

## Child Injury Prevention Studies (CChIPS)

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### **Comparing FMVSS 213 Sled Test to the Full-Scale Vehicle Crash Environment**

The objective of this work has been to evaluate the fidelity of the Federal Motor Vehicle Safety Standard (FMVSS) 213 sled test for testing child restraint systems to current vehicle crash tests. To do this, Maltese et al. reviewed over 1200 NHTSA vehicle frontal crash tests and evaluated pulse characteristics such as the length of the pulse, maximum acceleration, time at maximum acceleration, maximum velocity, and rise rate (max acc/time at max acc). These characteristics were then compared to FMVSS 213. It was known that the FMVSS 213 pulse onset rate and maximum acceleration were similar to that of light trucks, SUVs, and small school buses - none of which are typical family vehicles.



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CChIPs researchers demonstrated that the maximum acceleration of the FMVSS 213 test is similar to a sedan or minivan in a 25 mph full frontal rigid barrier crash test or a 35 mph offset deformable barrier crash test. The FMVSS 213 rise rate is similar to a SUV or pickup truck in a 35 mph offset deformable barrier crash test. The researchers also demonstrated that forward-facing child restraints significantly reduce pediatric injury risk compared to vehicle 2 belts alone. Therefore, it is not clearer that in order to properly assess the efficacy of child restraint systems, they need to be tested in crash environments similar to current vehicles.

Advantages over previous methodologies: The current regulatory standard for child restraint systems, FMVSS 213, is over 30 years old. While it was known in the industry that the protocol was outdated and not representative of the modern-day vehicle fleet in geometry or stiffness, there were no studies that illuminated these disparities. Therefore, this CChIPS work provided much needed scientific evidence to support the development of a child seat crash test protocol that deviated from FMVSS 213.

The end-user product/processes ramifications are numerous. In April 2014, Consumer Reports launched its new child seat crash test protocol that implemented the Maltese et al research findings. The new protocol implemented a frontal crash pulse that differed from FMVSS 213 in maximum acceleration, onset rate, and maximum velocity but more closely replicated the averages for those attributes as summarized from the study. These pulse characteristics were chosen to better represent the current vehicle fleet crash testing.

**Economic impact:** Use of the results of the Maltese study team eliminates the need for Consumer Reports (CR) to independently analyze actual crash data or to conduct its own crash tests to determine crash attributes for duplication. It is estimated that approximately \$350,000 was saved by CR in utilizing the results of the study.

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