# Afgestudeerd

FYSIEK

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## Designing an innovative backseat for comfortable working and relaxing in a car

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### Introduction

Current car seat development has been primarily focusing on enabling the drivers' designated task instead of car passengers' needs. As a result the shape of the seats and the limited space within the car dictates car passenger's postures and activities. However, car manufacturers should consider car passenger's needs and desires regarding two scenarios. The first consists of the current situation of a person being chauffeured. The second is the future scenario of an autonomous driving car. Both scenarios allow people to use their travel time for other activities than driving.

Within this context, the challenge of this design project was to develop an innovative backseat for passengers to comfortably perform their desired activities. Furthermore, trends show that the use of mobile devices (tablets, e-readers etc.) will continue to increase. These devices could be used for entertainment, but people could also use their travel time for work. Thus, the future car interior should support these activities.

### Method

User research has been an integrated part of this design project. First, to create input for the design the car passenger's (30 subjects) posture and experience were evaluated when using mobile devices in the backseat of a driving car (figure 1). Next, the designed armrests armrests (figure 2) were evaluated on comfort, posture and experience during another user research.

The armrests were developed to support the arms in such way that a higher position of the handheld device is achieved (improving neck posture). The goal of the research was to evaluate the effects on neck flexion, subjective (dis)comfort and user experience. Neck flexion was measured by determining the angle of the line C7-tragus (according to Young e.a., 2012). Subjective (dis)comfort was determined by scores (scale 1-10) on a body map (filled out by participants in a procedure according to Grinten & Schmitt, 1992). The user experience was evaluated in elaborate interviews with the participants. Ten subjects participated in this research (age: mean 36.8, sd 18.1, height: mean 174.4, sd 10.4).

### Results

The posture analysis of the first research (figure 1) showed that people were seeking support by using the middle console and were crouching over the device resulting in neck flexion (figure 3, right). In the other observed posture, subjects tilted the screen to enable a better viewing angle resulting in wrist flexion (figure3, left). The subjects also reported that they missed support for the arms and the tablet.

Based on the results of this first research, armrests have been developed which support a higher position of the hands and device, while enabling a relaxed posture of the arms. This higher position should decrease neck flexion and increase comfort. For the second user research, a mock-up of the design was built (figure 4).

Results of this second user research show that neck flexion is decreased significantly and corresponds with what is described as neutral in literature. Furthermore, discomfort is considered decreased for the neck and the arms and comfort increased for the neck, the arms and the hands (figure 5). Discomfort was not decreased in the hands due to problems with holding the device while interacting with it. Therefore, design improvements are necessary. The participants preferred the configuration with armrests and described the resulting posture of the arms as natural. Thus, the designed armrests are promising, although further evaluation in a dynamic situation is necessary.

**Figure 1. Using a tablet in the backseat of a car**

**Figure 2. The innovative armrests**

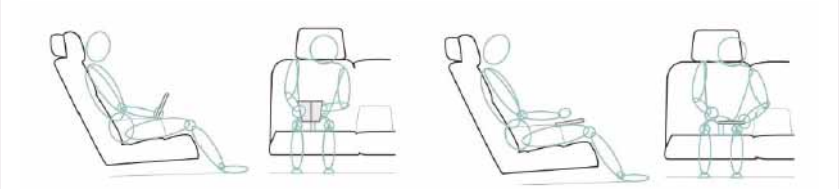

**Figure 3. The observed body postures for using a tablet device in the back of the car**

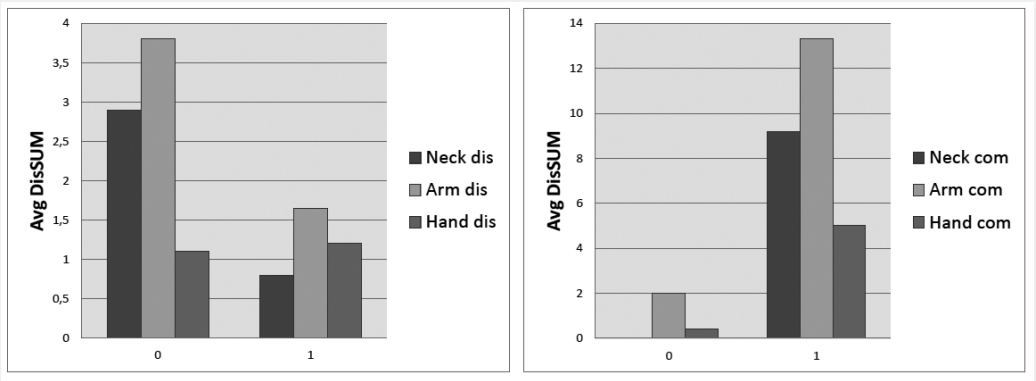


**Figure 5. Average of the total (dis)comfort per body area at position 0 (no armrests) and position 1 (armrests)**

**Figure 4. The mock-up of the armrests**

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