Posture and Belt Fit in New Booster Configurations

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Background

- Belt-positioning boosters reduce injury risk compared with seat belts alone
- “Boosting” (raising) the child, has several benefits:

→ shortens the effective seat length, potential reducing slouching

→ increases lap belt angle, potentially improving belt fit and reducing submarining risk

→ improves fit of shoulder belt

→ raises the child’s head into a range better protected by side airbags

Objective and Approach

Objective:

Quantify differences in posture and belt fit across a range of boosters, including two atypical boosters

Approach:

Laboratory study with volunteers with six boosters in three mockup conditions

Boosters

Photos have different scales

A

Britax Pioneer Harness2Booster

B

Lil Fan Backless Box Seat

C

Graco 4Ever 4in 1

D

Graco TurboBooster Highback

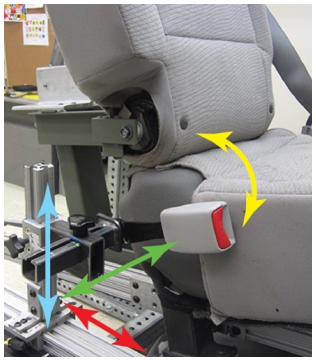
E

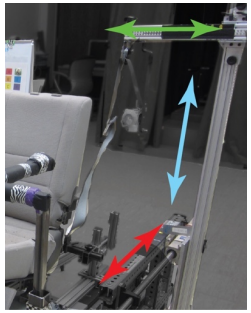
Combi Kobuk

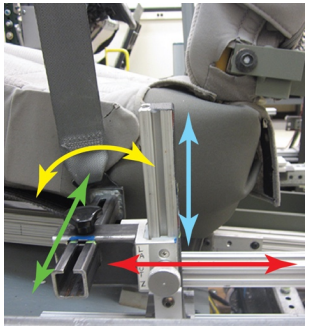
F

Safety 1st Incognito

Mockup

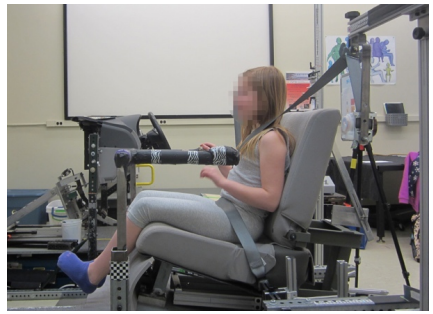






1

CL: 465 mm

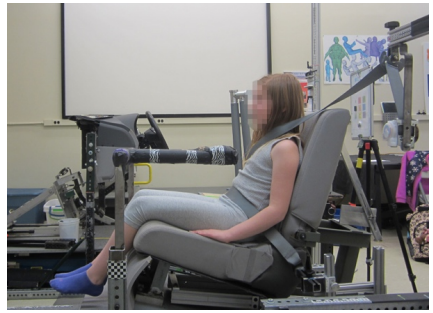


2

CL: 495 mm

3

CL: 523 mm



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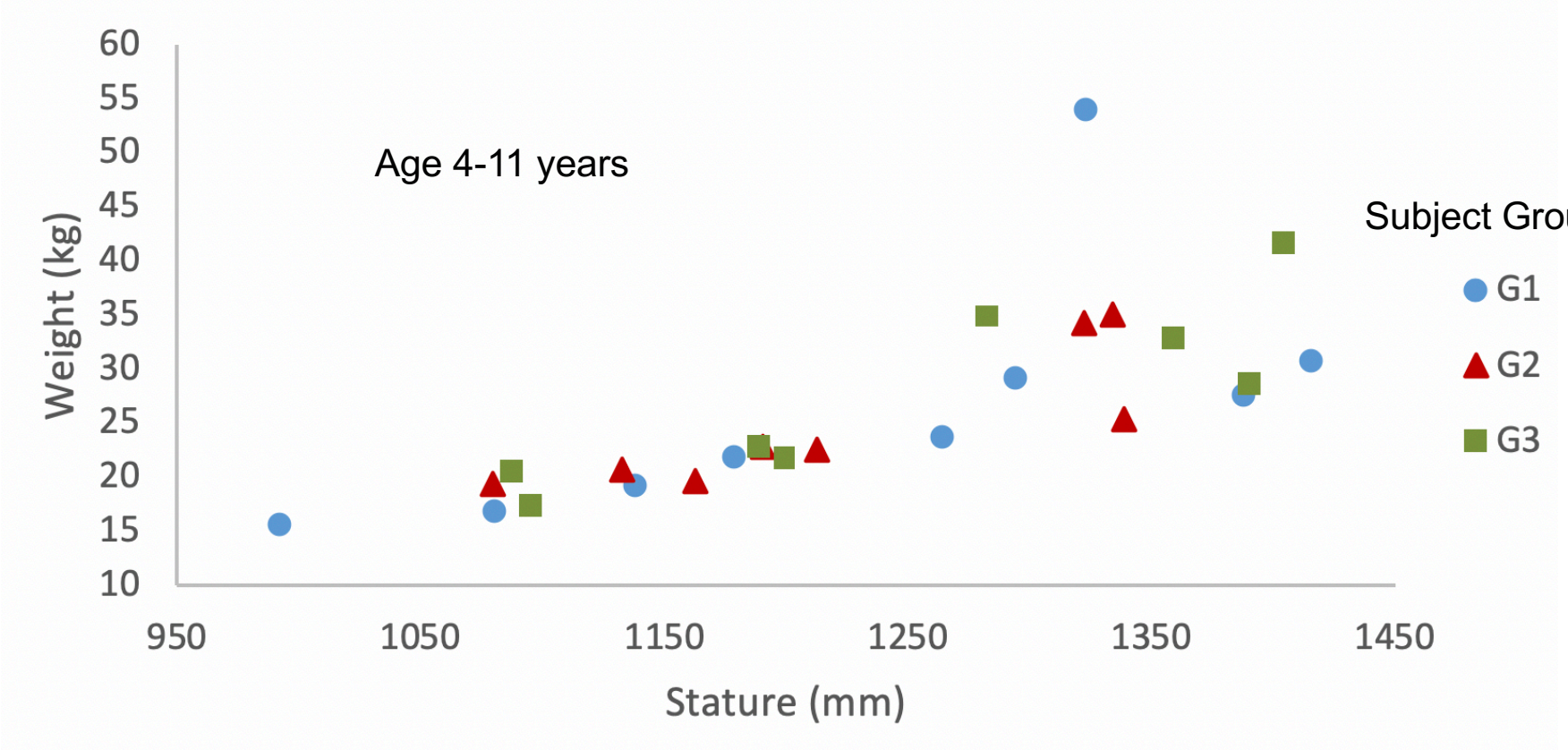
Participants (N=24)



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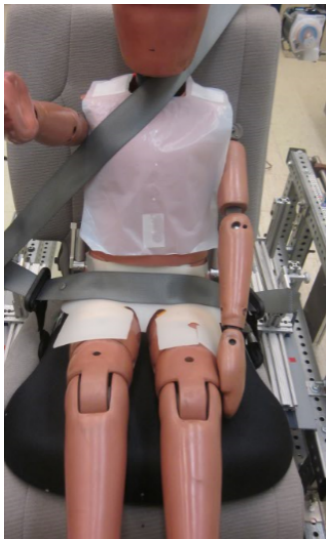
ATD Positions

Hybrid-III 6YO posture and belt fit were recorded in each condition using belt fit measurement procedures developed by UMTRI and IIHS

