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EDITORIAL

REHABILITATION RESEARCH BARRIERS IN PAKISTAN

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Editor, Student Corner

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In diverse field of rehabilitation, it is so difficult for us to state that whether our work is debilitating or restorative. The impact of what we are doing is measured by the rehabilitation research. It is one of the source through which we test the belief of making a difference in the lives of people we serve.¹ Major rehabilitation research barriers documented worldwide may include four major barriers: technical barriers-lack of access to library resources², lack of familiarity with research process^{3, 4}, lack of research mentors⁵⁻⁷, and lack of statistical support⁸, personal barriers-lack of time⁴, social barriers-ethical concerns about use of human participants and animal subjects¹ and professional barriers-lack of funds², clinician researcher dichotomy⁹.

In Pakistan, the barriers in rehabilitation research correlate as lack of time (63%), lack of administrative support (38.9%), while 37% do research only for advancing in careers and 9.3% lack interest in research¹⁰. Another similar study showed 58% holding back in research due to limitation of time because of extensive curriculum 49.3% exam phobia and 16.7% lack of interest. Improper training in research methodology and scientific literature search were also documented to be two important barriers contributing 25.3% and 31.4% respectively¹¹. Limited access to the digital libraries impedes the know-how of the current and latest researches in the advancing, innovative field of rehabilitation. This barrier puts a restraint on gaining an insight in the area of interest hence proving to be a huge stone in doing quantitative as well as qualitative research work¹². The development and establishment of digital libraries is the direct after effect of lack of: concept of digital libraries, technological applications, and human resource with relevant skills, copyrights and financial support¹³. Such barriers are a great hindrance in the quality of research work and negates rather than potentiation in narrowing of the gap between antiquated, still in practice techniques and modern modifications of regimen incarnated into the rehabilitation protocols. Due to the combination of lack of interest and pre-disposing factors, the rehabilitation research is in very critical phase. Moreover, if a research successfully goes through its final form by the experience, constant hard work, dedication and commitment, it still fails to appear on the larger grounds due to failure of publishing. This failure not only buries it under the heap of leaves but also result in continuation of the previously discarded techniques¹.

Research must be incorporated in undergraduate studies to properly produce trained students that will come forward and apprehend the challenges faced today. Independent learning, writing, and critical appraisal of the existing literature will become so easy by such assimilation of skills^{14,15}. These skills also help in further postgraduate studies without wastage of further time in acquiring the research skills from a new and varied perspective. The background knowledge will provide a definite base in flourishing of the rehabilitation research¹⁶. As it is so difficult to erase the rehabilitation research barriers, we must work coherently to minimize such limitations, as much as we can, to enhance the quality of the work we produce in contributing towards the growing domain of rehabilitation. Creating awareness among the people about destigmatizing the participation in research, awareness among the users, customizing the users' interface and providing proper training to the students/researchers¹⁷ helps positively in potentiating the achievement of required goals of rehabilitation research. Training of library professionals¹⁸ to assimilate digital competencies in developing, managing and protecting digital libraries and their contents¹¹, proper administrative, mentoring and financial support will also contribute in enhancing the rehabilitation research.

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ORIGINAL ARTICLE

PHYSICAL HEALTH RELATED QUALITY OF LIFE IN PAKISTANI PHYSICAL THERAPISTS

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ABSTRACT

Objectives: The objective of this study is to find out the quality of life (QOL) related to physical health and factors associated with it in physical therapists of Pakistan. **Materials & Methods:** Descriptive cross sectional survey was conducted among physiotherapists of Pakistan working in different hospitals and teaching institutes. The sample (n=378) was collected through convenient sampling technique. The qualified doctors of physical therapy with age of 22-50 years were included. Data was collected by using General demographic questionnaire including age, gender, qualification, marital status, job type, job nature, financial issues, family issues, job satisfaction, salary satisfaction, overall satisfaction, depression anxiety stress (DAS) and physical health related quality of life (WHO-QoL). Data was analyzed by using SPSS 21. **Results:** The results showed that mean age of study participant was 29.66±3.75. the average population of PTs had normal physical health(49.53±15.17). A total of n=146(38.64%) physical therapist had good, n=90(23.81%) had normal, n=136(35.98%) had poor and n=6(1.59%) had very poor quality of life related to their physical health. Physical health was found poor among PTs those who were divorced (37.33±9.81), severely depressed (32.27±13.09), in severe anxiety (32.75±3.24) and severely stressed (31.00±.00). **Conclusion:** Average population of PTs had normal physical health. The physical health was associated with gender, type of job, nature of job, financial issues and family issues. Physical health becomes poorer as depression, anxiety and stress severity increases.

Keywords: Physical Therapist, quality of life, Depression, anxiety, stress. Work related musculoskeletal disorders.

INTRODUCTION

Quality of life is perception of a person about life according to his purpose, goals and expectations in relation to culture and values of a system in which he survives. It is a multidimensional concept referring to people's emotional, social and physical well-being and their ability to function in the ordinary tasks of living.¹

The concept of HRQoL is relatively new, though it is self-reported outcome but overall HRQoL is dynamic and multidimensional covering physical functioning, social functioning, role functioning, and mental health. Healthy people are more productive, more energetic to work, have good self-esteem, can communicate more honestly and effectively.² Studies related to HRQoL are useful in every sector³. Numerous studies have been carried out to assess HRQoL in various disease conditions to identify appropriate interventions to improve HRQoL of target population. However, there is a dearth of literature on HRQoL among Medical professionals⁴. One study done on physicians showed that many of them experience professional burnout, characterized

by emotional exhaustion, depersonalization, and a low sense of personal accomplishment which affect professionalism, influence quality of care, increase the risk for medical errors, promote early retirement, broken relationships, increased alcohol use, and suicidal ideation⁵. Research has consistently shown that doctors with healthy personal lifestyle habits are more likely to impart healthy behaviors to their patients.⁶ In most of the studies done on health of doctors, their health problems are mainly discussed in relation to substance abuse and psychiatric disorders rather than in terms of physical diseases⁷. One study reported prevalence of WRMDs among Saudi dentists affecting their daily activities. Physical therapists (PTs) are health care professionals who diagnose and treat movement dysfunctions. Their job is very demanding on both time and physical capabilities which can affect their physical health due to musculoskeletal problems and decrease their work performance and increase absenteeism.⁸ A study was conducted on physiotherapists to examine their activity levels and quality of life related to health in an Australian

hospital and health service and participants reported with most of them being in full health. Musculoskeletal problems and burnout of moderate intensity with high level jobs have been reported by Physiotherapists which even result in more health care consultations and leaves due to sickness.⁹ No study has been conducted to observe physical and mental health in PTs of Pakistan. There is paucity of information so further studies are required to assess HRQOL in physical therapists. The objective of this study is to find out the QOL related to physical health and factors associated with it in physiotherapists of Pakistan.

MATERIAL & METHODS

Descriptive cross sectional survey was conducted among physiotherapists of Pakistan working in different hospitals and teaching institutes. The sample (n=378) was collected through convenient sampling technique and was decided by raosoft sample size calculator with 5% margin of error. The qualified doctors of physical therapy with age of 22-50 years were included. Physical therapy technicians and diploma holders were excluded from the study. Anonymity and Confidentiality of study participants was observed throughout the research. Prior to study informed consent was obtained from the study participants. Data was collected by using General demographic questionnaire including age, gender, qualification, marital status, job type, job nature, financial issues, family issues, job satisfaction, salary satisfaction, overall satisfaction, depression anxiety stress (DAS) and physical health related quality of life

(WHO-Qol). The mean±SD and n(%) were use to describe the results. To determine association between variables, chi square was used. The level of significance was set at $p<0.05$. Data was analyzed by using SPSS 21.

RESULTS

The results showed that mean age of study participant was 29.66±3.75 and mean physical health score was 49.53 ±15.17 that showed that average population of PTs had normal physical health. A total of n=146(38.64%) physical therapist had good, n=90(23.81%) had normal, n=136(35.98%) had poor and n=6(1.59%) had very poor quality of life related to their physical health. (Figure 1)

The results showed that no significant association was found between age and physical health of Physical therapist. The physical health showed significant association with gender ($\chi^2=9.04, p=0.02$), type of job ($\chi^2=14.76, p=0.02$), nature of job ($\chi^2=21.99, p=0.00$), financial issues ($\chi^2=9.96, p=0.01$), family issues ($\chi^2=11.70, p=0.00$), depression ($\chi^2=48.37, p=0.00$), anxiety ($\chi^2=40.81, p=0.00$) and stress ($\chi^2=31.36, p=0.00$). Physical health was found poor among PTs those who were divorced (37.33±9.81), severely depressed (32.27±13.09), in severe anxiety (32.75±3.24) and severely stressed (31.00±.00). The detailed results of different variables according to mean±SD, frequency distribution and their association with physical health can be seen in table 1.



