

REVIEW ON ERGONOMIC DESIGN OF A CAR SEAT

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ABSTRACT

In the present time the rate of road car accident and risk of health injuries on road increases day by day it develops due to less attention during driving un-comfortability of driver seat, incorrect manufacturing of road and improper shape and designing of car seat of Driver. There are several reasons behind every road car accident and health injury. Uncomfortable sitting and improper design of driver seat one of the common and important reasons of road car accidents. In this paper researcher mention about different causes which can be responsible for the road car accidents and risk of injuries while driving a car or vehicle. Such as improper posture and shape of driver seat, uncomfortable adjustment of driver seat, etc. structure of human body affected by long period of driving and it generate many bodies parts pain. Human life is important so to save the life and health of human we need a comfortable sitting of driver seat. A proper shape of car sitting and comfortable area of driver seat which overcome the risk of injury while car driving. An appropriate dimension, right angles, structure and comfortable zone of driver's seat is always a necessary part of every car designing and structuring. Comfort zone is one of the major and pivotal parts which can help to reduce the physical and mental pressure. This comfort zone can be developed by correct parameters while structuring and designing a car seat. Automotive ergonomics engineering helps to design the car seat with proper measurement of sitting area and human body posture. Ergonomics engineering applied to overcome the risk of injury and they mainly work on the appropriate structuring of car driver's seat.

Keywords: Automotive Ergonomic Engineering, Injuries, Comfort Zone, Parameters And Improvement.

I. INTRODUCTION

In the present time the rate of accident increases day by day and the reason behind the accident and injuries occurs due to uncomfortable and incorrect posture of seat driver, improper structure of road etc. There are many other reasons of accident but one of the most important reason discomfort zones of driver seat and improper design of driver seat posture. Who gets more fatigue than passenger which is serious for the professional driver and driver has the more responsibility towards passenger and its vehicle? To decrease the quantity of accident for that we must focus on structuring and designing of driver seat and this could be happened through automotive ergonomics and it help us to design better car seat for human use. Onawmni (2012) has mentioned and evaluated various musculoskeletal problems that are prevalent among professional drivers worldwide. Driver tend to experience pain more often as it is more difficult to shift body position while driving so there are many consequences and risk of injuries due to inappropriate setting and poorly fitting of the driver seat. Poor posture from personal habits improper adjustment and fitted seat create trouble and injuries for driver as well as becomes uncomfortable for passenger. The shape of the vehicle seat is most of the important part or structure and design of car or vehicle. Due to improper shape and structure of seat of driver from neck to spine and limited space for taller driver and shorter driver with short limbs do not only have problem to reach controls but also in the field of vision these kinds of problems are reduced by correcting the seat design and structuring with the help of automotive ergonomics engineering. This branch of design engineering applied to driver seat design required that we make into consideration the goal of these various approach is to decrease risk of injury or fatigue to enhance driver performance so that it could maximize the natural ability of body to move and respond without physical stress. Whiplash injury and lower back pain are two most common injuries which occur while driving cars and vehicle. kolich (2003) included that anthropometric criteria and ergonomics criteria should be applied simultaneously. There many kinds of injuries or driving posture which are generated due to the discomfort of driver seat. Lower back pain is one of the injuries which occur due to incorrect design of driver seat, therefore the proper design of driver seat needs of

the present time. Many industries and technical design company who develops the design and dimensions of driver seat which can reduce the risk of injuries and accident and give stable and comfort zone during driving. Comfort zone of driver seat is related to the neck angle and body posture, there are some parameters like seat back angles, neck angle, seat width, H-point, R-point, head restrain, space between leg and operating vehicle parts.