Pioneer

Kobuk

4ever

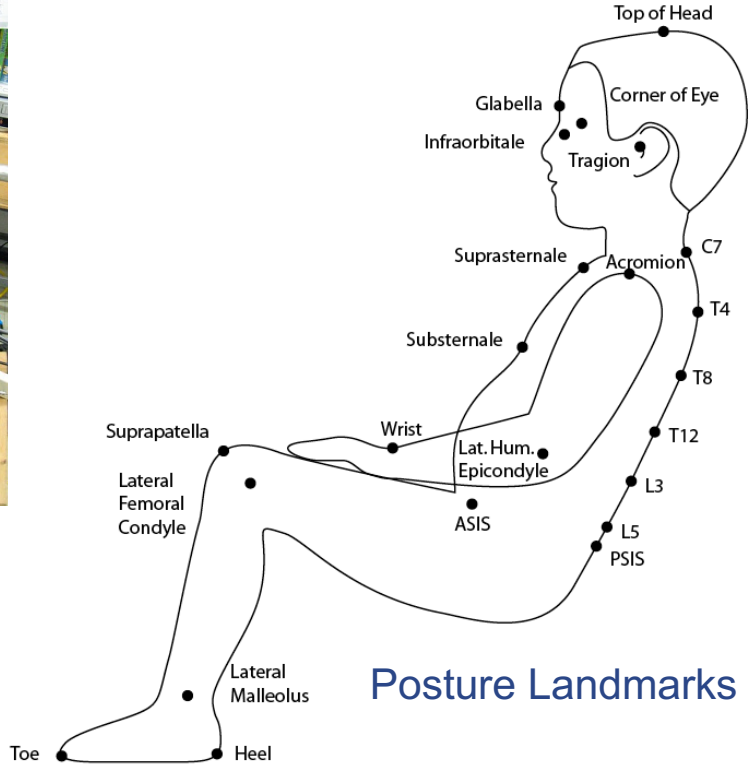


Incognito

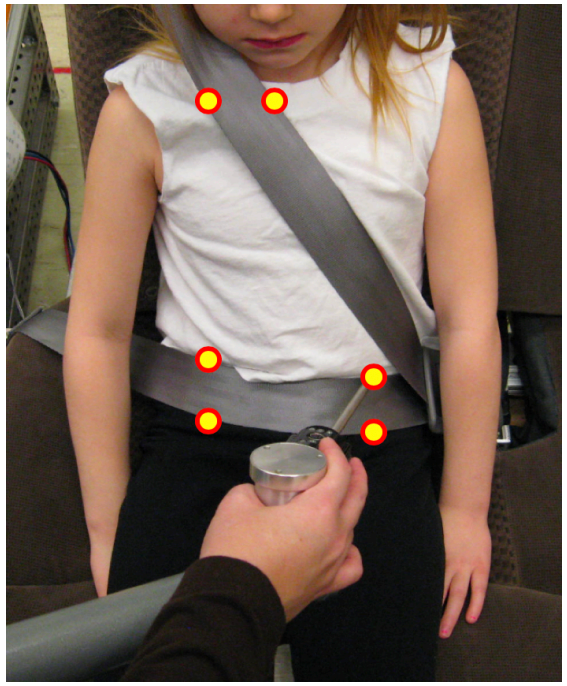
M | UMTRI

Posture Measurement

Spine and Pelvis Measurements



Posture Landmarks



Belt-Fit Landmarks

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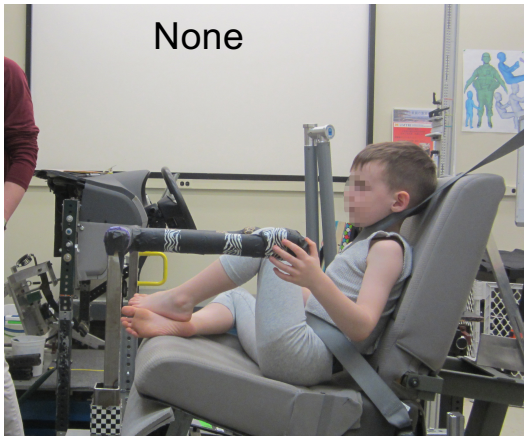
Child Posture (Qualitative)



