Study on Postural analysis and ergonomic interference on drivers

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Abstract

Musculoskeletal problems (MSD) influence the staffs in numerous professions including vehicle drivers. The examinations happening muscular issues from truck, taxi, and bus drivers were attempted yet there is no investigation to assess these three automobile users and give ergonomic interferences amongst them. In such manner, the study means to survey the level of musculoskeletal problems on critical elements influencing the three automobiles as for demographic contours and undertakings drivers' appliance. It additionally means to evaluate the degree of musculoskeletal sufferings of physical portions of automobile drivers from the usual factors, and suggest ergonomic facilitations to address frequency of musculoskeletal problems among the drivers. Evaluation on the issues of these vehicle drivers utilizing RULA and CMDQ were attempted. The outcomes exhibited that there was a correlation on the body portions of truck, taxi and bus drivers on the RULA and CMDQ esteems. The vehicle drivers showed that their neck, inferior back, subordinate legs, upper limb and wrists were the main five greatest usual body parts associated with musculoskeletal issues. As such, the study proposes proposed ergonomics interferences required for these body portions.

Keywords: Musculoskeletal Disorder (MSD), Ergonomic interferences, CMDQ, RULA, Vehicle drivers

1. Introduction

Generally, vehicles are planned concerning the European anthropometric qualities [1], which sometimes falls short for Indian anthropometry esteems. To withstand in Indian scenario the concern has to progress the design of cars to compete with existing industrialists in India considering Indian anthropometry and stance of Indian market. Subsequently, this issue can be tended to by upgrading the plan of different parts of vehicle. Drivers face a number of clinical issues, for example, muscle cramp, muscle weakness, blockage on muscle, spinal disorder, stiffness, deadness in spine and other musculoskeletal issues that are even steady [2]. One of the components influencing these issues is the stance wherein they sit. Specifically, in India the ergonomics of the driver is given least importance and the drivers end up using pads, towels and different materials to give the cushioning and make their drive insignificant pleasing. A seat that is charming in static conditions may have defenceless incredible characteristics that make it abnormal. Most extreme of the train seats, particularly transport driver seats in India, are not planned by the Indian anthropometry neither one of the investors will put assets in planning devices assuaging human ergonomics. How proficient driver is connected with MSDs is maintained by epidemiological examinations among drivers in different kinds of vehicles. These join carriers, country carriers [3], forklift drivers [4] [5] transport drivers [6], and taxi drivers [7].

Park S J takes contrasted real seating solace position and respect to ideas in the investigation. Sex associations and relationships were similarly made to close their results [8]. Park S J further thought about ergonomic comforts on most comprehensively used vehicle and decreased vehicles with pressure assessments and 3D scanner with ANOVA genuine assessment [9] [10]. Jianghong developed a fluffy set model of a Multistage Comfort Scale (MCS) and assessed seating stance, joined with the methodology of human back shape, EMG assessments and position assessment. The assessment surmised that MCS is a fast anyway complete evaluation methodology for single seat appraisal [11]. Mergl worked on an association between contact power course and ponderousness in human-seat correspondence was thought about using pressure appropriation and underwriting [12].

Wenxia et al. had projected the ergonomic analysis of the driver seat. The mathematical model of the driver seat is planned by keeping the norm. The ergonomics investigation of the seat is completed utilizing Ansys programming. The consequence of the examination is extremely useful in anticipating the comfort assessment while sitting in a vehicle. It is closed from the exploration that support can be assessed and the item can be planned in like manner [13]. The serious issue actuated while riding the vehicle is because of the vibrations initiated. The problem makes an awful inclination that the item is badly designed or not great [14].

2. Methodology

2.1 Area allocation and subject selection

Haldia is a modern port city in Purba Medinipur region in Indian domain of West Bengal. It is a huge stream port and financial belt discovered approximately 124 kilometres southwest of Kolkata near the mouth of the Hooghly River, one of the distributaries of the Ganges. Haldia is concentrated for some petrochemical associations and is being made as a critical trade port for Kolkata. Due to Industrial Sectors, road density is much higher compared to other areas [15].