Table 1: Physical Health Related QOL among Physical Therapist

		Physical Health						X ²	p-value
		N	Mean±SD	Very Poor (1-20) N(%)	Poor (21-40) N(%)	Normal (41-60) N(%)	Good (61-80) N(%)		
Gender	Male	136	52.37±13.49	2(33.3)	36(26.5)	40(44.4)	58(39.7)	9.04	0.02
	Female	242	48.46±15.50	4(66.7)	100(73.5)	50(55.6)	88(60.3)		
Qualification	BSPT	38	52.21±14.30	-	12(31.6)	8(21.1)	18(47.4)	6.44	0.69
	DPT	138	50.27±15.09	2(1.4)	46(33.3)	38(27.5)	52(37.7)		
	PPDPT/ MS	192	48.79±15.06	4(2.1)	76(39.6)	42(21.9)	70(36.5)		
	Ph. D candidates	10	55.40±10.59	-	2(20)	2(20)	6(60)		
Marital status	Married	128	51.90±14.28	2(1.6)	40(31.3)	30(23.4)	56(43.8)	11.63	0.23
	Unmarried	172	48.94±15.56	2(1.2)	66(38.4)	35(20.3)	69(40.1)		
	In a relationship	72	49.54±14.24	2(2.8)	26(36.1)	23(31.9)	21(29.2)		
	Divorced	06	37.33±9.81	-	4(66.7)	2(33.3)	-		
Job type	Clinical	172	48.51±15.16	2(1.2)	64(37.2)	51(29.7)	55(32)	14.76	0.02
	Academic	112	49.09±14.85	2(1.8)	44(39.3)	25(22.3)	41(36.6)		
	Both	94	53.32±14.12	2(2.1)	28(29.8)	14(14.9)	50(53.2)		
Job nature	Government	82	46.34±14.46	2(2.4)	32(39)	29(35.4)	19(23.2)	21.99	0.00
	Semi-government	60	52.96±14.55	2(3.3)	18(30)	12(20)	28(46.7)		
	Private	196	50.18±15.14	-	74(37.8)	39(19.9)	83(42.3)		
	Self employed	40	51.10±14.34	2(5)	12(30)	10(25)	16(40)		
Financial Issues	Yes	228	49.66±14.75	6(2.6)	80(35.1)	63(27.6)	79(34.6)	9.96	0.01
	No	150	50.16±15.20	-	56(37.3)	27(18)	67(44.7)		
Family Issues	Yes	118	46.79±14.84	-	56(47.5)	24(20.3)	38(32.2)	11.70	0.00
	No	260	51.28±14.76	6(2.3)	80(30.8)	66(25.4)	108(41.5)		
Job satisfaction	Yes	161	48.24±15.23	4(2.5)	62(38.5)	35(21.7)	60(37.3)	2.56	0.46
	No	217	50.49±15.09	2(0.9)	74(34.1)	55(25.3)	86(38.6)		
Salary satisfaction	Yes	101	48.34±15.16	-	44(43.6)	18(17.8)	39(38.6)	6.46	0.09
	No	277	49.97±15.17	6(2.2)	92(33.2)	72(26)	107(38.6)		
Overall satisfaction	Satisfied	68	52.63±14.23	-	19(27.9)	15(22.1)	34(50)	6.11	0.41
	Average	132	48.89±15.29	3(2.3)	51(38.6)	30(22.7)	48(36.4)		
	Not satisfied	178	48.83±15.36	3(1.7)	66(37.1)	45(25.3)	64(36)		
Depression	Normal	94	50.19±13.95	-	29(30.9)	35(37.2)	30(31.9)	48.37	0.00
	Mild	184	49.38±14.97	2(1.1)	69(37.5)	44(23.9)	69(37.5)		
	Moderate	89	51.31±15.92	2(2.2)	30(33.7)	11(12.4)	46(51.7)		
	Severe	11	32.27±13.09	2(18.2)	8(72.7)	-	1(9.1)		
Anxiety	Normal	176	49.93±15.40	4(2.3)	59(33.5)	42(23.9)	71(40.3)	40.81	0.00
	Mild	168	51.66±14.50	-	55(32.7)	38(22.6)	75(44.6)		
	Moderate	26	38.30±12.18	2(7.7)	14(53.8)	10(38.5)	-		
	Severe	8	32.75±3.24	-	8(100)	-	-		
Stress	Normal	151	49.98±14.64	-	55(36.4)	33(21.9)	63(41.7)	31.36	0.00
	Mild	121	52.23±15.44	3(2.5)	34(28.1)	28(23.1)	56(46.3)		
	Moderate	96	47.37±14.93	3(3.1)	37(38.5)	29(30.2)	27(28.1)		
	Severe	10	31.00±0.00	-	10(100)	-	-		

DISCUSSION

The objective of the study was to find out the physical health and factors affecting it within physiotherapists of Pakistan and according to results the mean values of physical health which is one of the domains of WHO Bref QoL were in moderate ranges while majority of participants were with mild depression but with normal anxiety and stress level. Physical function was associated with depression level, anxiety level, stress level, job status, job

nature, family issues, marital status, and health status. 73% females were with poor health.

Enormous studies have been conducted in western countries to assess level of stress, mental health and other related variables in various professions but very few for physical therapists.^{8,9,10} In present study poor health increases with increasing depression, anxiety and stress. Studies conducted previously have demonstrated that physical therapists experience high level of job stress. But the scope of the problem is difficult to evaluate because of focus group studies and interviews. However, there is

evidence that doctors are at greater risk of mental illness and stress-related problems and more susceptible to substance abuse.^{10,11} Further their suicide rate is higher than general population.¹² they are at greater risk of poorer health and wellbeing because of their professional circumstances like working in rural and remote areas, excessive hours or shift work¹³. For junior doctors their professional stage and For senior doctors, professional isolation, the challenges of managing a business, employing staff, juggling commitments to patient care, teaching, administration, professional development, family and caring responsibilities plus chronic diseases can cause stress^{14,15}. In present study from clinicians 37.2% and from academics 39.3% were with poor health. Though clinicians have more physical work as compared to those who work in academics but mental health is affected more in them so it might have indirectly affected the physical health. 37% privately employed were with poor health. 37.3% although were with no financial issues but having poor health while 35.1% were with poor health with financial issues and 47.5% with family issues were also with poor health.

Medical students also experience higher rates of depression and stress.¹⁶ One study done for Medical representatives showed that they were suffering from health problems and majority of them were not involved in any physical activity other than the routine work which was affecting their HRQoL¹⁷. It is also reported that use of junk/fried food affect the HRQoL which affects their productivity and satisfaction level.¹⁸ Some other studies also reported stress, psychiatric morbidity, high suicide rates and ill health in doctors with high BMI, prevalent smoking and alcohol use^{7,19,20}.

It is sad and surprising that physicians suffer more from one or more of "the three Ds" drugs, drink & depression. Illnesses experienced by doctors include: cardiovascular diseases (4% to 15%), respiratory illnesses (10% to 21%), musculo-skeletal problem (9% to 38%), cancer (2 to 3%) & psychiatric illness (3 to 10%)²¹. There has been no study which investigated quality of life among Pakistani physiotherapists but some other studies in different countries like in South Korea investigated prevalence

of WRMDs and its association with QOL and work place stress and the results showed that 94.5% of participants were suffering from WRMD at least at one body site. For QOL difference was higher for above 49 years of age and it was associated with number of pain sites. Work stress was higher and due to job specifications, role conflicts, personal relations and employment instability. Work stress was influenced by multiple pain sites and in turn affecting quality of life thus supporting the results of present study that effect on mental health can affect physical health²². In a study done by Morken et al. reported that QOL specially physical role limitations and observable symptoms have lower average values unlike present studies in which physical function was in moderate ranges.²³ Another study showed that QOL can be affected by length of shift and duration of labour²⁴. Different other studies have also reported WRMD within physical therapists and their assistants^{8,10,25-27}.

Another study done in KSA reported that demands of work in context of physical and psychological health leads towards moderate level of job demands. To work in uneasy positions, work pressures and to complete work in time results in musculoskeletal problems which affect the quality of life of PT's. It was more prevalent in juniors. Physical health can be affected by either of physical or psychological factor^{28,29}.

In current study comorbidities which could also affect health were not identified. Geography and environmental factors that may affect physical health are missing in the study.

CONCLUSION

Average population of PTs had normal physical health. The physical health was associated with gender, type of job, nature of job, financial issues and family issues. Physical health becomes poorer as depression, anxiety and stress severity increases. In future studies can be performed with larger sample size.

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ORIGINAL ARTICLE

STRETCHING EXERCISES VERSUS DEEP FRICTION MASSAGE FOR THE MANAGEMENT OF PIRIFORMIS SYNDROME

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ABSTRACT

Objective: to compare cross friction massage (CFM) and stretching exercise (SE) in decreasing pain and disability in patients with piriformis syndrome. **Methods:** A randomized controlled trial was conducted at Benazir Bhutto Hospital Rawalpindi for duration of 1 year (June 2017-18). Non probability convenience sampling technique was used for data collection. A total of n=47 participants between 20-60 years with +ve FAIR test with mild to moderate level of disability on Oswestry disability index (ODI) were included in the study. A total of n=47 were divided into two groups, CFM group (n=23) and SE group (n=24). The demographic data was collected in term of age, gender, height, weight, BMI, sitting and standing duration. Each participant was evaluated for symptoms of piriformis syndrome on Oswestry Disability Index (ODI). Paired samples t-test was used to analyze with-in group changes in both groups and independent t-test was use to compare the effects of both rehabilitation protocols. **Results:** The mean age of study participants in both groups was 37.62±8.97. Between-group changes showed significant difference in overall ODI of CFM group & SE group (7.08±2.74 ver. 13.27, $p<0.001$). But individual item of ODI including lifting (1.13±0.91 ver. 1.58±0.97, $p=0.10$), standing (1.08±1.23 ver. 1.50±1.31, $p=0.27$) and sleeping 0.65±0.93 ver. 1.20±1.21, $p=0.08$) did not showed significant difference in both groups. **Conclusion:** it is concluded that cross friction massage is more effective in reducing pain and improving functional abilities in patients with piriformis syndrome as compare to stretching exercises