II. CAUSES OF INJURY DUE TO INAPPROPRIATE DESIGN OF DRIVER SEAT

Because of uncomfortable and incorrect pattern of driver's seat creates risk of accident and lead towards major injuries. Incorrect back angles, dimension and shape of neck to spine which make driver uncomfortable a create psychological pressure during driving. There are many causes of injuries which are occurring due to incorrect shape and design of the driver seat as well as passengers' seat. Sometimes height and weight aspects of driver and passengers also create (such as taller man has less space in driving seat and shorter man has long distance due to short limbs on driving seat) some problematic situation which is also developed the injuries conditions. There are some causes which develop or generate due to discomfort seat of driver unfitting angle and shape of driver seat. Inappropriate posture of driver and inclination of neck towards staring or car vehicle also produce health injuries. A person who spent a lot of time in a vehicle like truck driver is likely to experience back ache and pains. Driver tends to feel more pain as they can't shift body position while driving for long period of time. Similarly, passenger can also feel the same effect if they are sitting in a vehicle for a long duration and without changing their position on a seat. There are some causes including: poor posture from personal habits and from improper adjustment or fitting seat. Low frequency whole body vibration in moving cars and other vehicle can contribute do effect on the lower back pain. Shape of vehicle seat itself may put pressure on selected parts of the leg back and buttocks. This can contract lead to pain and discomfort at pressure point a may affect blood flow to the leg a foot. Muscle fatigue long duration car driving leads to driver discomfort which causes fatigue with the help of muscular skeleton molding. Whiplash injury a human body during driving feels pain in a many joints of body like lower body leg joints and feet joints. To avoid the injuries and accidents while driving the car. Driver needs comfortable posture while driving and correct shape and design of driving seat.

III. NEED OF COMFORT FOR CAR DRIVER SEAT

Comfortable seat is a necessary part of car and as well as for car driver because comfort zone always matters for the travelling members and car driver. A safe journey or travelling by car always depends upon the driving of driver and smooth driving is depends upon the comfortable position and natural posture of the driver seat. Wolf (2008) Categories the comfort into two parts statics and dynamics where static comfort means right posture in position and right angle of back rest, neck to spine and position leg to toe, whereas a dynamic comfort related with vibration of the seat and how driver's seat function during producing a vibration. The main an important reason of any accident during driving is lack of posture and position of car seat or driver seat because human body needs a comfortable zone for every kind of sitting area either it is driving or other working field because for a long period of time if human bodies sit or drive with incorrect and discomfort position developed the pain and after sometimes it developed the hardness and fatigue an anxiety so to overcome these positions and prevent from whiplash kind of injuries required or need a comfortable and proper angle and shape posture design for driver's seat. Discomfort is distributed in various area of human body like head to neck region and right angle from neck to spine and supportive posture of seat back rest. The concept of articulated seat means gives support to that the person could be set in its natural position. There are many factors which are connected with the comfort of driver seat like right position, natural posture, correct angle accurate pressure on the driver seat, vibration among the driver and passenger seat. Performance of the driver always affects by these above factors because these factors interconnected with driving and driver seat. Wassim (2003) had done experiment on comfort and discomfort of the driver's seat and he concluded that vibration produce in the car seat create the discomfort for the driver and it's affected the performance of the driver while driving. For the driver and for correct right-angle design of driver's seat ergonomics automotive works to make easy, smooth, comfortable seat for driver and for passengers as well. Many researchers are still working on making a comfortable design of the seat and they are mainly focusing on the joints of the human body which affect the driver while driving and while on sitting posture. Today scenario or condition every

person need a comfort in their car vehicle while travelling or driving a car so it Challenging for technician day by day for procedure to fulfil the expectations of customers for their comfort.

IV. PARAMETER AN IMPROVEMENT RELATED TO CAR DRIVER SEAT

This comfort factor is connected with many areas like right angle and posture towards back and back rest neck and neck back angle and shape towards buttock to feet. Some parameters must to be measured while designing a driver seat in order to accomplish the four norms:

1. Vehicle control with clear vision for driving.
2. Modifications in driver seat according to size and shape.
3. Provide comfort for long duration of driving.
4. Seat protection for driver during accident.

Ergonomics is branch of design engineering applied to fulfill the requirement of human body and driver seat design. When seat fit to the driver it gives more comfort, less stress and maintains good psychological and health condition of driver. Ergonomics can be an important part of design, manufacturing. The study of anthropometry, posture, repetitive motion, and workspace design is done with help of Ergonomics engineering.

