

## Effects of post-isometric relaxation, myofascial trigger point release and routine physical therapy in management of acute mechanical neck pain: a randomized controlled trial

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### Abstract

**Objectives:** To compare the effects of post-isometric relaxation, myofascial trigger point release and routine physical therapy on pain, disability and cervical range of motion in patients with acute mechanical neck pain.

**Methods:** The randomised control trial was conducted at the District Headquarter Hospital in Nowshehra, Pakistan, from July to December 2017 and comprised subjects of either gender aged 16-49 years with acute neck pain. They were randomised into three groups; post-isometric relaxation group 1, myofascial trigger point release group 2 and routine physical therapy group 3. Neck disability index, numeric pain rating scale and cervical goniometry were documented before intervention, after the first session and after 6 sessions in two weeks. Data was analysed using SPSS 21.

**Results:** Of the 60 patients, there were 20(33.3%) in each of the three groups. Mean age in group 1 was 32.25±9.56 years, group 2 2.35±9.05 years and in group 3 it was 32.75±7.82 years. Scores for neck disability index and numeric pain rating scale as well as rotation to right and left showed significant difference among the groups post-treatment ( $p<0.05$ ). Within group analysis showed significant improvements in all parameters post-treatment in all the groups ( $p<0.0001$ ).

**Conclusion:** Acute mechanical neck pain treated with post-isometric relaxation technique had more and faster effect in decreasing pain and disability and in improving mobility.

**Keywords:** Neck pain, Neck disability index, Neck mobility, Neck pain, Numeric pain rating scale, Post-isometric relaxation. (JPMA 70: 1688; 2020) DOI: <http://doi.org/10.5455/JPMA.15939>

### Introduction

Mechanical neck pain affects two-third of the global population at some stage in their life, mainly in the middle age. Around 20% of the people report acute mechanical neck pain, which, if treated, properly can be prevented from getting to the chronic phase.<sup>1</sup> Mostly the neck pain is mechanical in nature which can occur insidiously or be associated with anxiety, depression, poor posture, strain in neck, occupational or sporting activities.<sup>2</sup>

Mechanical neck disorders are associated with pain, muscle spasm, decreased cervical mobility<sup>3</sup> and limitation in function/disability.<sup>4</sup> Trigger points are hyper-irritable points<sup>5</sup> and can be found where nerves join the muscle fibres. It may be at different places in the body like the hip, shoulder and neck regions.<sup>6</sup> Myofascial trigger points in the cervical region are known to limit range of motion (ROM).<sup>7</sup>

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Conservative treatment approaches to this mechanical disorder include pharmacological treatment, such as analgesics, as well as physical therapy (PT) with options of myofascial trigger point (MTrP) release, massage, spinal mobilisation/ manipulation, hot packs, active exercises and electrical current, such as interferential therapy.<sup>8,9</sup> Despite the widespread use of PT and other conservative treatment approaches, there is a lack of high quality study in literature to support use of these treatment techniques.<sup>10,11</sup> There is also lack of data available for the treatment options in acute mechanical neck pain.<sup>4</sup>

This study was planned to determine and compare the effects of post-isometric relaxation (PIR), MTrP and routine physical therapy (RPT) on pain, disability and cervical ROM in cases of acute mechanical neck pain.

### Patients and Methods

The randomised control trial (RCT) was conducted at the District Headquarter (DHQ) Hospital in Nowshehra, Pakistan, from July to December 2017. After approval from the ethics review committee of Riphah International University, Islamabad, Pakistan, the sample size was calculated using OpenEpi calculator in line with

literature<sup>12</sup> and patients were recruited using non-probability purposive sampling technique after getting permission from the hospital administration. Those included were patients of either gender aged 16-49 years with acute neck pain for up to 3 months visiting the outpatient PT department. Those excluded were patients having chronic neck pain or with systemic diseases, such as rheumatoid arthritis/ankylosing spondylitis. After taking informed consent, the patients were randomised into 3 groups using the lottery method through single blinding. Group 1 was treated with PIR along with RPT, group 2 with MTrP along with RTP, while group 3 received only RPT. Data was collected through a self-structured proforma including demographics and outcome measures that included the numeric pain rating scale (NPRS), the neck disability index (NDI) and cervical goniometry (CG). Measurements were taken at baseline, after the first session to determine which group showed faster relief in symptoms and then at the completion of 6 sessions over 2 weeks to document the difference in measurements from the baseline. The duration of each session was 30 minutes. One therapist provided the treatment to all the participants, while the outcomes were documented by the other therapist.