Keywords: friction massage, physical therapy, piriformis syndrome, stretching exercises, sciatica

INTRODUCTION

Piriformis syndrome is the compression or irritation of sciatic nerve causing pain in low back, hip region, back of thigh radiating to leg and side of foot along with the root of sciatic nerve.¹ Patient experiences pain, numbness, burning sensation, painful bowel movements, trouble with walking and performing other functional activities. If untreated it causes problems with prolonged sitting, walking and long standing.² Magnetic resonance imaging, X-rays of hip, electromyography, freiberg and beatty test are considered for diagnosis of piriformis syndrome.³ Treatment for piriformis syndrome includes NSAIDs, painkillers, muscle relaxant, steroids, physical therapy, and psychiatric therapy.⁴ Physical therapy management includes number of treatment options such as hot packs, ultrasound, shockwave therapy, soft tissue mobilization, cold packs, stretching exercises. Muscle stretches, Gebauer's spray and stretch technique, and soft tissue, myofascial, muscle energy, and thrust techniques can relieve all somatic dysfunctions in the patient with piriformis syndrome.^{5,6,7} Surgical

treatment is done in severe cases when symptoms become severe and stubborn and syndrome is causing disability.⁸

Soft tissue mobilization techniques are effective than electrotherapy for the management of symptoms related to piriformis syndrome.⁷ Cross friction massage helps to release scar tissue and break adhesions in muscles.⁹ The stretching exercise improves the elasticity and flexibility of muscles thus reducing pressure on sciatic nerve.¹⁰ Some studies showed that cross friction massage and stretching exercise are effective in relieving pain and reducing disability in patients.^{7,9,10}

But in past no study have been conducted to find out the effects produced by these techniques separately. Most of the studies have reported effectiveness of different physical therapy techniques on symptoms of piriformis syndrome; no study investigated the effects on disability level. For this reason, randomized controlled trial was focused on the comparison of the results produced by cross friction massage and stretching exercise separately in

decreasing pain and disability in patients with piriformis syndrome.

MATERIAL & METHODS

A randomized controlled trial was conducted at Benazir Bhutto Hospital Rawalpindi for duration of 1 year. Non probability convenience sampling technique was used for data collection. Physiotherapist performed FAIR test (sensitivity=0.881 & specificity=0.832) to evaluate each participant for piriformis syndrome. A total of

n=56 participants between 20-60 years with +ve FAIR test with mild to moderate level of disability on Oswestry disability index (ODI) were included in the study. A total of n=53 were divided into two groups, cross friction massage (CFM) group (n=23) and stretching exercises (SE) group (n=24) and n=47 participants received intervention. (Figure 1) Participants with diagnosis of lumbar sacral disk herniations, hip and sacroiliac osteoarthritis were excluded from the study.

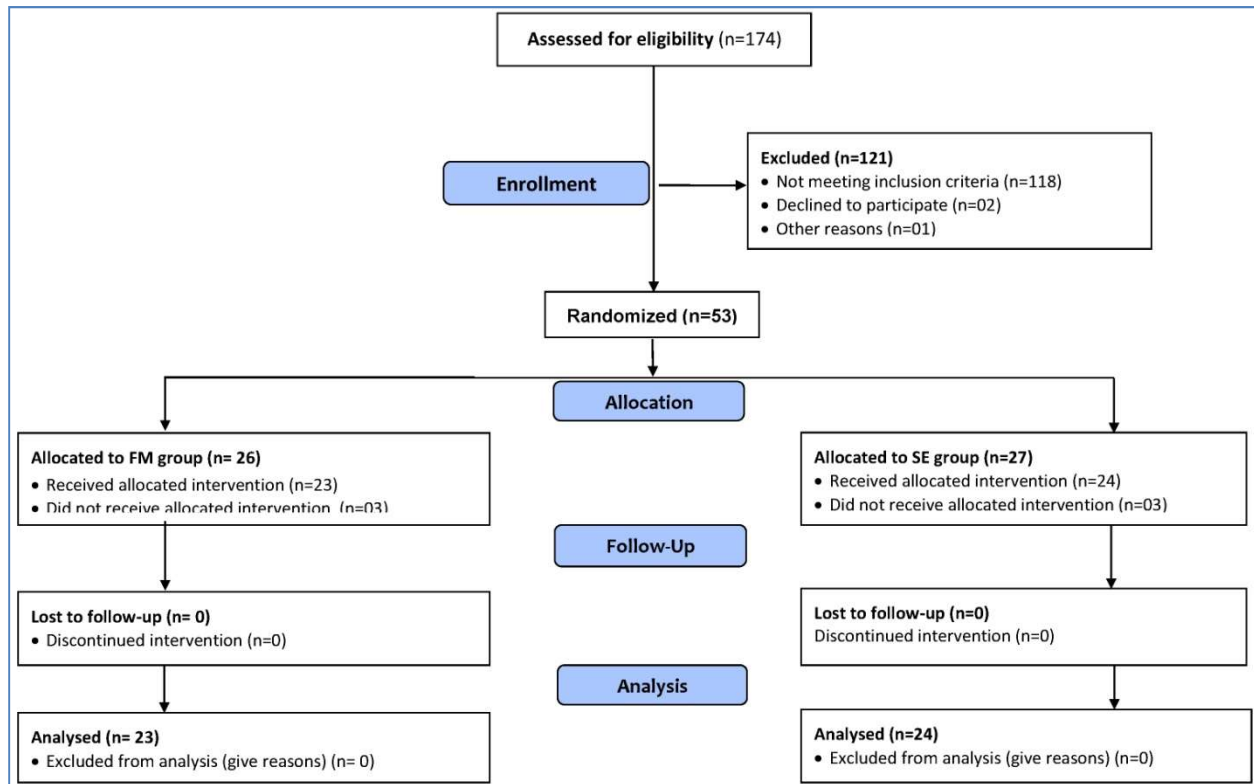


Figure 1: CONSORT diagram

Patients of both groups were given physiotherapy sessions in outpatient department and they were guided for regular follow up visits. After taking informed consent from the study participant’s demographic data was collected in term of age, gender, height, weight, BMI, sitting and standing duration. Each participant was evaluated for symptoms of piriformis syndrome on Oswestry

Disability Index (ODI). The both CFM and SE groups received hot pack at gluteal region for 15 minutes along with stretching of hamstring muscle for 10 seconds and 10 repetitions per session. Additional detail of treatment protocol is given in table 1. After the completion of 3 weeks of management final data was obtain by ODI.

Table 1: Intervention Protocol

	CFM Group	SE Group
Frequency of sessions	3 days/week for 3 weeks	3 days/week for 3 weeks
Repetitions of technique in each session	10 Repetition/per session	10 Repetition/per session
Duration of each technique	10 sec	30 sec

The data was normally distributed on the basis of Shapiro–Wilk test. Paired samples t-test was used to analyze with-in group changes in both groups and independent t-test was use to compare the effects of both rehabilitation protocols on the symptoms of piriformis syndrome. The data was analyzed through SPSS 20 and level of significance was set at $p \leq 0.05$.

RESULTS

The mean age of study participants in both groups was 37.62 ± 8.97 . A total of $n=26$ females and remaining $n=21$ were male divided in friction massage (CFM) group ($n=14$ females & $n=9$ males) and stretching exercises (SE) group ($n=12$ female & $n=12$ male). It was found that $n=18$ were obese ($n=10$ CFM & $n=8$ SE), $n=17$ were overweight ($n=8$ CFM & $n=9$ SE) and $n=12$ were normal ($n=5$ CFM & $n=7$ SE).

Table 2: Demographic characteristics - (CFM Group $n=23$, SE Group $n=24$)

	Groups	Mean	SD	p-value
Age	CFM	39.65	6.54	0.12
	SE	35.67	10.58	
Height (Feet)	CFM	5.47	0.29	0.61
	SE	5.52	0.27	
Weight (Kg)	CFM	77.60	9.02	0.60
	SE	76.04	11.61	
BMI	CFM	27.95	3.85	0.45
	SE	27.10	3.85	
Sitting (hr/day)	CFM	5.69	2.49	0.30
	SE	5.00	2.08	
Standing (hr/day)	CFM	3.52	2.21	0.86
	SE	3.62	1.92	

Within the group changes showed that overall pre & post changes of CFM GROUP showed significant improvement (25.34 ± 4.55 ver. 7.08 ± 2.74 , $p < 0.001$) in overall mean score of ODI. The SE group also showed significant improvement (28.62 ± 6.90 ver. 13.29 ± 7.66 , $p < 0.001$) in the overall mean score of ODI. The detail with-in group changes in individual items of ODI were presented in table 3.