Long-cushion condition

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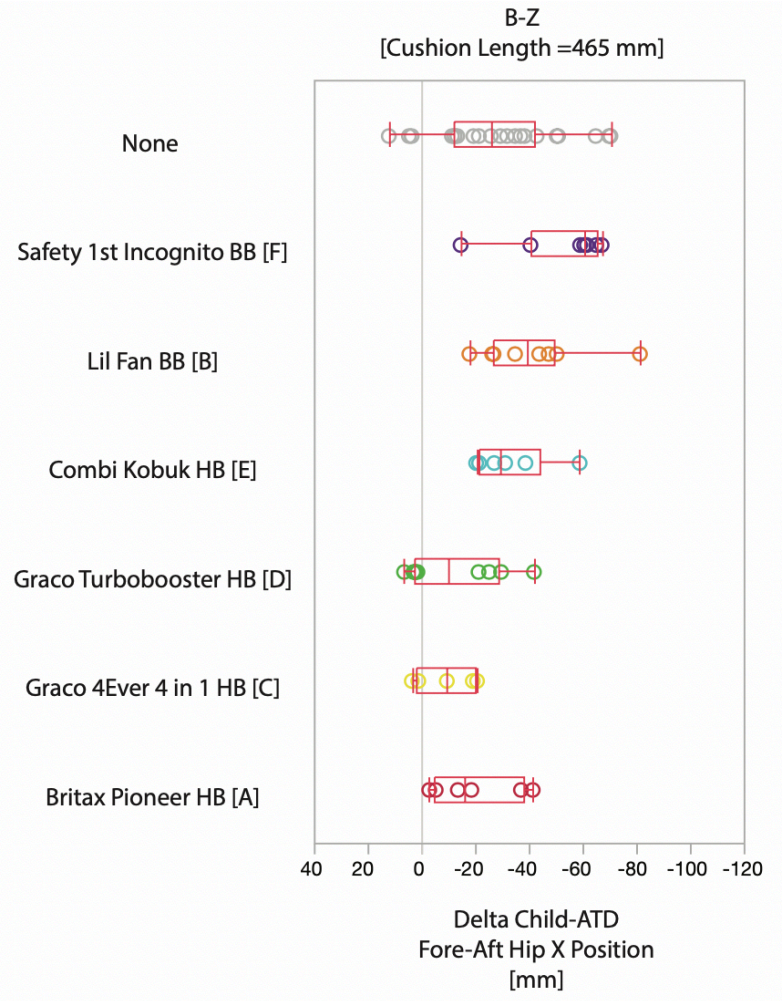