Data was analysed using SPSS-21. Normality was checked at baseline using Shapiro-Wilk that showed significant value of <0.05 and histogram showed skewed data. Non-parametric Kruskal Wallis H test and Friedman test were applied. Mann Whitney U test was used for comparison among the groups and Friedman test was used for within group analysis.

**Results**

Of the 105 patients screened, 87(83%) were included and of them, 60(69%) completed the study; 20(33.3%)

**Table-1:** Kruskal Wallis H test for comparison among 3 groups.

Variables	Baseline	P value	
		Post 1st Session	Post Final Session
NDI	0.71	0.105	<0.0001
NPRS	0.439	<0.0001	<0.0001
CROM			
NF	0.284	0.031	0.379
NE	0.122	0.136	0.179
RSF	0.291	0.753	0.432
LSF	0.231	0.496	0.1
RSR	0.381	0.02	0.012
LSR	0.464	0.043	0.005

NDI=Neck disability index, NPRS=Numeric pain rating scale, CROM=Cervical range of motion, NF=Neck flexion, NE= Neck extension, LSF=Left side flexion, RSF=Right side flexion, LSR=Left side rotation, RSR=Right side rotation.

**Table-2:** Pair-wise comparison using Mann Whitney U test.

Groups	Variables	P value		
		Baseline	Post 1st Session	Post Final Session
PIR & MTrP	NPRS	0.2	0.004**	<0.0001****
	NDI	0.643	0.059	<0.0001****
	CROM			
	NF	0.858	0.089	0.197
	NE	0.88	0.437	0.17
	RSF	0.334	0.628	0.209
	LSF	0.11	0.239	0.038*
	RSR	0.27	0.02*	0.012*
	LSR	0.253	0.022*	0.003**
	MTrP & RPT	NPRS	0.965	0.084
NDI		0.55	0.817	0.292
CROM				
NF		0.243	0.343	0.672
NE		0.129	0.268	0.836
RSF		0.794	0.783	0.58
LSF		0.412	0.482	0.568
RSR		0.849	0.671	0.715
LSR		0.53	0.492	0.465
PIR & RPT		NPRS	0.273	<0.0001***
	NDI	0.48	0.077	0.003**
	CROM			
	NF	0.118	0.01**	0.27
	NE	0.046*	0.043*	0.063
	RSF	0.097	0.463	0.416
	LSF	0.275	0.655	0.086
	RSR	0.195	0.01**	0.005**
	LSR	0.436	0.052	0.007**

NDI=Neck disability index, NPRS=Numeric pain rating scale, CROM=Cervical range of motion, NF=Neck flexion, NE= Neck extension, LSF=Left side flexion, RSF=Right side flexion, LSR=Left side rotation, RSR=Right side rotation.

in each of the three groups (Figure-1). Overall mean age was 32.45±8.69 years, with 28(46.6%) males and 32(53.3%) females. In group 1, there were 10(50%) males and as many females with a mean age of 32.25±9.56 years. In group 2, there were 9(49%) males and 11(55%) females with a mean age 32.35±9.05 years. In group 3, there were 9(45%) males and 11(55%) females with a mean age of 32.75±7.82 years.

At the baseline, there was no significant differences among the groups (p>0.05), but midway and post-intervention values showed significant difference for all the tools (Table-1).