After completion of rehabilitation of piriformis syndrome, between-group changes showed significant difference in overall ODI of CFM group & SE group (7.08 ± 2.74 ver. 13.27 , $p < 0.001$). But individual item of ODI including lifting (1.13 ± 0.91 ver. 1.58 ± 0.97 , $p = 0.10$), standing (1.08 ± 1.23 ver. 1.50 ± 1.31 , $p = 0.27$) and sleeping 0.65 ± 0.93 ver. 1.20 ± 1.21 , $p = 0.08$) did not showed significant

difference in both groups (table 4). The results showed that mostly study participant were improved from moderate to mild disability on ODI. (Figure 2)

Table 3: Within –Group Changes (CFM Group $n=23$, SE Group $n=24$)

		CFM Group			SE Group		
		Mean	SD	p-value	Mean	SD	p-value
Pain Intensity	Pre	2.91	1.20	<0.001	2.96	1.51	<0.001
	Post	0.91	0.59		1.46	0.77	
Personal Care	Pre	2.26	1.00	<0.001	2.66	1.09	<0.001
	Post	0.52	0.59		1.16	1.00	
Lifting	Pre	3.21	1.24	<0.001	3.33	1.20	<0.001
	Post	1.13	0.91		1.58	0.97	
Walking	Pre	2.60	0.72	<0.001	2.95	0.90	<0.001
	Post	0.65	0.64		1.25	0.94	
Sitting	Pre	2.52	1.08	<0.001	2.79	0.88	<0.001
	Post	0.60	0.65		1.29	0.85	
Standing	Pre	2.56	1.34	<0.001	2.83	1.37	<0.001
	Post	1.08	1.23		1.50	1.31	
Sleep	Pre	2.17	1.26	<0.001	2.79	1.50	<0.001
	Post	0.65	0.93		1.20	1.21	
Social	Pre	2.39	0.49	<0.001	2.75	0.89	<0.001
	Post	0.39	0.58		1.33	0.81	
Travelling	Pre	2.30	0.63	<0.001	2.70	1.26	<0.001
	Post	0.52	0.59		1.08	1.13	
Employment	Pre	2.39	0.94	<0.001	2.83	1.12	<0.001
	Post	0.60	0.58		1.41	1.01	
Total Score	Pre	25.34	4.55	<0.001	28.62	6.90	<0.001
	Post	7.08	2.74		13.29	7.66	

Table 4: Between Group Comparison (CFM Group $n=23$, SE Group $n=24$)

		CFM Group			SE Group		
		Mean	SD	p-value	Mean	SD	p-value
Pain Intensity	Pre	2.91	1.20	<0.001	2.96	1.51	<0.001
	Post	0.91	0.59		1.46	0.77	
Personal Care	Pre	2.26	1.00	<0.001	2.66	1.09	<0.001
	Post	0.52	0.59		1.16	1.00	
Lifting	Pre	3.21	1.24	<0.001	3.33	1.20	<0.001
	Post	1.13	0.91		1.58	0.97	
Walking	Pre	2.60	0.72	<0.001	2.95	0.90	<0.001
	Post	0.65	0.64		1.25	0.94	
Sitting	Pre	2.52	1.08	<0.001	2.79	0.88	<0.001
	Post	0.60	0.65		1.29	0.85	
Standing	Pre	2.56	1.34	<0.001	2.83	1.37	<0.001
	Post	1.08	1.23		1.50	1.31	
Sleep	Pre	2.17	1.26	<0.001	2.79	1.50	<0.001
	Post	0.65	0.93		1.20	1.21	
Social	Pre	2.39	0.49	<0.001	2.75	0.89	<0.001
	Post	0.39	0.58		1.33	0.81	
Travelling	Pre	2.30	0.63	<0.001	2.70	1.26	<0.001
	Post	0.52	0.59		1.08	1.13	
Employment	Pre	2.39	0.94	<0.001	2.83	1.12	<0.001
	Post	0.60	0.58		1.41	1.01	
Total Score	Pre	25.34	4.55	<0.001	28.62	6.90	<0.001
	Post	7.08	2.74		13.29	7.66	

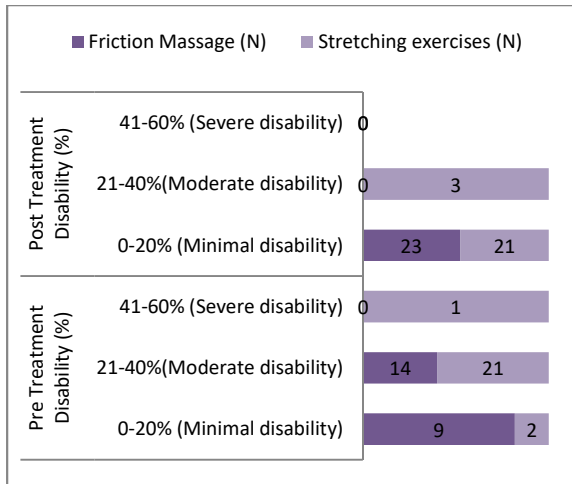


Figure 2: Frequency distribution of change in Pre & Post disability level of study participants

DISCUSSION

The objective of the study was to compare the effects of stretching exercises and friction massage in relieving symptoms associated with piriformis syndrome. The results of the study showed that stretching exercises and friction massage both showed significant effects on symptoms of piriformis syndrome but friction massage is more effective than stretching.

Treatment options for piriformis syndrome focus around the subjective and objective findings of the assessment. A manual medicine approach have also supported the use of muscle stretches and soft tissue, techniques for somatic dysfunctions in the patient with piriformis syndrome.^{5,6}

Indirect osteopathic manipulative techniques like counter-strain and facilitated positional release also remove tension from the piriformis and relieve the symptoms.⁵ The muscle energy technique can also be applied in the management of piriformis spasm. In another study diverse stretching methods were used to reduce piriformis thickness and increase in coxal articulation and all methods were effective to reduce symptoms.¹¹

Cross friction massage helps in reducing inflammation, releasing scar tissue, reduces muscle spasm and enhances flow of blood.⁹ Cross fiber friction provides movement to the tissue itself and produces traumatic hyperemia. The gentle passive movements move the structure but do not detach

the healing fibrils. The transverse movement maintains normal mobility by broadening but not stretching or tearing the healing fibers thus movement encourages realignment and lengthening. Traumatic hyperemia, results in the increased blood supply to the area and decrease pain by increasing the speed of destruction of Lewis' P substance.¹² According to Kirschner et al. piriformis stretching relaxes the tight piriformis muscle, thereby relieving sciatic nerve compression and improving the symptoms.¹³

Stretching improves physical performance ability, prevents injury, reduces muscle pain, and increases flexibility.^{10,13} Stretching generally focuses on increasing the length of a musculotendinous unit and muscle tension is usually inversely related to length: decreased muscular tension is related to increased muscle length, while increased muscular tension is related to decreased muscle length. Inevitably, stretching of muscle applies tension to other structures such as the joint capsule and fascia, which are made up of different tissue than muscle with different biomechanical properties. Thus by increase in length and decrease in tension of piriformis muscle it relieved pressure on sciatic nerve and symptoms improved.¹⁴

Piriformis syndrome causes disability related to daily activities. In present study 9 patients were in crippling pain and 13 in severe disability according to oswestry disability index and by treatment disability level reduced in both groups but more in Group A according to the mean difference of total disability score pre and post treatment. Overall disability level changed from moderate disability to minimal disability.

A case study done by Awan et al. reported that deep soft tissue mobilization techniques improved the symptoms of piriformis syndrome by reducing compression of the sciatic nerve by surrounding muscles. Transfer fibre frictions were applied for several minutes at the tenoperiosteal junctions and sacrum attachments of the piriformis, as well as the gluteus maximus and minimus attachments. In the same study In conjunction with deep soft tissue mobilization techniques, stretching exercises of

the involved muscle and postural awareness were also effective for reducing pain frequency.¹⁵

Choi and Yoo¹⁰ applied muscle energy technique (MET) to women in their twenties who complained about buttock and lower extremity pain due to piriform muscle syndrome and reported that pain decreased from 4 points to 2 points and the passive flexion angle of the coxal articulation increased from 90° to 120°. In one study Hashemirad et al. applied taping to the trigger point of the piriformis muscle in a stretched position and reported that pain decreased from 6.5 points to 3.9 points and the medial rotation angle increased from 39.5° to 46.2°.¹⁶

Although Improvement by massage is more due to the fact that it improves healing process along with realignment and lengthening of fibres and also by increase in blood supply which directly relieve the pain rather than stretching which focuses only on lengthening the muscle and indirectly decreasing the tension of muscle.

It is evident that demographic data must be noted properly i.e age, gender, BMI, weight, occupation. No of standing and sitting hours because according to the results and literature review they affect the results.

CONCLUSION

The study indicated that cross friction massage (CFM) and stretching exercises (SE) both are significantly improved symptoms of piriformis syndrome. But cross friction massage is more effective in reducing pain and improving functional abilities in patients with piriformis syndrome as compare to stretching exercises.

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ORIGINAL ARTICLE

LEVEL OF PHYSICAL ACTIVITY IN ELDERLY POPULATION OF RAWALPINDI-ISLAMABAD

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Ramsha Sohail¹: Analysis & interpretation of data, writing; Revised and Accountable for all aspects

Abdul Haseeb Bhutta²: Analysis & interpretation of data, writing; Revised and Accountable for all aspects

Nayab Asif³: Writing; Revised and Accountable for all aspects

Qurat Ul Ain⁴: Writing; Revised and Accountable for all aspects

ABSTRACT

Objective: To find out the level of physical activity in elderly population. **Methods:** a cross-sectional survey was conducted in Rawalpindi and Islamabad. The sample size of the study was n=165 elders who fulfill the inclusion criteria were included in the study. Non-probability convenience sampling was used in order to collect data from the respondents. To explore physical activity Rapid Assessment of Physical Activity (RAPA) questionnaire was filled by the respondents. The results of study are presented as frequency, percentages; mean±SD. SPSS ver. 21 was used for data analysis. **Results:** A total of 26(15.76%) elderly population were sedentary, 24(14.55%) were under active-perform light to moderate activities but not every week, 58(35.15%) were under active, 31(18.79%) were also under active and perform moderate physical activities every week, 21(12.73%) were active and perform moderate physical activities >30 minutes/day, 5 or more days a week and only 2(1.21%) were active and perform vigorous physical activities >20 minutes/day, 3 or more days a week. **Conclusion:** The result indicates that majority of geriatric population was under active. The elderly population who had sedentary lifestyle and who were active had the same prevalence.

