RESEARCH ARTICLE

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Evaluation of the Effectiveness of Customized Postural Correction Device for Motorcyclist

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Abstract

Background: The work-related motorcyclist is prone to driving-related issues due to the longer duration of riding positions and might not be aware of the improper posture they hold throughout the day and land up causing several problems There is a need for a posture corrector device which can help the motorcyclist maintain their proper posture and reduce pain. **Objectives:** The objective of the study was to assess the musculoskeletal pain in the motorcyclist, to assess the range of motion of the spinal and cervical joint and to evaluate the effectiveness of the customized backrest with post-assessment. **Materials and Methods:** An analytical study was done among motorcyclists working in Karad. Detailed assessment was taken with the VAS (visual analogue scale) and range of motion of the cervical and spine. Proper consent and ethical permission were taken, the prototype was given to the motorcyclist for use for 30 days and an assessment was done after the use of the backrest. **Results:** In our study, the participants experienced that the pain they had during riding and the musculoskeletal problems they had dure to improper posture while riding were reduced after the use of the customized device and was also supportive for the back and easy to use for daily need. **Conclusion:** We conclude that the effect of a backrest for the motorcyclist is a need of cause. The results observed after the use of the backrest were significant, the pain rating was reduced and the altered range of motion was also improved in post-assessment.

Keywords: Backpain, Backrest, Motorcyclists, Musculoskeletal Pain, Severity

1. Introduction

India is a developing nation where two-wheelers are the most preferred mode of transport due to packed roads, fewer bays, and highly rising fuel rates[1]. In the latest report, motorcyclist populace in Maharashtra state was 73%[2]. Every motorcyclist has a different riding posture. Extended contact to difficult posture brings pain and discomfort for the rider producing musculoskeletal problems[3]. The motorcyclist might not be aware of the improper posture they hold throughout the day and land up causing several problems[4].

According to the ergonomic statement, the two-wheeler posture is an important factor which should be considered. Mostly they have a load on their musculoskeletal system the back, neck and the spine[5]. When we land on a bad road while driving most of the pressure is felt on the spine and it absorbs all the pressure[6].

The discomfort experienced by the motorcyclist is due to various factors like joint angles, postures, muscular contractions and pressure distribution while in seated posture[7]. This indeed makes the motorcyclist to acquire the postures which will balance the forces acting on the body and maintain the equilibrium[8]. The level of pain differs from acute or chronic and can change from dull,

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constant or abrupt severe pain, affecting the normal living of the motorcyclist[9].

The objective of the study was to assess the musculoskeletal pain in the motorcyclist, to assess the range of motion of the spinal and cervical joints and to evaluate the effectiveness of the customized backrest with post-assessment.

There are various studies done on the proper posture to be held on the motorcycle, etc but there are very least devices in the market which will help the motorcyclist to hold the proper posture for a longer duration[10].

Based on the determinants leading to the severity of the pain the study is completely based on checking the viability of the backrest provided for the improvement of the posture and reducing musculoskeletal problems. The structure of the backrest provides an anatomically correct posture holder while riding. It is a need of a cause for practising the use of backrests to avoid musculoskeletal problems.

1.1 Objectives

To assess the altered range of motion of cervical and lumbar joints.

To assess the pain rating with a visual analogue scale.

To evaluate the effectiveness of customized backrest with post-assessment.

2. Materials and Methods

Study Design: This was an observational study.

Study Type: This was an analytical study.

Study Setting: This study was conducted at Karad.

Study Population: This study was undertaken with the motorcyclist fulfilling the inclusion criteria.

Inclusion Criteria: All gender motorcyclists suffering from back pain and whose duration of use of the motorcycle is more than 3 hours a day continuously. And having experience of more than 3 years.

Study Duration: This study was conducted from July 5, 2023, to January 30, 2024.

Tools for Data Collection: A pre and post-assessment sheet was used which included data of pain rated with VAS and altered ROM of cervical and lumbar joints measured with inch tape and goniometer.

2.1 Determination of Pain

The patient was explained about the Visual Analogue Scale (VAS) which contains a scale ranging from 0 to 10. '0' is the indication of no pain at all and '10' indicates severe pain. The examination was done under two circumstances, pain at rest and pain while driving a bike. The patient was asked to mark between 0 to 10 based on the pain he/she experiences first while in rest, and then while during an activity.

2.2 Range of Motion

The range of motion of cervical and lumbar joints was measured using inch tape. The readings of pre-examination were noted and later post-examination readings were compared.

2.3 Statistical Analysis

The outcome measures were evaluated at the start of the study. Using instat software analysis was done and VAS

Table 1. Analysis of visual analogue scale

S. No.	Age (yr.)	VAS	
		Customised backrest	Conventional
1.	28	2	7
2.	30	3	10
3.	27	0	7
4.	35	2	9
5.	26	1	8
6.	32	0	6
7.	27	2	9
8.	32	1	8
9.	40	2	10
10.	37	1	8
11.	39	0	7
12.	26	2	7
13.	42	1	9
14.	39	0	7
15.	34	2	9
16.	46	1	8
17.	28	0	7
18.	43	2	9
19.	39	2	8
20.	25	1	7