In pair-wise comparison, baseline measures indicated no statistically significant difference (p>0.05). At midway, comparison between PIR and MTrP showed significant difference in NPRS, left-side rotation (LSR) and right-side rotation (RSR), while post-intervention results showed statistically significant difference in all

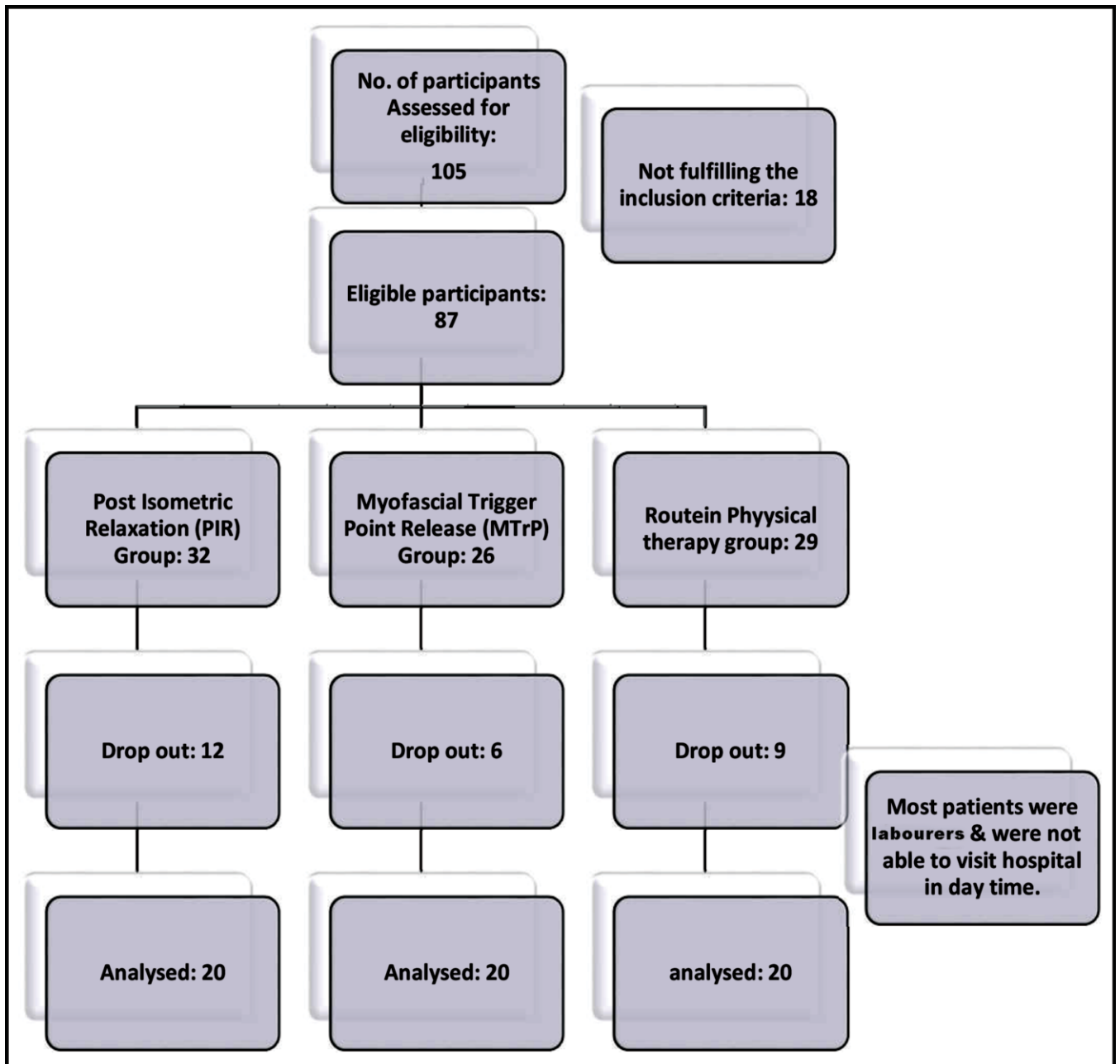


Figure-: Consolidated Standards for Reporting of Trials (CONSORT) diagram showing randomisation and dropouts.

tools except for neck flexion (NF), neck extension (NE) and right-side flexion (RSF). PIR and RPT showed statistically significant difference in NPRS, NF, NE and RSR at midway, while NDI, NPRS, ROM of LSR and RSR showed significant difference post-intervention ( $p < 0.05$ ). MTrP and RPT pair comparison showed no significant difference at midway, while in post-intervention evaluation, only NPRS showed significant difference (Table-2).

