

Data & Worked Calculations

BTB - Beat the Brakes | General Physics

Question: How does road surface affect the mean stopping distance of a toy car?

Setup: 25 cm ramp; same car and release point; no push; front wheels used as the measuring reference.

Our prediction: 90 cm = 0.90 m.

All nine trials reached the road end before stopping naturally. Values are recorded travel distances, not valid natural stopping distances.

Surface	Trial 1 (cm)	Trial 2 (cm)	Trial 3 (cm)	Mean (cm)
Smooth cardboard	100	100	100	100.00
Felt	100	95	98	97.67
Sandpaper	85	90	95	90.00

MEAN = (TRIAL 1 + TRIAL 2 + TRIAL 3) / 3

Smooth cardboard

$(100 \text{ cm} + 100 \text{ cm} + 100 \text{ cm}) / 3 = 300 \text{ cm} / 3 = 100.00 \text{ cm}$

Convert to metres: $100.00 \text{ cm} / 100 = 1.000 \text{ m}$

Felt

$(100 \text{ cm} + 95 \text{ cm} + 98 \text{ cm}) / 3 = 293 \text{ cm} / 3 = 97.67 \text{ cm}$

Convert to metres: $97.67 \text{ cm} / 100 = 0.977 \text{ m}$

Sandpaper

$(85 \text{ cm} + 90 \text{ cm} + 95 \text{ cm}) / 3 = 270 \text{ cm} / 3 = 90.00 \text{ cm}$

Convert to metres: $90.00 \text{ cm} / 100 = 0.900 \text{ m}$

Conversion: 1 m = 100 cm. Means were calculated from the original values before rounding. Tables show cm to two decimal places and metres to three decimal places.

WHAT THESE CALCULATIONS CAN TELL US

These are arithmetic means of the recorded distances. They do not give mean natural stopping distances, because none of the nine trials stopped naturally. A longer road and repeated valid trials are needed. Do not replace the reported values with guessed stopping distances.

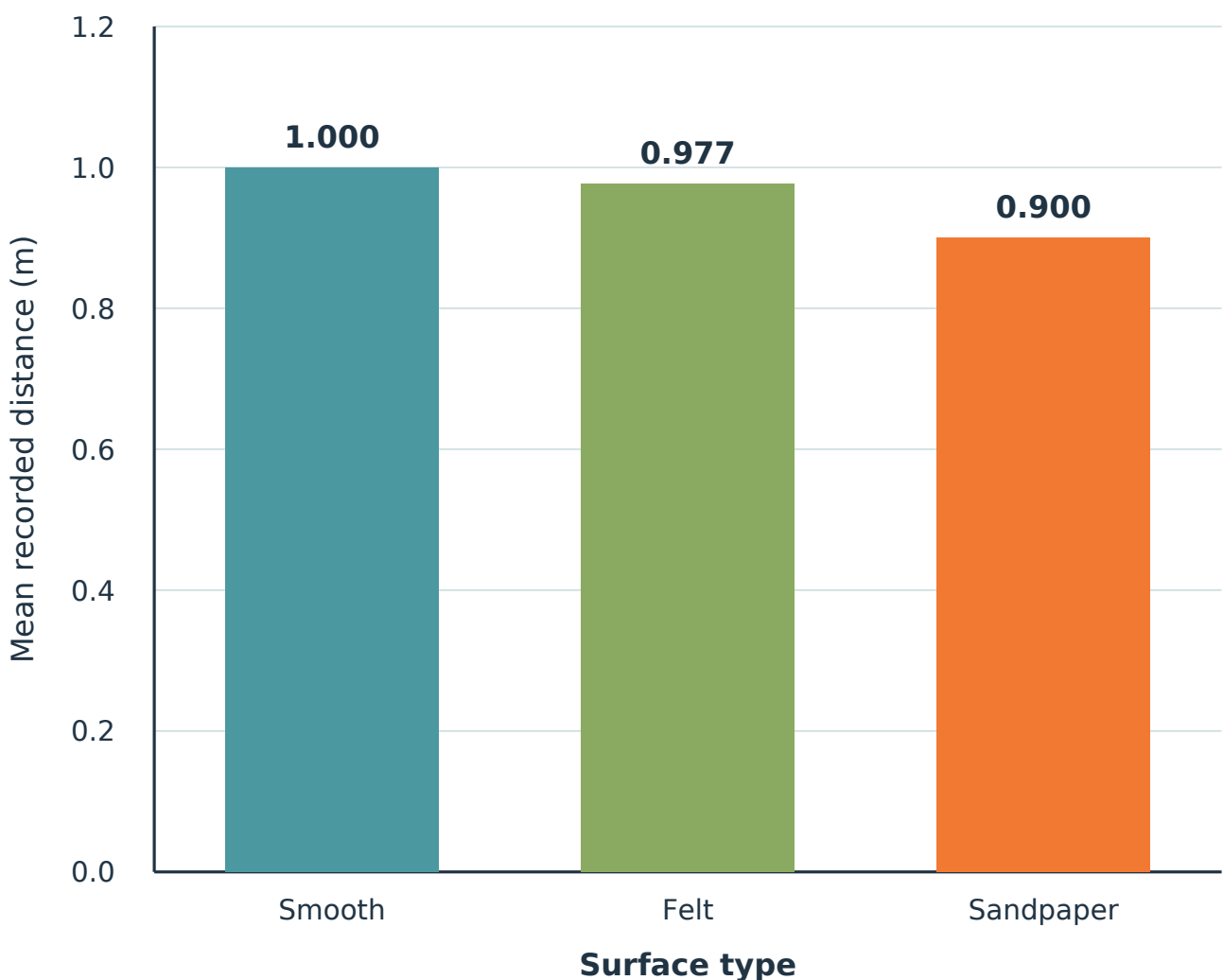
Recorded Results Graph

BTB - Beat the Brakes | General Physics

Mean recorded travel distance by surface

Fixed ramp height: 25 cm | Three reported trials per surface

All nine trials reached the road end before stopping naturally. Values are recorded travel distances, not valid natural stopping distances.



Smooth: 1.000 m | Felt: 0.977 m | Sandpaper: 0.900 m

Bars summarize reported values only. All trials ended at the road limit; therefore the true stopping-distance comparison is inconclusive.

Conclusion & Trial Validity

BTB - Beat the Brakes | General Physics

The recorded means were 1.000 m on smooth cardboard, 0.977 m on felt and 0.900 m on sandpaper. These numbers describe the reported road-limited runs. Because every car run reached the road end, we cannot determine the true mean stopping distance or reliably rank the surfaces by it. The 0.90 m prediction cannot be confirmed. Extend the flat road and repeat three natural-stop trials per surface at one fixed height.

VALIDITY RECORD

Natural-stop trials: 0 of 9.

Road-end-limited trials: 9 of 9 (group confirmation).

Other unexpected problems: none reported.

Requested improvement: a longer flat road.

NEXT TEST

Extend the flat road so the car can stop before reaching the end. Keep the release height fixed at 25 cm for all surfaces if sufficient road is available. If extending it is not possible, select a lower fixed height for a new investigation and repeat all three surfaces at that height. Do not mix new-height trials with the 25 cm data.

WHAT TO SAY DURING THE SHOWCASE

Our model worked as a rolling-car demonstration, but the road was too short for natural stopping. We recorded the distances reached and identified that limitation. We cannot claim a valid stopping-distance ranking from these trials. Our next improvement is a longer road followed by repeated natural-stop trials.