Keywords: Elderly population, physical activity, sedentary

INTRODUCTION

Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities.¹ Planned, structured, and repetitive physical activity has a final or an intermediate objective the improvement or maintenance of physical fitness. To sustain life every individual performs physical activity but the amount of physical activity they perform depends on their personal choice.²

Many diseases are associated with the increasing age. Increasing elderly population is defined as the chronological age of 65 years or older.³ Symptoms of aging can be slow down by the active life style. Increased level of physical activity leads to lower self-reported prevalence of urinary incontinence in the community.⁴ Severe incontinence leads to the reduced activity and socially isolated person. Reduced socialism has the impact on the expectancy of life of the increasing aged population.⁵

Physical activity prevents the development of the chronic diseases and reduces the risk of death. Physical activity improves the quality of life of an individual.⁶ Researchers have proven that there increased level of physical activity and exercise participation is directly proportional to improved health. In a study, it was reported that 3.2 million

deaths per year are because of inactivity. Even in developed countries where the life expectancy of people is long, low level of physical activity leads to development of chronic health conditions.⁷

To maintain a healthy lifestyle exercising at least 5 days of week at moderate to vigorous level is important.¹⁵⁻⁶ Exercising includes both aerobic activity and strength training. In elderly population, only few of them maintain the required level of physical activity that accompanies health improvement. To increase the level of physical activity in elderly population is a challenge for health professionals as they should have sufficient knowledge to prescribe adequate amount of physical activity to the elderly patients so they can improve their quality of life.⁸

Motivating the elderly population to perform more physical activity and maintain it over their lifetime is a true challenge in our society.⁹ Some success in this has been reported when physicians have given specific, detailed and localised information to their patients, but more high quality research is needed to continue to address this issue of non-participation in physical activity and exercise of a high enough level to ensure health benefits. Maintaining desired level of physical activity in elderly population also improves their cognitive deficits.^{9,10}



In elderly population, the greater concern is their capacity to carry out activities of daily living than the disease prevention. The quality of life and life expectancy of elders who live in a dependent state is low. Increased life expectancy along with functional independency is directly related to level of physical activity.¹¹

The purpose of this study was to explore the level of physical activity in elderly population of Rawalpindi Islamabad

MATERIAL & METHODS

A cross-sectional survey was conducted in Rawalpindi and Islamabad. The sample size of the study was n=165 from elderly population whose age according to our setting was ≥ 55 years. The elderly population with prostate cancer, neurological disease, kidney problem and diagnosed case of knee & hip osteoarthritis and sciatica were excluded from the study. Non-probability convenience sampling was used in order to collect data from the respondents. To explore physical activity Rapid Assessment of Physical Activity (RAPA) questionnaire was filled by the respondents. RAPA is a questionnaire designed to assess the level of physical activity in individuals which in our research is used to assess the level of physical activity in elderly population. The study has cross-sectional aspects and results of study are presented as frequency, percentages; mean \pm SD. SPSS ver. 21 was used for data analysis.

RESULTS

The total numbers of study participants n=165. The minimum age of subjects was 50 years and maximum was 91 years. The mean \pm SD age of subjects was 63.40 ± 8.85 years, and BMI was 25.32 ± 4.12 kg/m². (table 1)

A total of 26(15.76%) elderly population were sedentary, 24(14.55%) were under active-perform light to moderate activities but not every week.

Table 1: Characteristics of study participants (n=165)

	N(%)	
Gender	Male	94(57.0)
	Female	71(43.0)
BMI Category	<18 (Underweight)	4(2.4)
	18.5-24.9 (Healthy weight)	79(47.9)
	25-30 (Overweight)	65(39.4)
	30-35 (Obese)	17(10.3)
Area	Rural	85(51.5)
	Urban	80(48.5)
Comorbidities	No	92(55.8)
	Diabetes	24(14.5)
	HTN	27(16.4)
	Constipation	4(2.4)
	HTN+Diabetes	15(9.1)
	HTN+Constipation	2(1.2)
Smoking	HTN+Anemic	1(.6)
	Yes	32(19.4)
	No	133(80.6)

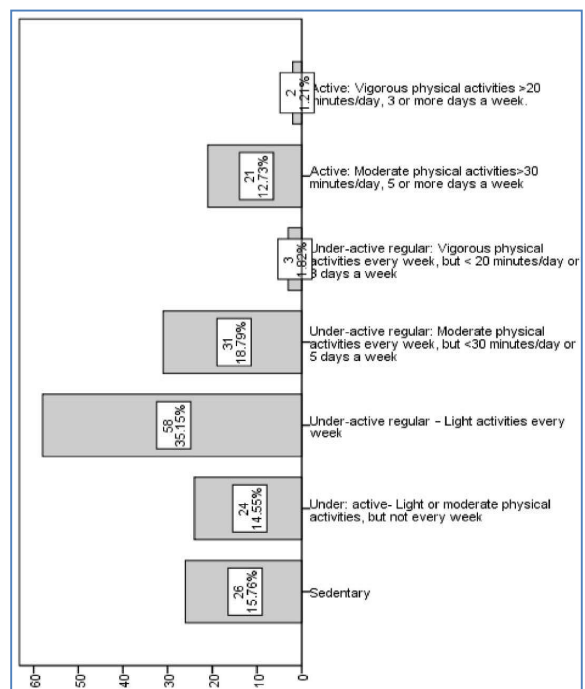


Figure 1: Physical Activity (Aerobics)

A total of 58(35.15%) were under active and perform light activities every week. A total of 31(18.79%) were also under active and perform moderate physical activities every week but <30 minutes/day or <5 days/week. A total of 3(1.82%) were under active and perform vigorous physical activities every week, but <20 minutes/day or 3 days a week. A total 21(12.73%) were active and perform moderate

physical activities >30 minutes/day, 5 or more days a week and only 2 (1.21%) were active and perform

vigorous physical activities >20 minutes/day, 3 or more days a week. (Figure 1)

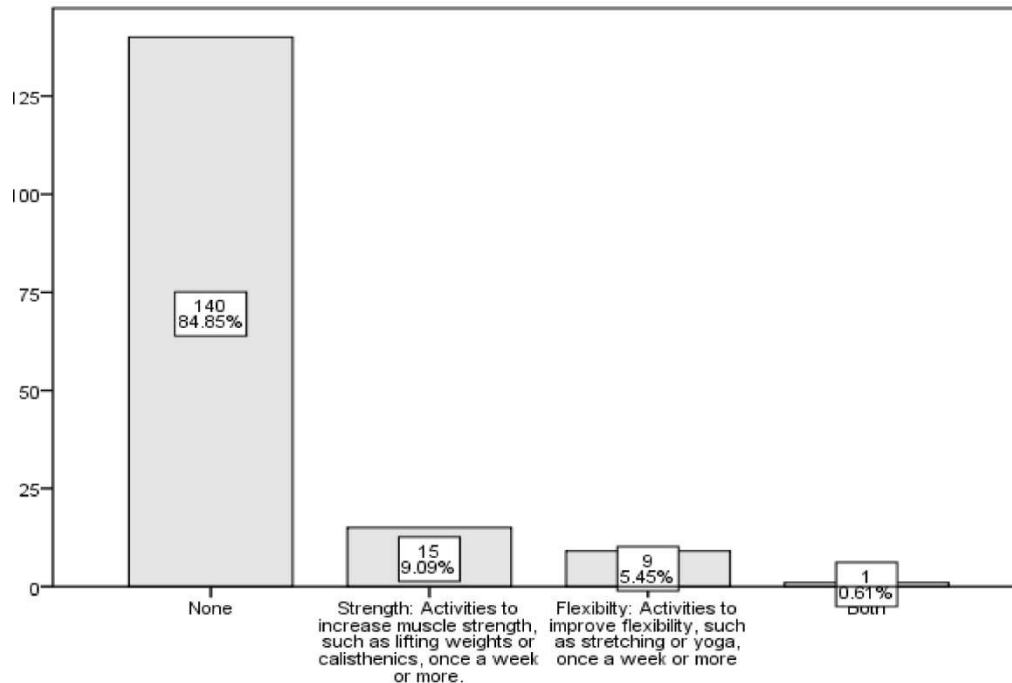


Figure 2: Physical Activity (Strength & Flexibility)

According to results a total of 15 (9.09%) perform activities to increase muscle strength and 9 (5.45%) perform activities improve muscle flexibility once a week or more. (Figure 2).

DISCUSSION

The aim of the study was to find level of physical activity in elderly population. The results of the study indicated that a small portion of the elderly population is engaged in appropriate level of physical activity and most of the portion is sedentary having little or no physical activity in their daily life leading them towards poor physical health. Elderly population is more involved in sedentary lifestyle, not even performing their activity of daily living which further reduces their level of activity and quality of life.¹² Engaging elders into activity is a challenge to health professional as finding ways to motivate them to increase level of physical activity is difficult.¹³

Healthy aging requires regular participation in physical activity.¹⁴ The individuals involved in regular physical activity show positive health outcomes including better mood states, improved health related quality of life.¹⁵ Researchers have shown that better health is associated with physical activity. Elderly population is at risk of developing chronic

health conditions that physical activity could prevent¹⁶ but in current study most elderly population was underactive and engaged in the moderate activity level of physical activity.

