentally affect the children, leads to social isolation due to feeling of uselessness. The hearing loss cause low self-esteem level in individuals as the degree of hearing loss increases the level of self-esteem decreases.[16] The hearing loss causes depression, anxiety and high temperament which negatively affect the person's personality and behaviour. The self-esteem correlates with both temperament and behaviour in hearing loss children.[19],[20] The literature shows that the use of hearing aids improve self-esteem because the hurdles and problems they faced by the hearing loss are overcome and they feel more confident and shows improvement in the social relations.

There are some other factors which are not included in the study and may affect the self-esteem of hearing impaired children i.e. socioeconomic status, education level of parent family support etc.

CONCLUSION

The self-esteem in the children with hearing impairment was affected by gender and degree of

hearing loss. Although the age did not impact the self-esteem in current population, but as per available literature, it may affect the self-esteem if appropriate sample is used in future studies.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.

RESEARCH ARTICLE

THE COMPARISON OF PLYOMETRIC AND RESISTANCE WARMUP PROTOCOLS ON THE RUNNING PERFORMANCE IN RECREATIONAL ATHLETES

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Received on: *16-11-2021*
Revision on: *21-03-2022*
Published on: *31-03-2022*

Citation; Gul T, Razzaq A, Sheraz S The comparison of plyometric and resistance warmup protocols on the running performance in recreational athletes. T Rehabili. J. 2021:06(01);313-317
soi: 21-2017/re-trjvol06iss01p313
doi: https://doi.org/10.52567/trj.v6i01.102

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ABSTRACT

Background: The warm-up prepares the body to withstand the high-intensity exercises and improves the athletic performance and reduces the risk of musculoskeletal injury. Active warm-up is one of the best and commonly used techniques in athletes that can induce a special type of cardiovascular and metabolic changes that can bring prominent change in running performance. **Objective:** To compare resistance and plyometric warm up Protocols in recreational athletes to improve running performance. **Methods:** A randomized clinical trial was conducted at Aman Medical Institute Islamabad. A total n=33 recreational athletes of both genders, having total exercise load less than 5 hours per week, with normal BMI and Must fulfill the 10 minutes' walk test on treadmill before starting the warm-up were recruited through convenience sampling technique. The sample was randomly assigned through sealed envelope method into Resistance warm up protocol (n=11), plyometric warm up protocol (n=11) and control group (n=11). The running performance was measured with lower limb power, VO_2max, endurance, fatigue and time of exhaustion. The RCT was registered in national library of medicine. Data was analyzed on SPSS version 23. After checking the normality, kruskal walis test was applied to compare the groups. **Results:** The mean age of the participants was 21.97±1.3 years and BMI were 23.27±1.12 kg/m^2. There was significant improvement in plyometric group in terms of VO^2max (p=0.003), rate of perceived exertion (p<0.001), time of exhaustion (p<0.001), fatigue (p=0.002), power p=(.002), endurance (p<0.001) as compared to other groups. **Conclusion: T**here was improvement in running performance in plyometric warm up protocol and resistance warm up protocol as compared to control group

Keywords: Lower limb power, Plyometric**,** Resistance warm up, Running performance.

INTRODUCTION

Warm-up is commonly known as preparatory initial practice that aimed to improve the subsequent performance.[1] It reduces the risk of musculoskeletal injuries, improve player performance in particular sport by helps to upgrade body temperature, excel the muscle potential, decrease muscle stiffness as well as resistance, regulate muscle contractile units, increase heart rate and blood flow toward muscles,[2] increase oxygen saturation, improve and regulate neuro-muscular electrical signals to achieve best outcome in competition. Warm-up reduces fatigue and it also improves the balance ability. [3],[8]Warm-up practices can modify oxygen uptake(VO2) motor reactions to resulting focused energy exercise and improve execution of performance.[6] Warm up training programs have been showed positive effects in elevating neuromuscular trials, running economy and distance running performance execution.

Running performance is determined by physiological parameters that include the VO2max, speed, endurance, lower limb power and fatigue. VO^2 max refers to the maximal volume of oxygen that the individual can uptake and utilize per minute[8],[2] Warm up types like active, passive and mixed regimes are generally recommended prior to any sports.[4] Stretching, treadmill walking, plyometric exercises are frequently directed for warm up.

