Car seats:
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The modest car seat has come of age, or has it. The average driver does not really appreciate the passive\(^1\) and active\(^2\) safety aspects of a vehicle, in modern vehicles there are many, the seat itself forms part of these.

The seat consist of the following basic sections: frame, seat bracket, seatback, seat cushion and upholstery, there are other components such as arm rests, suspension, mechanical or electrical components and others, however these are the basics.

There has been extensive development in the seat; arguably the most important is that of the move many years ago from the “bench seat” to individual seating, however there are many developments that have taken place over time that sees our vehicles now equipped with far safer seats.

The seat forms a crucial role, it is designed to be comfortable however most importantly, it performs the dual role of allowing a driver to safely and correctly operate the vehicle, and likewise to provide as much safety as possible in the event of a crash.

Considering the issue of vehicle operation, which is well researched and documented\(^3\), a vast number of drivers do not position themselves correctly. Advancements in the seat, such as individual seat positioning help to attain and maintain the drivers correct positioning during general driving; perhaps most importantly during harsh braking, cornering or evasive actions; through such advancements as bolstering the sides of the seatback and seat cushion, likewise, the “recessing” of the seat cushion as well as other factors such as tilt and height control, and even the fabric itself all assist in reducing the occupants movement from the ideal positioning during driving.

The effects of the “safety” of the seat, in terms of its ability to reduce injuries to the occupant in a crash, is somewhat logically apparent from the effects offered as just mentioned, in that the effects offered by the seat in allowing greater control of the vehicle cross pollinate to serve as a reduction in physical injury. As an example of this, the inclusion of “side bolstering” and recessing of the seat cushion reduces lateral movement and forms, to some extent, a cushion against the contact of the body with structural intrusion during lateral impacts\(^4\), similar to that achieved by the side airbags. Similarly, the combination of the recessing of the seat cushion, the tilt control and the correct fabrics used on the seat also serves to reduce forward slide, such as that experienced during a head-on type crash, therefore assist in reducing lower limb injuries.

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\(^1\) Such as a seatbelt
\(^2\) Such as ABS
\(^4\) Lateral impacts identified as one of the most dangerous impact types / Reducing primary and secondary impact loads on the pelvis during side impacts – Allan F. Tencer; Robert Kaufman; Phillipe Huber; Charles Mock; M L Route / Lateral automobile impacts and the risk of traumatic brain injury - Jeffrey J. Bazarian, MD, MPH / a plethora of other research papers indicate likewise.
Another crucial inclusion on the seat has been the “headrest”; although on some seats this is a separate component (removable), and on others is part of the structure of the seatback, either way, the headrest is a crucial piece of the seat. Once again, extensive research and development has taken place over the years regarding this section of the seat, and has seen many different designs and technical parameters develop around the headrest. In essence, the headrest serves to minimise the injury to the upper sections of the spine and the head.

Extensive testing is ongoing on seat development, this R&D is undertaken by both the manufacturers, and or private companies on their behalf, and is also researched to some extent by entities such as Universities. Seat testing is usually linked directly to what is termed occupant kinematics, where seat design usually aims at ensuring that the occupant, and in particular the head, neck and spine is protected during all types of crash scenarios.

It is extremely difficult to quantify precisely to what extent the seat itself reduces the overall costs of an accident, however it is somewhat logical that the seat will and does assist in the reduction of injury, this was identified long ago and has spurred research and development on this particular item. Development of modern procedures, materials and technology have also allowed far greater advancements in the simple seat’s assistance to a safer vehicle.

So, the next time you get into your vehicle, remember that the seat you occupy has developed over many years, and serves a very important role in making your trip as comfortable as possible, as controllable as possible and perhaps most importantly, as safe as possible.

Safe driving

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5 Relationships between seat properties and human subject kinematics in rear impact tests - Welcher JB, Szabo TJ / Seat design principles to reduce neck injuries in rear impacts - Viano DC / Lateral automobile impacts and the risk of traumatic brain injury - Jeffrey J. Bazarian, MD, MPH

6 Whiplash injuries are common in rear impacts. While the mechanisms by which the injuries are caused are not fully understood, it is known that seat and head restraint design can influence the risk of injury. Euro NCAP assesses the geometry of the restraint in relation to the head and tests the seats in three severities of impact – high, medium and low – using a dummy specially designed for rear impacts. Seats at the top of the table are likely to offer better protection than those at the bottom.