The incident of heart diseases such as coronary heart disease is higher in elders with lower fitness level. Fitness or Adequate exercise has a strong inverse relationship with mortality. Obesity in elderly population is also a major cause of mortality which can be reduced by performing physical activity.¹⁷ As exercise helps in reducing weight and blood pressure. It also reduces level of bad cholesterol from blood and increases good cholesterol. Diabetic patients with regular exercise favorably affect the ability of body to utilize insulin and control blood glucose level. Although exercise effect on a single risk factor is small but if the effect of moderate continued on overall cardiovascular risk is combined with life style modification can be outstanding.^{4,16} in current study mostly participants were diabetic and hypertensive.

In one of the research conducted in 2007, the expert panel after recommendations from the American College of Sports and Medicine (ACSM) and the American Heart Association (AHA) concluded that physical activity in elder adults should emphasize on aerobic activity that were in moderate intensity and also emphasize on the risk management by reducing sedentary behaviour.¹⁸ Through our results it was concluded too that those who were engaged in light activity weekly had the low incidences of age related problems and had healthy life.¹⁰ Physical activity including aerobic exercise in older age reduces the risk of functional limitation and disability. Moderate level of physical activity is effective and produces significant outcomes.¹¹

According to the results of the research done by Med Science and Sports medicine, older population had the capacity to adapt to increased level of physical activity. From their results it was also concluded that lower intensity aerobic activities had more impact on older population rather than high intensity aerobic training. And they also stated that regular exercise had the positive impact on the population.¹⁸ Elderly population has greater concern with their capacity to carry out activities of daily living than the disease prevention. Elderly population who are dependent on someone has low life expectancy and poor quality of life and who live alone or do their own work are healthier than the ones who are dependent for their ADLs on others. Increased life expectancy along with functional independency is directly related to level of physical activity and those engage in the light weekly activity had less complication and better quality of life.^{11,18}

A research was conducted on physical activity in aging, changes in patterns and their relationships to health and functions, reported that a large number from generally older population had no activity and had sedentary lifestyle. Through our research findings, it is also evident that many of older population had sedentary lifestyle and some from many were engaged in the light physical activity.¹⁹ Greater physical activity predicts higher functional status in older age. Moderate to high level of activity is effective. Many studies suggests that moderate amount of physical activity is associated with

improved health and reduced risks of morbidity and mortality when compared to sedentary lifestyle in older age. Physical activity recommendations should be to encourage the most sedentary elderly population to become at least moderately active.²⁰

The current study was conducted on elderly population without musculoskeletal or joint problem that may be reason of some kind of physical activity as these problems contribute in no or very low physical activity. Generalizability of the study is also limited by small sample size and sample from Rawalpindi-Islamabad.

CONCLUSION

The result indicates that majority of geriatric population was under active. But prevalence of sedentary and active life style in geriatric population was almost same. The author suggests an analytical study to further investigate the factor contributing in physical activity with larger sample size.

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RESEARCH ARTICLE

EFFECTIVENESS OF GRADED MOTOR IMAGERY IN PAIN AND DISABILITY AFTER ROTATOR CUFF INJURY

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ABSTRACT

Objective: to determine the effects of graded motor imagery (GMI) on pain and disability in rotator cuff injuries. **Methodology:** A Randomized Control Trial conducted at national institute of rehabilitation medicine (NIRM) after the approval from the executive director. A total n=40 subjects were recruited through non probability convenient sampling technique and allocated randomly in the Conventional physical therapy (CPT) (n=20) and the graded motor imagery (GMI) group (n=20). Patients with age range 25-50 years having history of trauma with positive impingement sign were included and patient with diabetes were excluded from the study. The data was collected through General demographic questionnaire included age, gender, ADLs, Diabetes, Hyper tension etc. Shoulder Pain and Disability Index (SPADI) was used to measure current shoulder pain and disability in an outpatient setting. Data was compared at baseline and after 2nd week and 4th week. **Results:** The mean age of the study participants was 38.67±7.437 years. Within-group changes showed that both group improved significantly (p<0.05) from 0-4th week regarding total shoulder pain and disability score. While comparing the both groups, significant improvement (p<0.05) was found in as compare to conventional PT group. **Conclusion:** graded motor imagery (GMI) and conventional PT both are effective for management of pain and disability due to rotator cuff injuries. But GMI was found to be more effective than conventional PT.

Keyword: rotator cuff injury, graded motor imagery, pain, disability, phantom limb pain.

INTRODUCTION

The Glenohumeral joint is one of the strongest and mobile ball and socket complex joint and it is supported by static and dynamic components of Musculotendinous cuff and the scapular stabilizers muscles.¹ Musculotendinous/Rotator cuff injuries are most common cause of pain in shoulder area.² Repetitive overhead activities, trauma to shoulder joint leads to massive tear or tendinitis of rotator cuff muscles. Repetitive overhead activities or trauma or gradual onset is associated with the rotator cuff injuries^{3,4}

Pain in rotator cuff injuries is most common symptom, it may be aggravated by overhead activities or a forward-flexed position which is associated with weakness and limitation of motion presented with clicking, catching, stiffness, and crepitus.^{5,6} The severity of injury determine the treatment option, as Complete full thickness tears require surgery followed by rehabilitation and minor breadth tears can be preserved with physical therapy^{7,8}

According to recent suggestion the neuromatrix model codes pain characters allowing for mental, passionate, and sensory dimensions. So it offers specific rehab strategy that addresses all these dimensions.⁹

Graded motor imagery (GMI) it is very good method in pain management that organizes cortical activation and gradually decreases cortical disinhibition to prevent from acute pain to chronic pain.¹⁰ Graded motor imagery process from innovation of improved sensory cortex organization to targeted sensory discrimination exercise for clinical benefit has been frequent in complex regional pain syndrome (CRPS). Without eliciting the protective response of pain graded motor imagery slowly involve cortical motor networks. excessively complex nociception system and the interrupted cortical mechanisms is only provided by graded motor imagery.^{11,12}

Graded motor imager (GMI) uses have 3 sequential stages for application. left & right judgment which activates premotor cortex without activating primary motor areas is the first stage of graded motor

imagery. Fictional movements which trigger motor cortical parts similar to those activated in actual accomplishment of movement is the second stage of graded motor imagery. Mirror therapy triggers not only motor cortex but also provides a strong visual input to the cortex in the third or final stage of graded motor imagery, though activation for each stage of GMI have been supported by brain imaging in healthy subjects.^{12,13,14} It has been shown that treatment methods like visualization approach reduces pain at early stage and motor imagery with proprioception and visualization takes part the same neural mechanisms.^{15,16}

Positive effects of motor imagery technique on motor effects and learning in athletes, healthy people as well as people with neurological conditions have many evidences (e.g., stroke, spinal cord injury, Parkinson disease) has been published. But evidence for effective treatment of rotator cuff retraining and rehabilitation with graded motor imagery is limited. Graded motor imagery is the psychological representation of attention doing movement of a part of body, without actually moving that part. Because of this, it was intended to conclude the effects of graded motor imagery (GMI) on pain and disability in rotator cuff injuries.

MATERIAL & METHODS

A Randomized Control Trial conducted at national institute of rehabilitation medicine (NIRM) after the approval from the executive director. A total n=40 subjects were recruited through non probability convenient sampling technique and allocated randomly in the Conventional physical therapy (CPT) (n=20) and the graded motor imagery (GMI) group (n=20) through lottery method. (Figure 1) The duration of the study was 1 year from June 2016 – June 2017. Patients with age range 25-50 years having history of trauma with positive impingement sign were included and patient with diabetes were excluded from the study.

The conventional PT group received total 8 sessions (twice a week for four weeks). Dry Heating pack applied on the shoulder at the start of treatment in side lying position for 15 mins as tolerable. After that Interferential Current Therapy was applied for 10

minutes with 90-130 MHZ frequency. At the end of session therapeutic exercises were incorporated for shoulder joint. Those are passive & active shoulder flexion extension, abduction, adduction and circumduction with and without Thera band. Each exercise was repeated 10-15 times for 3sets. These exercises were also part of home exercise plan in both groups.

The GMI Group was briefed doing three sessions for **left and right discrimination** in first week. In the left right discrimination step patient sound and painful shoulders were used. The shoulder images were displayed using multimedia on a power point presentation. The next week three sessions for **explicit motor imagery** was conducted in a relaxing environment and maintained temperature. The patients were instructed to calm down, lay on their couch close their eyes, inhale and exhale air deeply and focus on the words from physiotherapist. Physiotherapist made the GMI Group Increase their motor imagery experience with warmth, breezes, textures, smells, sounds, the weight of patients own limb, the space around them, the touch of their clothes, their environment was according to their occupations and routine life style. A total six **mirror therapy** was conducted for last two weeks. For treatment purposes physiotherapist chose to use a shoulder as the subject inside the box using a larger mirror box. The patients were made sit comfortably with the involved shoulder in the box, keeping it hidden from view. Depending on the pain and disability state, the on an appropriate activities were performed by the therapist doing same movements sitting opposite to the patient guiding verbally and with actions. After the patient conquered the movement the next progression to a more challenging movement was done by the patient. Overall, all the patients had to repeat movements under therapist's guidance which she accordingly graded from easy to more difficult. Therapist than enriched the movements with different contexts.

The data was collected through General statistical demographic questionnaire included age, gender, ADLs, Diabetes, hypertension etc. Ongoing shoulder pain and disability were measured in an outpatient

setting through Shoulder pain and disability index (SPADI). After second week and fourth week Data was compared at standard.