Resistance warm up used by competitors to perform warm up is performing sport specific activities while wearing a weighted vest that gives extra protection during activity, impact of preparing with such extra loads on different metabolic and lower-extremities in different competitors provide positive outcomes.[7]

Plyometric training is the recent powerful aerobics resistance training, commonly used to boost equilibrium, coordination, speed and agility and increase physical ability. Functionally, starting from high speed eccentric to move towards concentric exercises and generate reflex response. Plyometric training is a type of strength training that aims to increase the muscle's ability to generate force through shortened cycles of stretching using explosive activities such as jumping and hopping. It works best on muscle control, dynamic equilibrium

and advance lower extremities muscle strength. [5]Plometric Warm up training are harmless and suitable measures to enhance physical fitness. Heavy strength warm up regimes like jumping, additionally called plyometric works out, ordinarily used to expand strength through the stretch-shortening cycle (SSC). Warm up can reduce fatigue to improve the physical performances. [11]

Previous literature is present on comparison of different protocols. But the measurements of fatigue level after warm up and the endurance level in running in real ground environment was the research gap. Equal time allocation for the entire warm ups and the standard resistance according to their weight of the participants was also the research gap. This study can provide the evidence based warm up protocol that can be used in real ground environment before endurance sports.

To compare the effects of plyometric, resistance and control warm up on time of exhaustion, Vo2 max, fatigue, on lower limb power and endurance competition of athletes.

METHODOLOGY

A Post-test only control group design was conducted at Aman Medical Institute Islamabad. The inclusion criteria was recreational athletes of both genders, 19-25 years, having total exercise load less than 5 hours per week, with normal BMI and must fulfil the 10 minutes' walk test on treadmill before starting the warmup.[12] A total of n=33 sample size calculated through open epitool. Out of n=40 athletes that were recruited through convenience sampling technique, n=33 filled the inclusion criteria and then randomly assigned through sealed envelope method into Resistance warm up protocol (n=11), plyometric warm up protocol (n=11) and control group (n=11). (Figure 1)

The outcome measures were Vo_2max, time of exhaustion, lower limb power, endurance, fatigue and speed measured through incremental test, sergeant jump test, yo-yo test, visual analogue scale, 30-meter speed test respectively.

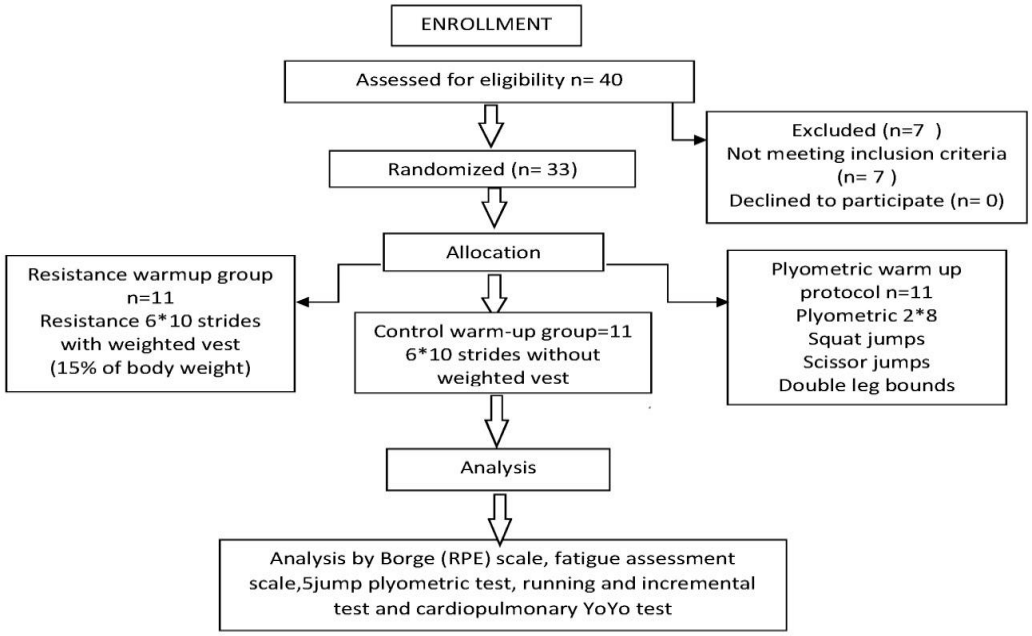

Figure 1: Consort Diagram

Participants were divided in 3 groups which were control group, plyometric group and resistance warmup group. In the first visit participant were familiarized with the testing equipment and procedures. Participants were asked to perform no strenuous exercise within the 48hrs prior to fatigue to avoid any fatigue. The participants were guided through the videos about the warmups which were included in the study. Participants were being instructed to wear the same pair of running shoes during the three tests. Total time for the each warm-up protocol was 16 minutes for each protocol. The one time data was collected post warmup after 10 min rest, Sargent jump test, incremental test, visual analogue scale and perceived race readiness was performed. The next day endurance competitions were performed after performing the same warm up protocol.