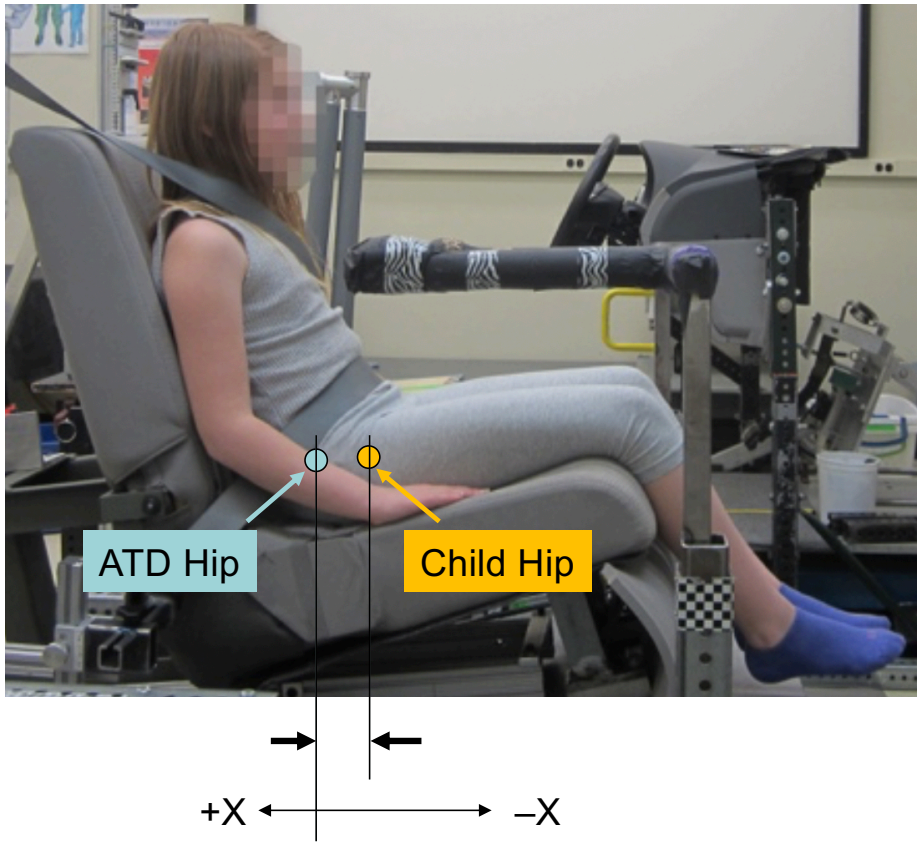
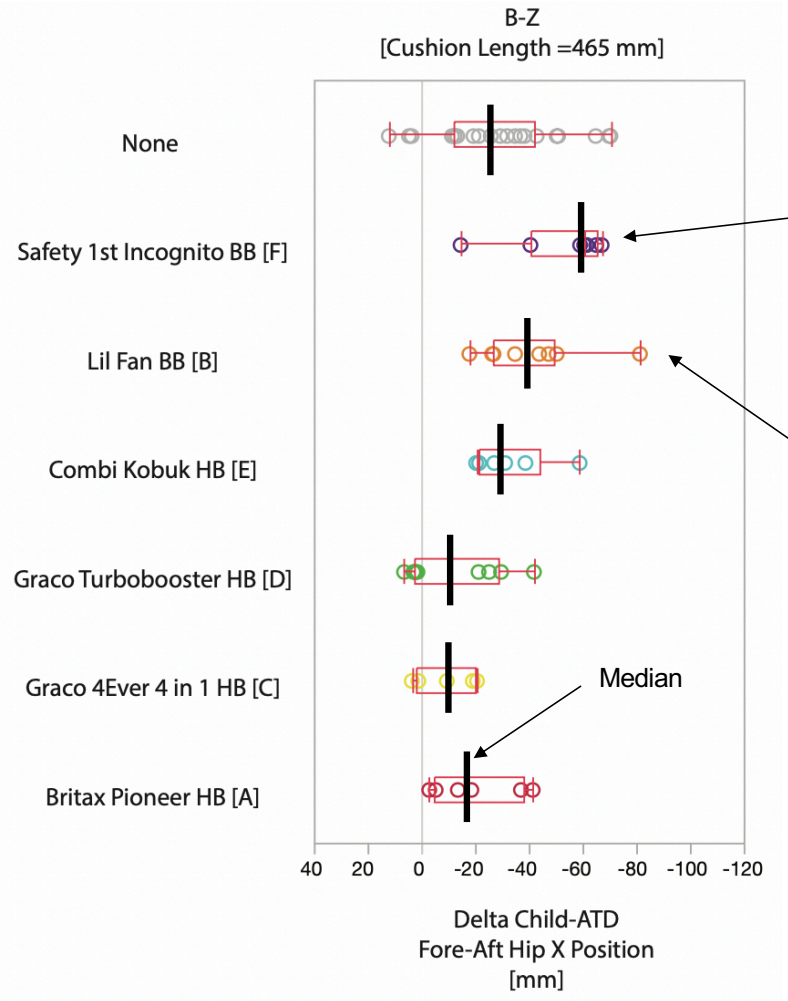
Results: Hip Location