The data was not normally distributed at standard presented through Shapiro–Wilk test, that's why non parametric tests were applied. The results were presented as frequency, percentages, mean±SD,

median (IQR), correlation coefficients and p-values. Different tests were used so that Mann Whitney U-test was used for between-group comparison and Friedman Test and Wilcoxon Signed-Rank Test with post hoc analysis was used for within-group changes. Significance level was set at a $p\text{-value}<0.05$. SPSS 21 was used to analyze the data.

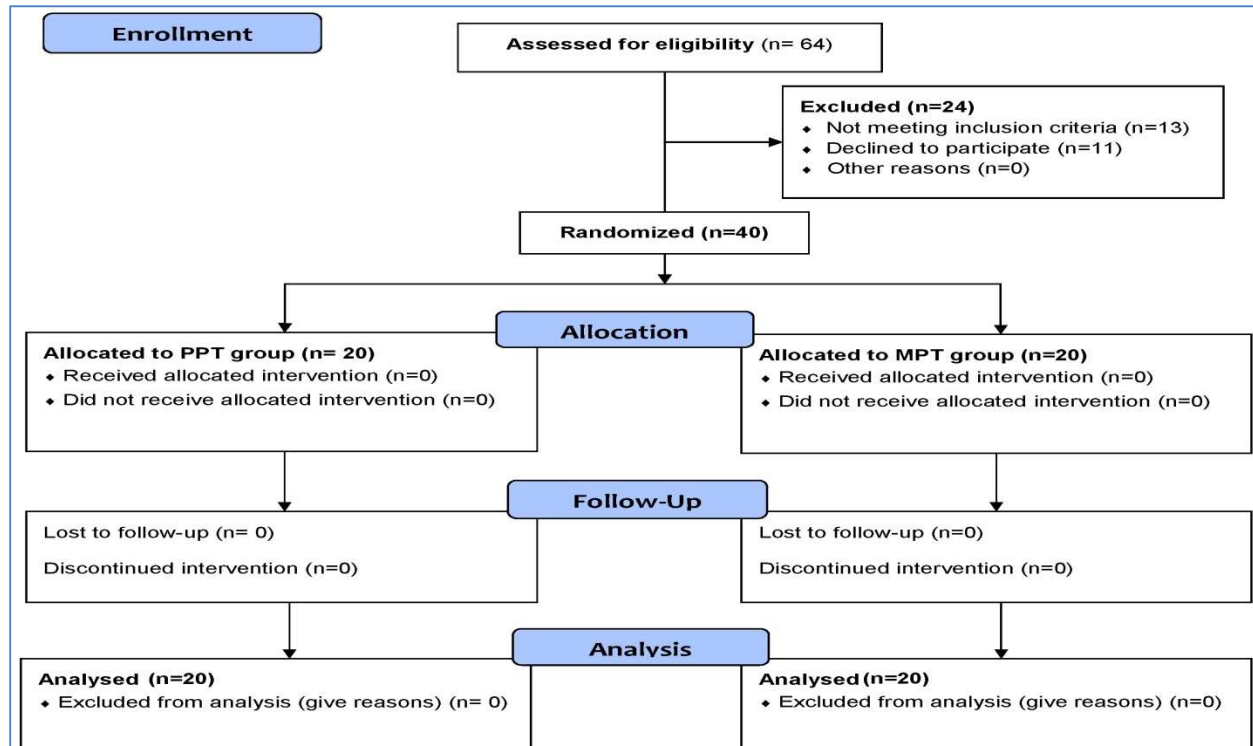


Figure 1: CONSORT diagram

RESULTS

The mean age of participants was 38.67 ± 7.437 years. A total of $n=26$ males and $n=14$ female participated in the study. The distribution of different physical activity life styles in current patients, $n=18$ (45%) patients had low physical activity, 8 (20%) had moderate while 14 (35%) patients had high physical activity. A total of $n=9$ (22%) participants were having a desk job, 18 (45%) having a field job and 13 (33%) having a job involving heavy physical activity. While there were 8 (20%) patients belong to the 25-30 years' age group, 5 (12%) patients belonging to the 30-35 years' age group, 8 (20%) patients from the 35-40 years' category, and 11 (28%) patients from the 40-45 years' category and 8 (20%) patients from the 45-50 years' category.

Within-group changes showed that both group improved significantly ($p \leq 0.05$) from 0-4th week regarding total shoulder pain and disability score. The detail of within-group changes in respect of individual items in both can be seen in table 1. While comparing the both groups, significant improvement was found in severity of pain of GMI group as compare to conventional group. {3(2) ver. 4(3), $p=0.020$ }. Pain when lying on involved side {6(1.75) ver. 4(2), $p=0.012$ } and difficulty in pulling over undershirt {6(2.50) ver. 4(2.75), $p<0.0011$ } also significantly improved in GMI group as compare to conventional PT last two weeks. The difficulty while placing an object on high shelf significantly reduced in GMI group as compare to conventional group in initial two weeks {6(1.75) ver. 4(2), $p=0.012$ }. the total score of SPADI also showed that GMI group significantly ($p \leq 0.05$) better score as compare to

conventional group in last two weeks. The table 2 shows detail of remaining items.

Table 1: Within-group changes (SPADI)

SPADI		Conventional group (n=20)			GMI group (n=20)		
		Median(IQR)	Z-score	p-value	Median(IQR)	Z-score	p-value
How severe is pain at worst?	0 week	7(1)	-3.271	<0.001	6(2.75)	-1.892	.058
	2 nd week	6(1.75)	-1.807	.071	5(2.75)	-3.197	<0.001
	4 th week	5(1.75)	-3.619	<0.001	4(2.75)	-3.841	<0.001
When lying on the involved side?	0 week	7(2)	-2.549	.011	6(1)	-3.436	<0.001
	2 nd week	6(1.75)	-2.075	.038	4(2)	-6.472	.517
	4 th week	4(2.75)	-3.691	<0.001	4(2.75)	-3.547	<0.001
Reaching for something on a high shelf?	0 week	7(4)	-3.491	<0.001	6(1.75)	-3.239	<0.001
	2 nd week	5(3)	-1.803	.071	4(2.75)	-1.782	.075
	4 th week	4(2)	-3.947	<0.001	4(2)	-3.682	<0.001
Touching the back of your neck?	0 week	6(2)	-1.955	.051	7(3)	-2.289	.022
	2 nd week	5(3)	-1.375	.169	5(2.75)	-2.177	.030
	4 th week	4(3)	-3.021	<0.001	3(2)	-3.455	<0.001
Pushing with the involved arm?	0 week	6(3)	-2.723	<0.001	7(2)	-3.127	<0.001
	2 nd week	5(2)	-2.382	.017	5(2)	-3.0014	<0.001
	4 th week	3(2)	-3.568	<0.001	3(1.75)	-3.847	<0.001
How much difficulty you have in Washing your back?	0 week	7(2.75)	-2.676	<0.001	6(1)	-1.853	.064
	2 nd week	5(1.75)	-1.908	.056	5(2.75)	-2.503	.012
	4 th week	4(2)	-3.052	<0.001	4(2.75)	-2.875	<0.001
Washing your hair?	0 week	7(2)	-2.210	.027	6(3)	-2.609	<0.001
	2 nd week	6(2)	-2.448	.014	5(2.75)	-1.480	.139
	4 th week	4(1.75)	-3.767	<0.001	4(2)	-3.479	<0.001
Putting on an undershirt or pullover sweater?	0 week	6(2)	-.888	.375	7(1)	-3.652	<0.001
	2 nd week	6(2.50)	-2.692	<0.001	4(2.75)	-.519	.604
	4 th week	4(2.75)	-3.289	<0.001	3(2.75)	-3.646	<0.001
Putting on a shirt that buttons down the front?	0 week	6(3)	-2.653	<0.001	6(3)	-2.597	<0.001
	2 nd week	5(3.75)	-2.159	.031	5(3.75)	-2.619	<0.001
	4 th week	4(2)	-3.475	<0.001	4(1.75)	-3.841	<0.001
Putting on your pants?	0 week	6(3)	-2.084	.037	7(1.75)	-2.415	.016
	2 nd week	4(2)	-.407	.684	5(3)	-2.917	<0.001
	4 th week	4(2)	-2.164	.030	4(2.75)	-3.736	<0.001
Placing an object on a high shelf?	0 week	5(2)	-0.477	.633	7(1)	-3.257	<0.001
	2 nd week	5(3.75)	-1.833	.060	4(2)	-2.099	.036
	4 th week	4(1.75)	-3.324	<0.001	4(3)	-3.741	<0.001
Carrying a heavy object of 10 pounds?	0 week	7(2)	-2.860	<0.001	7(2)	-3.358	<0.001
	2 nd week	4(2.75)	-2.519	.012	4(3)	-1.556	.120
	4 th week	3(2.75)	-3.587	<0.001	4(3)	-3.635	<0.001
Removing something from your back pocket?	0 week	6(2)	-1.838	.066	7(1.75)	-2.721	<0.001
	2 nd week	5(2.5)	-1.602	.109	5(3)	-2.032	.042
	4 th week	4(3.75)	-2.635	<0.001	5(3)	-3.462	<0.001
SPADI total	0 week	85(7)	-3.922	<0.001	84(7.75)	-3.925	<0.001
	2 nd week	66(8.75)	-3.923	<0.001	63(6.75)	-3.926	<0.001
	4 th week	53(7.50)	-3.923	<0.001	47(6.50)	-3.922	<0.001