Table 1: Intervention description in each group

Control (n=11)	Plyometric (n=11)	Resistance (n=11)
10-minute self-pace jog on a motorized treadmill 6*10 strides without weight on treadmill	10-minute self-pace jog on a motorized treadmill 2*8 scissor jumps & double leg bounds squat jumps.60 seconds to recover from between each set	10-minute self-pace jog on a motorized treadmill 6*10 strides with 15% of body weight on treadmill

The running performance was measured with running and incremental test for time of exhaustion and $V0^2$ max. The test is performed on treadmill with Initial velocity will be 7 km h/1 and increased by 1 km h/1 every 3 min up to 10 km h/1. The gradient of the motorized treadmill will be set at 1% to simulate the air resistance that athletes experience on an outdoor track. During the incremental test, at 10 km h/1, the gradient will be increased by 2.5% every 2 min until exhaustion.[12]

Modified Borg Scale (Rate of Perceived Exertion) is used for perceived exertion. Visual Analogue Fatigue Scale (VAFS) measures for the fatigue. Yo-yo test The main objective of this test is to measure the ability to repeatedly perform intense exercise including the potential to rapidly recover from such exercise. During the YoYo endurance test is performed as an open endurance competition. Sargent test is performed to assess lower limb power. Speed was measured through the 30-m speed test.

The demographic data was presented with mean, standard deviation, frequency and percentages. As the data was not normally distributed, for the post intervention group's comparison non-parametric kruskal willis test was applied with post hoc analysis was applied. The data was analysed through SPSS 23.

RESULTS

The mean age of the participants was 21.97 $\pm$ 1.3 years and BMI were 23.27 $\pm$1.12 kg/m^2. 13(39.4%) participants were females while 20(60.6%) were males.

The comparative analysis of time of exhaustion between three groups show significant difference (p=0.001), with significant difference between control and resistance (p=0.001) and control and plyometric (p=0.001) and no significant difference between resistance and plyometric groups (p=.052).

Table 2: Comparison of assessment of three groups control, resistance and plyometric.

Variables	Groups	Kruskul Wallis		Post Hoc	
		Median(IQR)	Mean Rank	p-value	p-value
Time of Exhaustion	Control	9(1)	6.82	<0.001	<0.001[a]
	Resistance	11(1)	19.27		0.052[b]
	Plyometric	11(1)	24.91		<0.001[c]
Rate of perceived exertion	Control	4(1)	8.91	<0.001	0.021[a]
	Resistance	4(1)	15.00		<0.001[b]
	Plyometric	6(1)	27.09		<0.001[c]
Visual analogue fatigue scale	Control	2(1)	10.09	0.002	0.007[a]
	Resistance	2(0)	18.55		0.180[b]
	Plyometric	2(1)	22.36		0.002[c]
Vo2 max	Control	45(2)	10.50	0.003	0.045[a]
	Resistance	45(0)	17.27		0.042[b]
	Plyometric	45(1)	23.23		0.003[c]
Speed	Control	10(0)	12.91	0.103	0.051[a]
	Resistance	10(0)	19.45		0.841[b]
	Plyometric	10(0)	18.64		0.086[c]
Sargent jump test	Control	20(1)	11.59	0.004	0.343[a]
	Resistance	21(2)	15.09		0.019[b]
	Plyometric	22(2)	24.32		0.002[c]
Cardiopulmonary Endurance Test	Control	950(100)	8.09	<0.001	0.002[a]
	Resistance	1100(150)	19.68		0.277[b]
	Plyometric	1150(100)	23.23		<0.001[c]

[a]Control vs. Resistance, [b]Resistance vs Plyometric & [c]Control vs. Plyometric