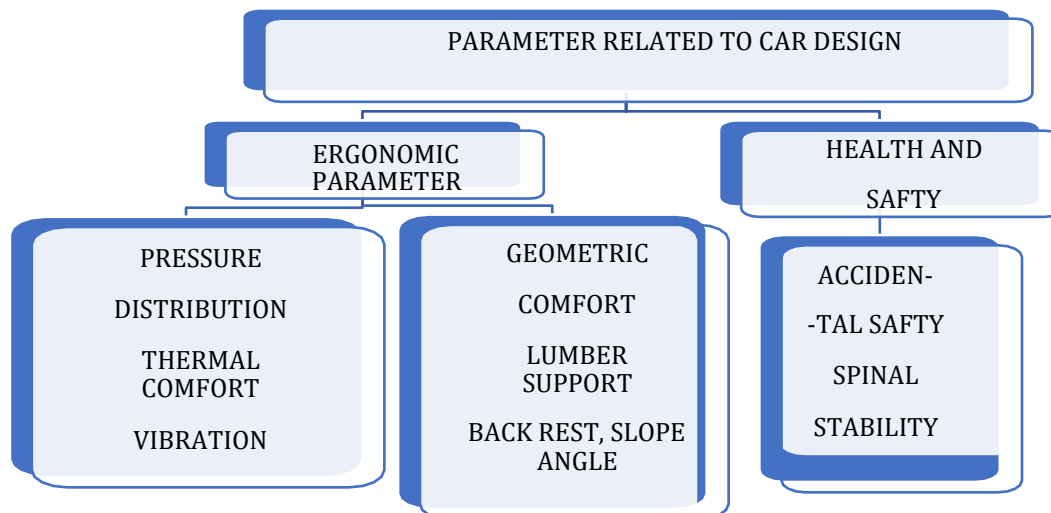


Figure 1: Parameter related to car design

Parameters associated with comfort zone: Comfort is like stability and relief, enjoyment and stable. Comfort zone is dependent on pressure distribution over the seat with static and dynamics, thermal comfort, vibration at driver body, geometric parameters. Pressure distribution over a seat provides the uniformity among the human body and its health. Proper uniform pressure distribution on driver seat depends upon different properties of design of cushion, seat pan, and backrest. These properties of pressure distribution help to reduce the stress over human buttock.

Thermal Comfort: Thermal comfort related with health and comfort of driver. In this comfort mainly focuses on materials and functioning of cushion, which works according to whether i.e., good for health in winter season but make un-comfortable in summer season.

Geometric Parameter: Geometric parameters like lumbar support, backrest slope angle, seat width, depth and height, seat pan angle. Driver works for long period of time. To maintain the position of vertebrae lumbar support, play important role. Therefore, proper lumbar support is very important. Large number of anthropometric data is required for proper design of seat which provides support to lumbar. Therefore, seat designer must study the huge amount of data related to anthropometry before building a first prototype. Seat angle is also responsible for pressure distribution over seat. (hanumant N.Kale.) Head is important part of human body, for its safety air bags are provided at front as well as at window side, which reduces the injuries to head during front and side collisions. Seat belt holds the driver body on the seat. To ensure the safety proper design of seat belt and position of air bags are very important part of design. (hanumant N.Kale.)



Figure 2: Cut-section of car seat and its components

V. CONCLUSION

From the above discussion and review many papers conclude that in the present time quantity of a car accident and risk of injury becomes common. Which can be a serious issue for human being and every injury an accident was happened due to careless improper driving incorrect structuring of roadways, un-comfortable of driver seat and other reasons which are responsible for the major car accidents and serious health injuries? Improper structuring of driver seat causes the serious health injury which can be destroyed the whole life of human beings. Non symmetric pattern or structure of driver seat builds up pressure on driver physically and mentally. Physical pressure originated from long period of driving in pain and this pain develops the anxiety and fatigue, in Behavior which affected the disturbance during driving and proceeds to serious accident. To remove or overcome the rate of a car accident we have to focus on the parameters and often on the comfortable factors. A comfortable seat posture lead toward stable and balanced, relief, stress less driving. Many researchers give emphasis on the comfort zone of driver seat as well as passenger seat. Driver seat comfort is necessary because it has whole responsibility of vehicle as well as sitting passenger. Parameter play a vital role to develops the proper shape, design of driver seat. And automotive ergonomics engineering play essential role to design appropriate measurement and correct dimension of human body postures which provide the safety a comfort during driving. The ergonomics engineering applied by different companies which design a driver seat with accurate measurement is focused on the static and dynamic comfort zone. Both comfort zone with the equal measuring help to develop the proper posture right angle and neck inclination of human body, free from physical and mental pressure. Thus, to improve the shape and design of car drivers seat make comfortable driving and as well as safety to driver and passenger both. The expectation of the customer in the present time is more on the safety and comfort of the driving as well as sitting posture, so this is the main challenge for the designing companies to fulfill the needs and requirement of customer with proper sitting adjustment in car designing.

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