In within group analysis, all the assessment tools showed significant improvements in all groups ( $p < 0.0001$ ). All three groups showed improvements, but, comparatively, more improvements were noted in group 1 (Table-3).

Mean values of the groups in relation to different age groups showed the highest improvement in group 1 (Table-4).

**Table-3:** Friedman test for within group analysis.

Groups	Variables	Baseline	Median±IQ		P value
			Post 1st Session	Post Final Session	
PIR	NPRS	5.00±1.00	2.00±1.00	1.00±1.00	0.0001
	NDI	7.00±2.00	3.00±1.75	1.00±1.75	0.0001
	CROM				
	NF	35.00±15.00	47.50±10.00	50.00±3.75	0.0001
	NE	45.00±17.50	55.00±15.00	60.00±3.75	0.0001
	RSF	32.50±13.75	42.50±10.00	45.00±0.00	0.0001
	LSF	40.00±15.00	45.00±8.75	45.00±0.00	0.0001
	RSR	60.00±31.25	75.00±20.00	80.00±5.00	0.0001
	LSR	65.00±26.25	80.00±8.75	80.00±3.75	0.0001
MTrP	NPRS	4.50±1.00	3.00±1.72	2.00±0.00	0.0001
	NDI	7.00±1.00	4.00±2.00	2.00±1.00	0.0001
	CROM				
	NF	35.00±26.25	40.00±18.75	50.00±10.00	0.0001
	NE	47.50±37.50	50.00±20.00	60.00±10.00	0.0001
	RSF	30.00±18.75	37.50±15.00	45.00±10.00	0.0001
	LSF	32.50±22.50	42.50±10.00	45.00±5.00	0.0001
	RSR	52.50±33.75	60.00±30.00	67.50±20.00	0.0001
	LSR	55.00±43.75	62.50±30.00	72.00±20.00	0.0001
RPT	NPRS	5.00±2.00	3.00±1.00	2.00±1.00	0.0001
	NDI	8.00±2.00	5.00±1.00	2.00±1.00	0.0001
	CROM				
	NF	30.00±20.00	40.00±15.00	50.00±5.00	0.0001
	NE	40.00±20.00	50.00±15.00	55.00±10.00	0.0001
	RSF	30.00±10.00	40.00±10.00	45.00±5.00	0.0001
	LSF	30.00±10.00	45.00±15.00	45.00±2.00	0.0001
	RSR	60.00±30.00	60.00±15.00	75.00±15.00	0.0001
	LSR	60.00±20.00	70.00±15.00	75.00±10.00	0.0001

P<0.0001\*\*\*\*, NDI=Neck disability index, NPRS=Numeric pain rating scale, CROM=Cervical range of motion, NF=Neck flexion, NE= Neck extension, LSF=Left side flexion, RSF=Right side flexion, LSR=Left side rotation, RSR=Right side rotation.