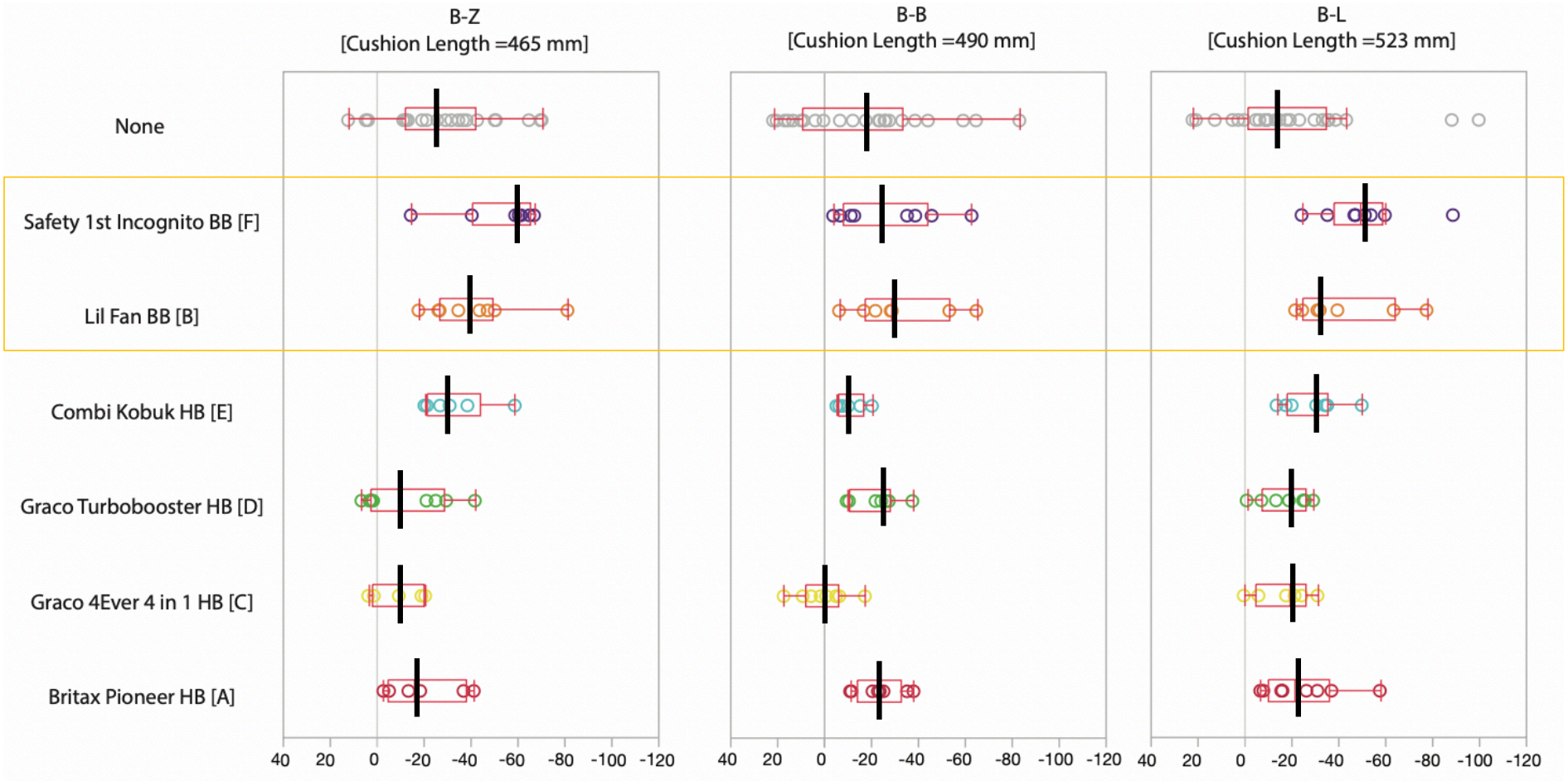


Results: Hip Location

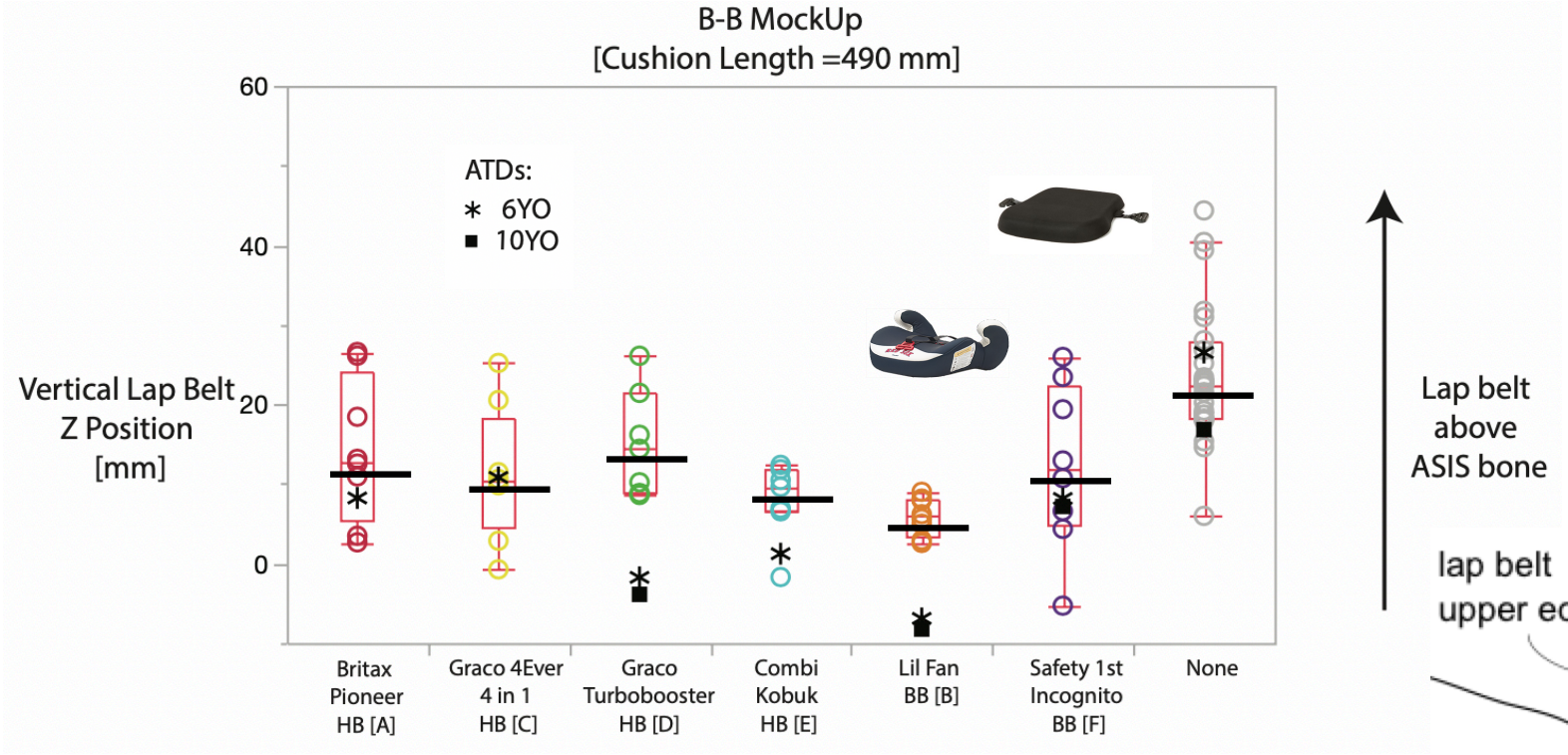


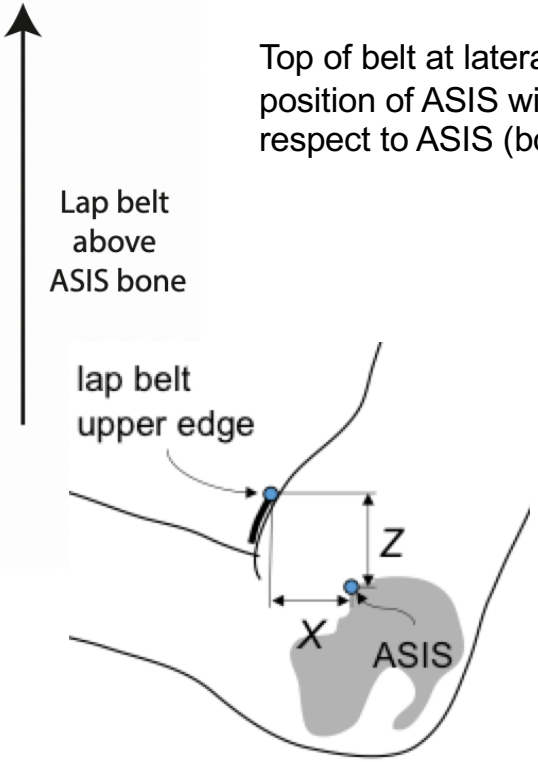
Child hip is forward of ATD (more slouched)

Results: Hip Location



Results: Lap Belt Fit





Top of belt at lateral position of ASIS with respect to ASIS (bone)