Significance level: p<0.05, p<0.01**, p<0.001****

There was significant difference in Rate of perceived exertion difference (p<0.001), with significant difference between control and resistance (p=0.021) and control and plyometric (p=0.001) and between resistance and plyometric groups (p=0.001). The Vo_2 max was significantly

more in the plyometric as compared to control group (p=0.003) and resistance as compared to control group (p=0.045) and between the resistance and plyometric groups (p=0.042). The speed was increased in all the three groups but there was no significant difference. (p=0.077) There was significant difference (p=0.004) between the three groups in leg power measured by the Sargent jump test. There was no significant difference between the control and resistance (p=0.343). There was a significant difference between resistance and plyometric (p=0.019) and between the plyometric and control group (p=0.002). There was significant difference (p=0.001) between the endurance among the three groups (p=0.001). There was significant difference between the control and resistance (p=0.002) and between the plyometric and control group (p=0.001). There was no significant difference between resistance and plyometric (p=0.277). (Table 2).

DISCUSSION

The plyometric and resistance warm up protocols were compared to control group in running performance in recreational athletes. VO2 max, speed, Time of exhaustion and leg flexibility was improved in plyometric and resistance group due to which running performance was also improved in plyometric and resistance group.

Chen Guang Wei, et al (2020) investigated that Vo2 max increased with increasing speed in control, plyometric and resistance groups following the plyometric and resistance training.[12] The primary finding of a study by Agustiyawan (2020) was that plyometric training tend to improve the VO2 max better than sprint training in amateur football players.[13] These results are in line with the results of current study where plyometric training has markedly improved the VO_2 max of athletes. Another study by Kurniawan (2021) also concluded VO2 max and endurance improvement in male judo athletes with 8 weeks of active-passive recovery plyometric training. [14] the current study also showed that VO2 max was improved although in all three groups but comparatively plyometric warmup group was better.

Hammami (2021) has also shown substantial improvement in endurance assessed through 20-m shuttle run performance of junior male handball players after 8 weeks of combined training of HIIT and plyometric exercise. [15]Plyometric training and weight-training for a period of 6 weeks using short rest interval, also improved aerobic endurance in physically active college student. [16] In current study the resistance and plyometric warm up groups both performed better in the endurance test that was performed as an open field endurance competition.

Huseyin Topcu and Ramiz Arabaci (2017) found that the speed of the athletes was positively affected after plyometric exercise protocol and suspension exercise protocol [17]. Francesco fischetti (2018) proved that standardized program of plyometric training improves the lower limb speed and explosive strength. [18] In a meta-analysis (2021) it is shown that the plyometric training as compared to strength training can greatly enhance the sprint speed particularly between the initial 15-30 meters.[1] The comprehensive 11+ comprehensive warm-up program did not have significant effects on the speed of athlets.[20] The weighted plyometric warm up also improves the speed and agility in the university football players. [21]The current study shows that there was no significant difference in speed after the warmup between the three groups

A Meta-analysis and systematic review suggested that there is moderate evidence present on improvement of vertical jump after the plyometric training than plyometric training and it can be used as more efficient and performance based approach to improve performance. [19] The dynamic warm up protocol has positive effects on the vertical jump performance to improve power of athlets.[17] They also showed that the vertical jump performance increase by warm-up in unstable conditions probably due to improve in balance skills. [17] This probably may be the reason of improvement in vertical jump performance in current study as compared to other groups.

Chen Guang Wei, et al (2020) investigated There was no significant change in perceived race readiness and time of exhaustion in these three groups control, plyometric and resistance. The current study showed that there was significant difference in the values of time of exhaustion and PRE scale values in the Plyometric, Resistance and control groups. [12] Romero et al. also shows that

there was more fatigue after the plyometric warm up as compared to the control group. [22]. The data was taken only at post-test level. Baseline data was not taken. The baseline values of running performance can be the reason of the difference in results of groups.

CONCLUSION

Running performance is effectively enhanced after the plyometric warm up protocol as compared to resistance warm up and traditional warm-up. Plyometric warm up exercises can be used to enhance running performance in long distance runners. Lower limb flexibility and agility should also be measured after the warm up protocol.

This study suggested that including these two warm up Plyometric and resistance will have better effect on running performance in running athletes so it should be incorporated in routine training of running athletes.

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Disclaimer: None to declare.
Conflict of Interest: None to declare.
Funding Sources: None to declare.