

*Energy Absorption Test  
Linear & Pendulum Impactors  
Braced & Unbraced*

*Head Restraint Informal Working Group GTR Meeting  
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*Draft*

# *Objective*

- **Evaluate the linear impactor and the pendulum impactor in the energy absorption test.**
- **Evaluate the effect of bracing the seat back when conducting the energy absorption test.**



# *Test Method*

- **Seats: Driver & Front Passenger from a 2005 Kia Rio**
- **12 Energy Absorption Tests conducted**
  - 4 tests, 3 seats per test
    - Pendulum impactor, seat braced
    - Pendulum impactor, seat unbraced
    - Linear Impactor, seat braced
    - Linear impactor, seat unbraced



# *Test Method*

- **Energy Absorption Test Procedure**
  - Pendulum test per ECE 17
  - Linear Impactor test per FMVSS 202
- **Seat setup per FMVSS 202 for all tests**
  - 25 degree Seat Back angle
- **Head acceleration measured**
  - 3 ms clip



# Results

Test Type	Pendulum		Linear	
Brace Condition	No Brace	Brace	No Brace	Brace
	20.4	24.3 <sup>†</sup>	25.6	30
	21.9	27.5 <sup>†</sup>	25.3	28.5
	19.8 <sup>†</sup>	22.6 <sup>†</sup>	26.4	26.7
<b>Average</b>	<b>20.7</b>	<b>24.8</b>	<b>25.8</b>	<b>28.4</b>
<b>Standard Dev</b>	<b>1.08</b>	<b>2.49</b>	<b>0.57</b>	<b>1.65</b>

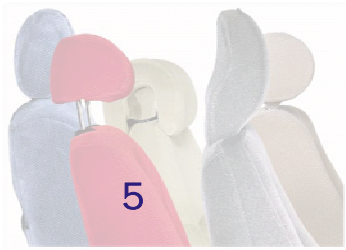
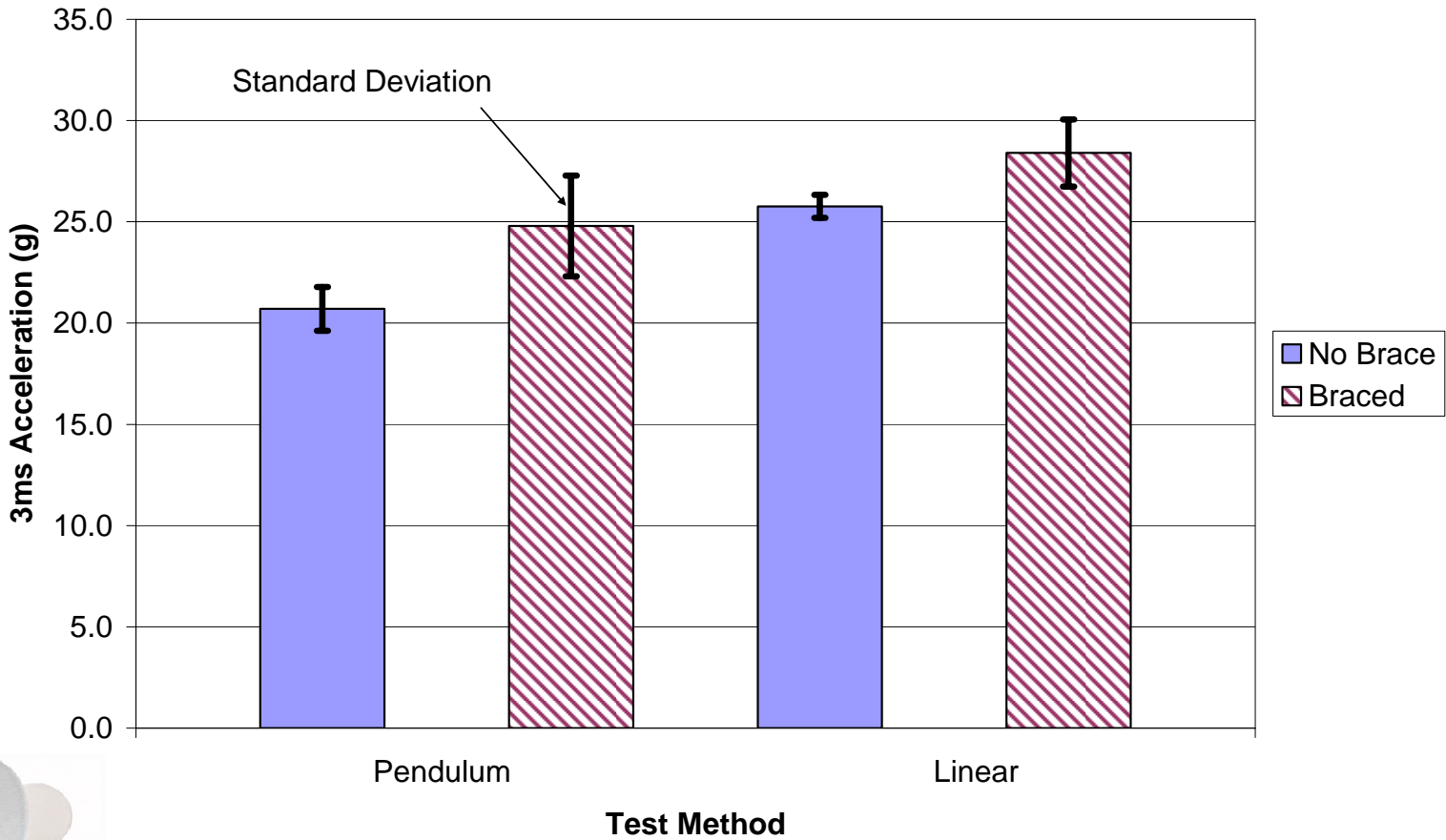
<sup>†</sup>Drivers Seat. All others are passenger seat.

- All results are far below the performance limit of 80g.
- The worst result was 36% of the limit.



# Results

## Energy Absorption Test



# Conclusion

- If the seat back is braced there is no significant difference in the acceleration between the pendulum and linear impact tests.
- Linear Impact - No significant differences between the bracing conditions.
- Difference between the no-braced pendulum test and the no-braced linear test is statistically significant ( $p=0.03$ )
- Caveats
  - Sample size is small
  - Only one make/model seat was tested