Table 2: Between group Comparison (SPADI)

		Conventional	GMI	U-stats	p-value
		Median(IQR)	Median(IQR)		
How severe is pain at worst?	0 week	7(1)	6(2.75)	163.5	.311
	2 nd week	6(1.75)	5(2.75)	187.5	.729
	4 th week	4(3)	3(2)	115.5	.020
When lying on the involved side?	0 week	7(2)	6(1)	165	.329
	2 nd week	6(1.75)	4(2)	109	.012
	4 th week	4(2.75)	5(2.75)	164	.322
Reaching for something on a high shelf?	0 week	7(1)	6(1.75)	147.5	.144
	2 nd week	5(3)	5(2.75)	157.5	.240
	4 th week	4(2)	4(2.75)	162.5	.298
Touching the back of your neck?	0 week	6(2)	7(3)	175	.489
	2 nd week	5(3.75)	5(2.75)	197	.934
	4 th week	4(3)	4(2)	184	.654
Pushing with the involved arm?	0 week	6(3)	7(2)	183	.638
	2 nd week	5(2)	5(2)	182.5	.630
	4 th week	3(2)	3(2)	156.5	.225
How much difficulty you have in Washing your back?	0 week	7(2.75)	6(1)	163	.303
	2 nd week	5(1.75)	5(2.75)	180	.577
	4 th week	4(2.75)	3(1.75)	159.5	.264
Washing your hair?	0 week	7(2)	6(3)	165	.327
	2 nd week	6(2)	5(2.75)	157	.238
	4 th week	4(1.75)	4(2.75)	178.5	.552
Putting on an undershirt or pullover sweater?	0 week	6(2)	7(1)	162	.285
	2 nd week	6(2.50)	4(2.75)	98.5	<0.001
	4 th week	4(2.75)	4(2)	196	.912
Putting on a shirt that buttons down the front?	0 week	6(3)	6(2)	195	.889
	2 nd week	5(3.75)	5(3.75)	198.5	.967
	4 th week	4(2)	3(2.75)	164	.317
Putting on your pants?	0 week	6(3)	7(1.75)	182.5	.628
	2 nd week	4(2)	5(3)	165	.335
	4 th week	4(2.75)	4(1.75)	132.5	.062
Placing an object on a high shelf?	0 week	5(2.50)	7(1)	117	.021
	2 nd week	5(3.75)	4(2)	184.5	.670
	4 th week	4(1.75)	4(2.75)	193	.846
Carrying a heavy object of 10 pounds?	0 week	7(2)	7(2)	195.5	.900
	2 nd week	5(2.75)	5(3)	173.5	.465
	4 th week	3(2.75)	4(3)	176.5	.518
Removing something from your back pocket?	0 week	6(2)	7(1.75)	150.5	.169
	2 nd week	5(2.50)	5(3)	195.5	.901
	4 th week	4(3.75)	4(3)	177	.523
SPADI total	0 week	85(7)	84(7.75)	171.5	.439
	2 nd week	66(8.75)	63(6.75)	107.5	.011
	4 th week	53(7.50)	47(6.50)	97.5	<0.001

DISCUSSION

The purpose of this research study was to determine the effectiveness of graded motor imagery (GMI) in

pain and disability after rotator cuff injury. The null hypothesis was rejected as graded motor imagery

(GMI) group showed significant progress in pain and disability score on SPADI as compare to conservative treatment.

Visual-motor imagery anticipated to improve motor behavior according to mental practice. Motor deficits can be rehabilitating by graded motor imagery in several neurological conditions. Balance in individuals with multiple sclerosis and elderly women can also be improved by graded motor imagery. In combination with actual practice, a motor deficit in patients of subacute stroke has been used to rehabilitate through mental practice. It has been reported by various studies that progress in strength, function and use of both upper and lower extremities.^{17,18,19,34}

Motor imagery is associated with the specific activation of the neural circuits involved in the early stage of motor control it has been proved by research and large number of functional neuro imaging studies. The supplementary motor area, the primary motor cortex, the inferior parietal cortex, the basal ganglia, and the cerebellum included in neural circuits. Common neural mechanisms of imagery and motor preparation has strong support by physiological data.^{20,21,22} To reduce the cortical disruption after injury GMI was developed that directly targets the cortex. Focusing attention on the affected limb may cause decline of the limb and chronic pain may result in changes at level of cortex shown by different studies. Reports suggest that pain relief changes the activation of the related neuromotor networks.^{17,23}

The effectiveness of graded motor imagery on pain or function has been studied in several studies.^{24,25,35} Effectiveness of the motor imagery trainings and the mirror therapy in patients with chronic complex regional pain syndrome (CRPS) was compered by Moseley GL and pain and edema was found reduced in motor imagery subjects.²⁴ Moseley GL in his study done in 2004 reported that GMI resulted in decrease in Neuropathic pain ($p < 0.01$) in patients of complex regional pain syndrome (CRPS) with replicated results in the cross over control group. The study concluded that there is cortical involvement in the development of CPRS and GMI is an effective modality for its treatment.³⁵ These results can be

compared to the results of current study where the mean SPADI score in GMI group was significantly reduced to 47(6.50) as compare to 53(7.50) in conventional group.

The mirror therapy found to be effective for controlling pain in acute CRPS than in chronic pain²⁵. During rest and activity graded motor imagery showed its effectiveness in reducing pain due to changes in cortex patients experiencing phantom limb pain sensory discrimination.²⁶ Graded motor imagery provide gradual activation of the cortical networks during movement without eliciting pain.^{27,28} At early stages after injury may contribute in pain control by non-stimulating primary cortex. Altered proprioception can be caused by immobilization period. Kinematic parameters and clinical symptoms from orthopedic conditions were shown improvement by mental and imagery exercises.^{29,30} Mental practice was effective in increasing the Range of motion measurement during the immobilization period by Frenkel et al.³¹ Neuroscience education tactile discrimination and limb laterality and graded motor imagery in patient with frozen shoulder and pain at rest, decreased functional status, and shoulder range was increased by Sawyer et al.³³

More pain relief is contributing factor in increasing movement and pain level contribute to functional status proposed by Metha et al. Approached should target to precise the gap between motor output and sensory feedback suggested by cortical model of pathologic.³⁴ These procedures lead to diminished pain with better recovery by cortical proprioceptive depiction.^{32,33,34,35} Muscle training is associated with morphological changes and neural adaptation required for strength gain. Greater activation in primary cortical areas along with more muscle unit activation result of neural adaptation.³⁶ Some study contradicts any relationship between GMI³⁷ and muscle strength, while other prove the efficacy of motor imagery on muscle strength.³⁸

Continuing and progressive nature of graded motor imagery is clinically important as suggested by a systemic review. Right and left discrimination which in the statistics provided drift towards pain increase rather than pain relief, only Motor imagery demands

attention as it gave no significant benefits. Graded motor imagery technique is very effective in encouraging in complex regional pain syndrome (CRPS) and phantom limb pain (PLP).¹⁴

The results of current study can also be compared to the results described by Polli A et. al when they compared GMI with conventional rehabilitation in patients of stroke as compared to patients with rotator cuff injuries. Primary outcomes in their study were Wolf Motor Function Test (WMFT) and Fugl-Meyer Assessment (FMA) as compared to (SPADI) score. With 14 patients in each group were included out of 28 patients in research study. Graded motor imagery group having 10 patients and control group having 4 patients reached the minimal clinically important difference in that study while the mean improvement was significantly more in GMI group as compared to the conventional group with the mean difference in WMFT being 0.72 in GMI group and 0.21 in the conventional group ($p < 0.001$), and the mean difference in the pain section of the FMA being 10.3 in GMI group and 2.7 in the conventional group ($p < 0.0016$). While in current study patients who underwent GMI did improve significantly more than conventional group after 4 weeks of therapy ($p < 0.001$).³⁹

The similar improvements in both GMI and conventional groups in current study can be compared to the results of S Johnson et.al in the UK, where they assessed the effectiveness of GMI in 2 centers for patients of CPRS.¹⁰ There was improvement at one center while no in the second center. The study conducted by Bahram Jam suggested use of Electromyography and Ultrasonography to measure the nerve activity in the region being treated and there was a significant improvement through conventional therapy and through GMI.⁴¹ Scores on SPADI improved with GMI than Conventional therapy. There were patients which due to being conscious and lacking the ability to discriminate switching of body sides during treatment, could not understand and benefit from it as compared to patients who understood the therapy and cooperated more during sessions^{42,43}

A female patient reported a strange feeling about having a delusion and unintentionally doing the

lifting of effected arm during her sleep and semi-conscious state while going into the sleep just like she was performing during exercise session. It may be due to unintentional nerve firing of same neurons which stimulate the muscle and nerves during the exercise sessions⁴⁴ or it may be due to her concern towards her treatment, conscious alertness and dedication towards the therapy. All the three steps of the procedure including the right and left judgement, explicit motor imagery and mirror therapy were difficult to understood and adapted by the subjects. Those who opted willingly for the procedure were also not much confident and sure about it may be due to short duration of GMI. This study also has limitations of assessment sources, like electromyography or ultrasonography.

CONCLUSION

It was concluded that graded motor imagery (GMI) and conventional PT both are effective for management of pain and disability due to rotator cuff injuries. But GMI was found to be more effective than conventional PT. Graded motor Imagery is a novel technique which can be used alone or as an adjunct to standard physical therapy

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