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Discussion

- Dynamic performance is what ultimately matters, but **good static posture and belt fit are necessary pre-conditions** for good crash protection
- Two low-height boosters produced postures that were **more slumped** (hips further forward) than in other typical boosters
- Lap belt fit in the low-height boosters **was not meaningfully different** from the other boosters

Acknowledgement

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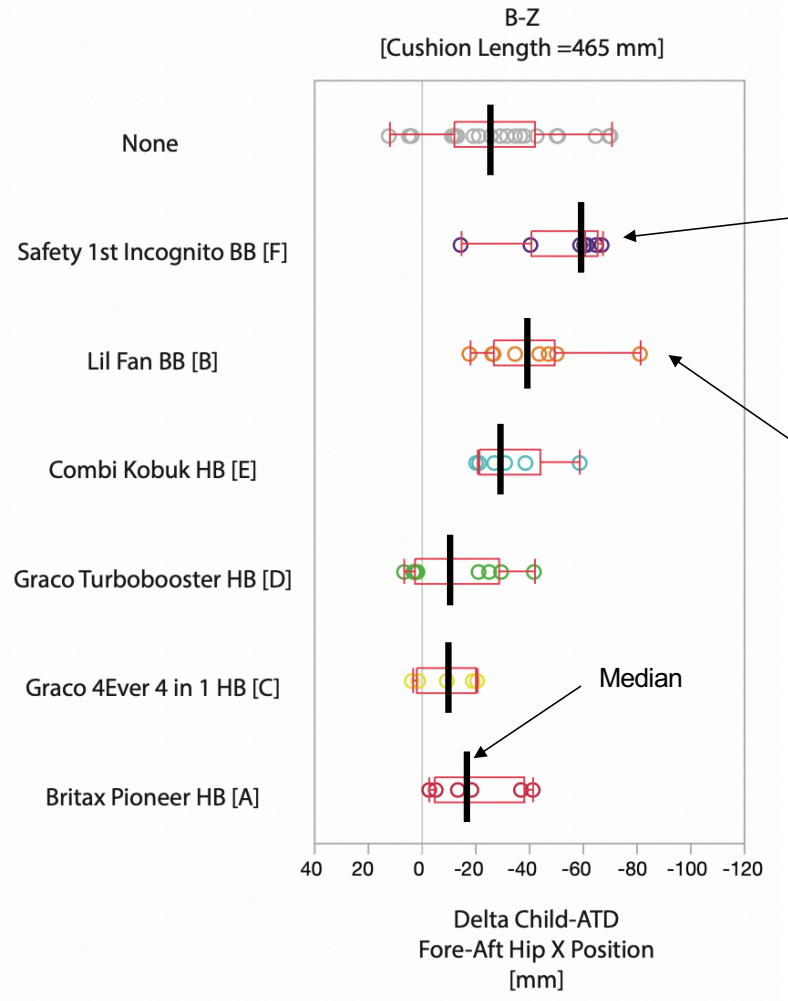
Results: Hip Location



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