2.2 Participants

There were 32 respondents utilized for the study involving 17 truck drivers, 11 bus and 4 taxi drivers. The apparatuses to be utilized to assemble data are the accompanying: review survey, RULA with a score rating of 1-2 acceptable, 3-4 further investigation needed, change might be required; 5-6, further examination, change soon, and finally 7 research and carry out change.

2.3 Assessment Tools used

RULA is performed for the postural analysis to the drivers with the standard RULA diagram. In lieu of critical components influencing vehicles drivers, the investigation coordinated the Cornell musculoskeletal confusion survey (CMDQ) to them by noticing their duties to decide the body parts where they encountered tension.

2.4 Statistical Investigation

The mean and standard deviation of the different physical boundaries were determined. The distinctions in ergonomic and postural analysis between various vehicles were inspected and χ^2 test was used to validate the RULA score.

Table 1: RULA assessment for drivers

Vehicle Driver	RULA Assessment	
	Holding steering	Gear Change
Truck [n=17]	4	5
Bus (Govt. and Non-Govt.) [n=11]	5	5
Taxi-cab [n=4]	2	4

Pearson connections were utilized to examine connections between RULA score and age, anthropometric information, rank status, and hazard. Out of these two varieties, one type of vehicle had an adjustable driving seat and steering wheel.

Table 2: Cornell Musculoskeletal seat discomfort level analysis

CMDQ Questionnaire	Drivers		
Level of Discomfort	Truck	Bus	Taxi-cab
Slight	80%	90%	96%
Moderate	15%	10%	4%
Very High	5%	0	0

3. Result and discussion

From Table 1, the mean value of RULA is between 3-5, hence there is a need for necessary action should take since its risk is medium. Mean RULA scores are higher for gear changing than holding steering. The study also mentioned that Cornell's seating discomfort evaluation scores showed in Table 3. In contrast to to RULA, as exhibited in Table 3, majority of the suggested exercises showed that there is a need to explore further the activities where the body portions are utilized. The effects of musculoskeletal disorders on the wrist of the drivers need consideration accordingly the administrators know about the particular proper ergonomic mediations for them.

Table 3: RULA scores for body parts

Body parts	Drivers					
	Truck		Bus		Taxi-cab	
	Mean	Suggestion	Mean	Suggestion	Mean	Suggestion
Upper arm	2.23	Further investigation	2.16	Further investigation	2.34	Further investigation

lower arm	1.6	acceptable	1.54	acceptable	2.59	Further investigation
Wrist	2.97	Further investigation	2	acceptable	2.41	Further investigation
Neck	2.47	Further investigation	1.2	acceptable	1.98	acceptable
Trunk	1.97	acceptable	1.54	acceptable	2.48	Further investigation
Leg	2.47	Further investigation	2.65	Further investigation	1.88	acceptable

From Table 2 it observed that the truck drivers suffered from very high risk, where for the others the moderate level of discomfort observed.

4. Limitation

Improve the sample size of the investigation through characterizing equivalent quantity of test size of the different participants dependent on their segment outline. In such manner a more exact outcomes of Disorder's may responded. Other factors such as brake, horn position, mirror view also be analysed further. Moreover, other assessment tools may apply to get better result and further system design modification may occurred on that note.

5. Conclusion

The majority of the subjects confronted discomfort during driving to the compelled poses and extended periods of driving. It is obvious from the study that the commonness of musculoskeletal problems is not relied upon a particular age, sexual orientation, or class of vehicle. The study also included both professional and non-professional drivers and no differentiation is done between them. Condition of the streets and vehicle vibration is not considered during this examination. The scores of gear change can be improved by placing the gear handle nearer to the steering.

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Conflicts of interest

None

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