Introduction

Background:
Current guidelines from the American Academy of Pediatrics (AAP) recommend that children ride in rear-facing child restraint systems (RF CRS) for as long as possible, or at least until age two. However, many parents transition their children to forward-facing (FF) CRS before the recommended milestones. A major reason for premature transition is the parental belief that the child is not comfortable in a RF CRS. This study aims to compare the comfort of children in FF vs. RF CRS in order to demonstrate the practicality of the AAP guidelines for children near two years of age.

Project Objectives:

- **Objective 1**: Identify the key variables for quantifying comfort levels in two year old children, including physical indicators as well as parental perception.
- **Objective 2**: Record and analyze video footage of children in RF and FF CRS in a controlled laboratory setting while collecting simultaneous feedback from parents.
- **Objective 3**: Install small video cameras in families’ vehicles and analyze the children’s comfort level in real-world driving situations.

Results:
The quantitative scores given by parents reflect a perception of greater discomfort in RF CRS compared to FF CRS ($p=0.003$). An ANOVA revealed a correlation between children’s leg lengths and parent-reported discomfort scores in RF ($p=0.005$). However, unbiased scores assigned by researchers reviewing the footage reflected no significant difference in RF and FF scores ($p=0.171$). Unbiased video movement scores were not significantly affected by anthropometric variables such as weight, height, or leg length ($p=0.054$). Real-world driving trials also demonstrated similar score distributions in RF and FF configurations.

Conclusions:
The results of this study support the practicality of AAP guidelines, as RF CRS do not appear to cause discomfort in children near the age of two. By better understanding the comfort of two-year-old children in each orientation, parents can be educated on the importance of safety over the perception of comfort. In addition, this study allows pediatricians and Child Passenger Safety Technicians to be better armed with data to respond to this common parental concern.

Methods

**Phase I**: Twenty-three children between the ages of 22-26 months were recruited for this phase of the study. They were placed in a rear-facing CRS and a forward-facing CRS for 20 minutes each. Their comfort was scored by their parents on a scale of 0 (very comfortable) to 6 (very uncomfortable) every 5 minutes. Their movements were recorded and later scored by researchers on a scale of 0 (very comfortable) to 3 (very uncomfortable) every 30 seconds. These scores were based on the amount of movement, stretching, and reaching that the child exhibited in each orientation.

**Phase II**: Three children between the ages of 22-26 months were recorded during real-world road trips for a total of three weeks. Recording sessions included each child’s initial transition from the rear-facing to forward-facing configuration. Comfort scores were assigned using the same scale as Phase I.

Comparison of RF and FF comfort scores, as assigned by researchers every 30 seconds during Phase I. No significant differences between RF and FF scores exist ($p=0.171$).