Table 2. Analysis of lumbar Range of motion

S. No.	Age	Lumbar ROM									
		Conventional					Customised Backrest				
		Flex.	Ext.	Lat. Right	Lat. left	Rot.	Flex.	Ext.	Lat. Right	Lat. left	Rot.
1.	28	40	10	15	10	4	50	15	20	20	5
2.	30	43	10	15	10	4	49	16	22	18	6
3.	27	42	12	12	12	3	52	15	20	19	5
4.	35	40	10	13	14	4	50	17	19	20	4
5.	26	42	12	10	10	4	49	15	18	22	7
6.	32	35	10	13	12	3	50	16	20	20	5
7.	27	42	10	14	14	2	52	17	22	24	6
8.	32	46	12	15	13	4	53	15	23	20	5
9.	40	41	10	10	12	3	50	16	20	21	7
10.	37	40	12	12	10	4	48	15	21	19	8
11.	39	35	13	15	12	2	50	17	20	20	5
12.	26	38	10	13	10	4	49	15	19	19	6
13.	42	45	9	10	12	4	52	16	20	22	8
14.	39	40	10	12	10	3	53	17	22	20	7
15.	34	42	8	14	12	3	50	16	24	19	5
16.	46	38	10	10	10	2	52	15	20	20	8
17.	28	30	12	12	13	4	49	17	23	19	6
18.	43	35	8	14	14	2	53	15	20	22	8
19.	39	40	10	10	10	3	52	16	22	20	5
20.	25	45	12	12	12	2	50	17	20	22	7

Table 3. Analysis of cervical Range of motion

S. No.	Age	Cervical ROM									
		Conventional					Customised Backrest				
		Flex.	Ext.	Lat. Right	Lat. left	Rot.	Flex.	Ext.	Lat. Right	Lat. left	Rot.
1.	28	70	60	15	15	65	85	70	45	45	90
2.	30	72	62	15	14	75	80	65	35	35	85
3.	27	70	55	10	18	55	85	73	40	40	80
4.	35	65	50	15	15	50	90	72	45	45	95
5.	26	55	58	14	15	65	85	68	43	40	80
6.	32	62	60	18	10	70	90	72	35	35	85
7.	27	70	55	15	15	75	85	70	32	44	88
8.	32	75	54	15	14	50	80	65	45	45	92
9.	40	59	50	10	18	75	85	73	36	35	90
10.	37	60	62	15	15	55	90	72	43	40	85
11.	39	65	55	14	15	50	85	68	45	45	80
12.	26	70	50	18	10	65	90	72	32	40	95

13.	42	55	45	15	15	70	85	70	35	35	80
14.	39	65	50	15	14	75	80	65	44	32	85
15.	34	70	48	10	15	50	85	73	45	45	88
16.	46	72	50	15	10	50	90	72	35	35	92
17.	28	65	45	14	15	65	85	68	40	40	90
18.	43	58	58	18	14	70	90	70	45	45	88
19.	39	65	50	15	18	75	80	68	38	40	92
20.	25	70	45	18	15	50	82	65	35	45	90

($P<0.0001$), and ROM for all the joints($p<0.0001$) were all shown a significant difference.

3. Results

The test results (Table 1), showed the superior effect of a customized backrest as compared to no use of the backrest given the visual analogue scale (pain assessment).

The test results (Table 2) and (Table 3) showed the effect of customized backrest as compared to a conventional given range of motion assessment of the lumbar and cervical joint respectively.

4. Discussion

This study was completely based on the aim to evaluate the effect of designing a backrest for the motorcyclist, which was done in Karad among the motorcyclists. The motorcyclist while driving experiences severe pain which indeed leads to postural accommodation and abnormalities. There must be an easy solution for the motorcyclist to improve their posture while they ride[11].

While being seated on the motorcycle they have a load on their musculoskeletal system the back, neck and spine, when they land on a bad road while driving most of the pressure is felt on the spine and it absorbs all the pressure[12]. The discomfort experienced is mostly due to the various factors like joint angles, postures, muscular contractions and pressure distribution while in seated posture which indeed makes them acquire the postures which will balance the forces acting on the body and maintain the equilibrium[13].

A study done by Farhan Ullah *et al.*,[1] concluded that there is moderate pain among the Peshawar occupational motorcyclists, hence there is a large number of populations suffering from the same related problem and there is a high number of people having pain in the lower back region[14].

In the study done by Aqsa Memon *et al.*,[2] they had an age group of 21-30 years those motorcyclists had maximum riding time and their results showed that age, duration of riding and the position of the motorcyclist were the considerable factors[15].

All the studies which are done prior include the motorcycle problems but there is very little data available on the riding posture of the motorcyclist[16]. The focus on the posture of the motorcyclist should be brought to notice, it is always said prevention is better than cure[17]. The factors responsible for all the problems mostly lead to the point that the sitting posture is not maintained by the motorcyclist. Those who are aware of the proper posture might also land up into various improper posture practices. So, there is a need for a cause to find a solution for the same.

After analysing the readings of this study, it is proved that the backrest which is customized has a great impact on the postural habits of the motorcyclist. The backrest is made up of different structural formations supporting the anatomical curvatures of the spine. The supporting structures provide an equilibrium to the posture that the forces acting on the joints while driving won't change the posture.

Once the backrest is wearied by the motorcyclist itself the curves are anatomically correct which helps the motorcyclist to gain support while riding. Once the posture is supported with the backrest the stress on the joints will be revealed which indeed relieves the musculoskeletal pain. The practice of use of this backrest should be made a daily wear product with ease to wear and comfortable at the same time.

5. Limitation

The limitation of this study was that ranges and pain were measured for only low back pain and cervical pain region. Hence it only focuses on the severe joints affected.

6. Conclusion

The need for a backrest for the conventional motorcyclist riding for a longer duration is a need of cause. The results observed after the use of the backrest were significant, the pain rating was reduced post-examination and the altered range of motion was also improved after the use of the backrest.

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