**Table-4:** Categorical age-wise comparison of different groups.

Age	Groups	Assessments	Mean±SD							
			NDI	NPRS	NF	NE	RSF	LSF	RSR	LSR
16-35 years	MET (PIR)	Pre	4.38±0.96	6.69±1.11	36.15±11.58	45.38±13.91	38.85±6.812	36.92±7.23	67.69±11.84	60.77±16.94
		Post 1st Session	2.38±0.96	3.00±1.15	45.38±6.28	52.31±9.27	40.77±7.03	39.62±6.60	76.15±8.45	69.23±15.39
		Final	1.38±0.51	1.38±0.87	46.54±5.16	56.54±4.74	43.85±3.00	44.23±1.88	78.46±3.15	75.38±6.91
	MtrP	Pre	4.53±0.52	7.40±1.12	35.67±15.68	39.67±18.27	31.33±13.02	26.67±12.63	48.67±25.03	47.33±21.87
		Post 1st Session	3.00±0.93	4.33±1.50	42.33±7.99	48.00±11.14	38.67±8.96	34.33±9.04	62.00±15.47	60.00±14.76
		Final	2.13±0.92	2.80±1.78	45.67±6.78	52.00±10.99	40.73±8.46	39.00±9.30	69.33±13.21	69.00±9.86
	RPT	Pre	4.08±1.04	7.15±1.07	29.38±11.72	35.38±14.93	31.15±9.16	31.15±10.03	53.46±17.61	49.62±17.73
		Post 1st Session	2.92±0.95	4.92±1.04	37.69±9.04	45.38±12.82	37.31±10.33	37.31±9.92	65.38±13.76	60.77±9.97
		Final	1.85±0.90	1.92±1.75	46.15±5.83	54.62±8.53	41.7±7.18	40.83±7.33	71.54±10.08	67.69±11.84
	MET (PIR)	Pre	4.43±1.13	7.29±1.11	32.14±16.29	38.57±19.30	28.57±14.92	29.29±14.26	47.14±28.56	42.14±31.34
		Post 1st Session	2.57±1.13	3.00±0.82	43.57±7.48	52.86±6.36	40.29±5.06	40.00±5.77	70.00±11.18	70.00±11.18
		Final	1.14±0.38	0.57±0.53	70.00±11.18	50.00±0.00	44.57±1.13	45.00±0.00	78.57±2.44	79.29±1.89
36-55 years	MtrP	Pre	4.40±0.548	7.20±0.45	27.00±9.74	46.00±15.16	33.00±9.75	34.00±9.62	33.00±9.75	45.00±29.37
		Post 1st Session	3.00±1.23	4.00±1.23	34.00±8.94	52.00±13.04	40.00±7.07	42.00±6.71	67.00±13.03	56±13.03
		Final	2.20±0.45	2.80±1.30	42.00±8.37	56.00±8.94	42.00±4.47	43.00±4.47	72.00±8.37	64.00±11.42
	RPT	Pre	4.43±0.961	7.43±0.976	29.29±13.05	32.86±13.49	32.86±6.98	33.57±6.90	60.71±12.05	57.14±18.67
		Post 1st Session	2.86±0.69	4.57±0.535	37.86±9.06	44.29±10.96	39.29±6.08	39.29±6.08	68.57±7.48	67.14±15.77
		Final	2.00±0.00	2.00±0.816	47.14±3.93	53.57±4.76	44.29±1.89	44.29±1.89	75.00±5.77	73.57±6.90

NDI=Neck disability index, NPRS=Numeric pain rating scale, CROM=Cervical range of motion, NF=Neck flexion, NE= Neck extension, LSF=Left side flexion, RSF=Right side flexion, LSR=Left side rotation, RSR=Right side rotation.

## Discussion

The present study found PIR technique as more effective compared to MTrP and RPT. A study compared three groups in which muscle energy technique using PIR was given to group A, ischemic compression was given to group B and strain-counter-strain along with RPT was given to group C. Results showed significant difference among the groups post-intervention and group A showed the most improvement in NDI, visual analogue scale (VAS) and cervical ROM (CROM) followed by strain-counter-strain plus RPT. The duration of treatment was four weeks.<sup>13</sup> In the current study, the duration was two weeks, indicating that PIR can show improvements even within a short duration.

PIR was also compared with ischemic compression previously and documented statistically significant difference in reducing pain and improving CROM in post-intervention measures.<sup>5,14,15</sup> Similarly, comparison among PIR and RPT treatment groups has also been reported in literature which suggested significant difference

between the groups.<sup>16</sup>

Literature suggests that more quality analysis is needed to determine which is the better treatment approach between MTrP and RPT.<sup>17</sup> In the current study, comparison suggested there was no major difference between the two.

In the current study, all groups showed improvements from baseline to the final results, but PIR showed more improvement, which is in line with literature.<sup>18-20</sup>

## Conclusion

PIR, MTrP and RPT showed improvements in alleviating pain and disability and in improving CROM. However, there was difference between the effects of these techniques as PIR combined with RTP showed better outcomes followed by RPT alone in all outcome measures.

## Limitations

The present study has its limitations. The sample size was too small to allow generalisation of the findings. Besides, the RCT was not registered with the relevant registry. Further studies are required with larger sample size so that the results could be more valid and generalisable.

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**Conflict of Interest:** None.

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