What students actually do in a hallway

N = 208 students
7 corridor configurations

Standard pedestrian models assume everyone walks at the same predictable speed and acts independently. Adolescents in a school don't: they move in friend groups, get distracted by their phones, and cut corners. Before modelling the new building, we needed to measure how big these effects actually are.

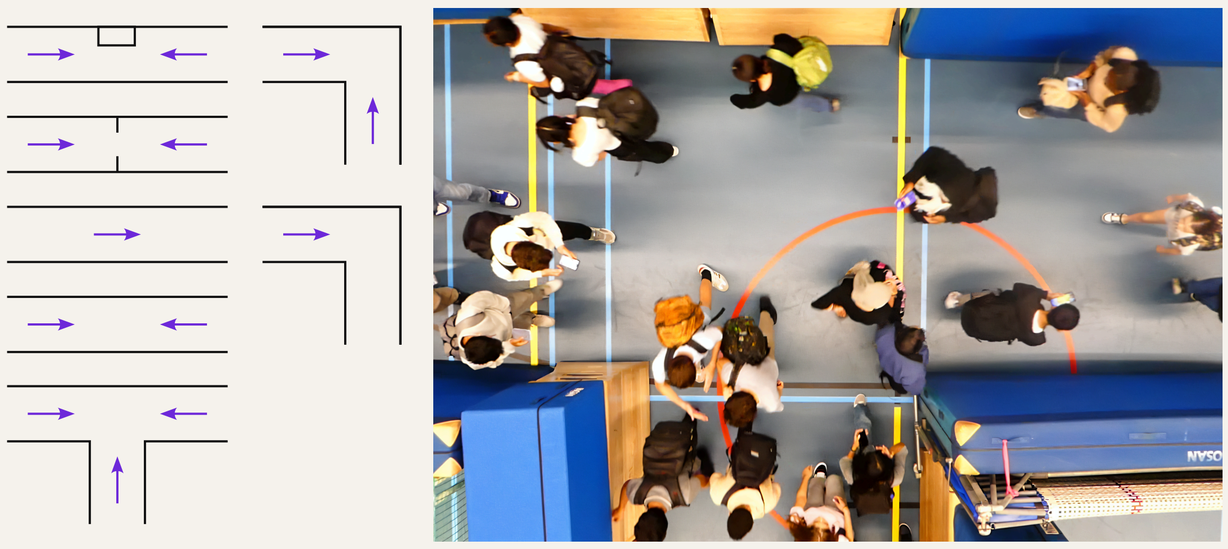
PROCESS

Setup.
We built seven corridor configurations — a straight section, bidirectional counterflow, an obstacle, a doorway, a corner, a corner with someone standing at the apex, and a three-way T-junction — out of gym equipment in the current school's sports hall, filmed from 7.5 m overhead. 208 students aged 11–19 ran through them in groups of 15–60, each scenario repeated once with an instruction to use a phone while walking. A separate, uninterrupted walk by 41 students, alone and without a destination to rush to, gave us a clean baseline walking speed.

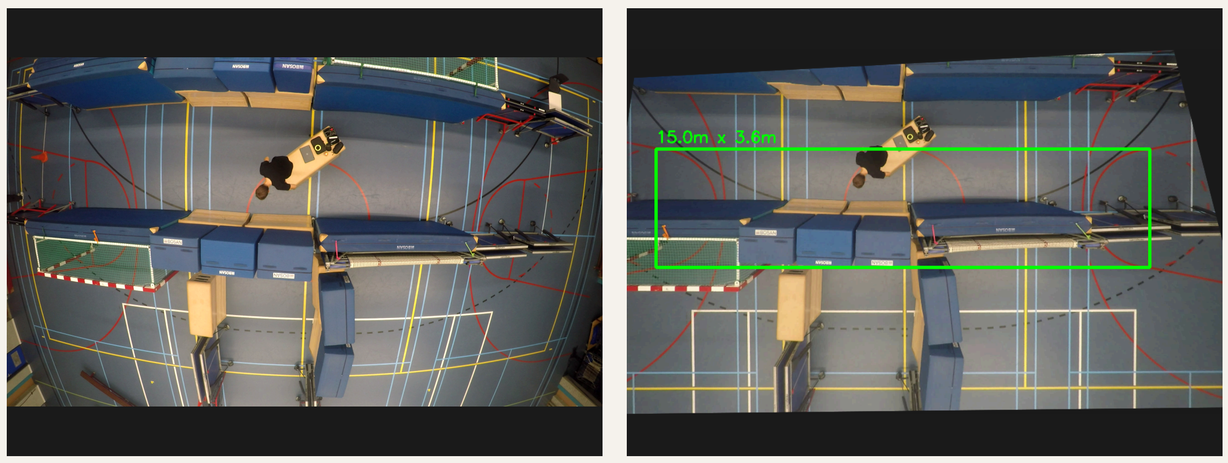
Correcting the camera view.
Wide-angle overhead footage bows straight corridor lines into curves. Before any position could be measured accurately, every frame needed correcting: we filmed a moving checkerboard pattern to calculate the lens's distortion coefficients, then applied that correction to flatten every frame into true, measurable coordinates.

Why we corrected by hand.
Fully automated tracking was attempted first, but occlusion and overlapping bounding boxes during group passage made it unreliable — the software would lose or swap students mid-cluster. Positions were instead selected manually on sampled frames and interpolated into continuous trajectories, trading automation for accuracy.

1 CORRIDOR SETUPS & OVERHEAD VIEW



2 LENS CALIBRATION, BEFORE / AFTER



UNCORRECTED — AFTER CALIBRATION

WHAT WE FOUND

1. **Groups move as one unit.**
Friend groups stay together through a corridor, narrowing the width actually usable for movement. At a T-junction, the whole group follows whichever direction the first person picks — nobody re-decides individually, so splits happen fast and are hard to predict lesson to lesson.

2. **Phones cause real stalls, not just slower walking.**
Distracted students drifted sideways and stopped without warning. At a corner, one distracted student stopping — worsened further when someone was already standing at the apex — was enough to jam the whole group behind them.

3. **Corners get cut, hard.**
Every student who took a turn cut the inside of it, without being told to. That concentrates the highest density exactly where the corridor is narrowest.

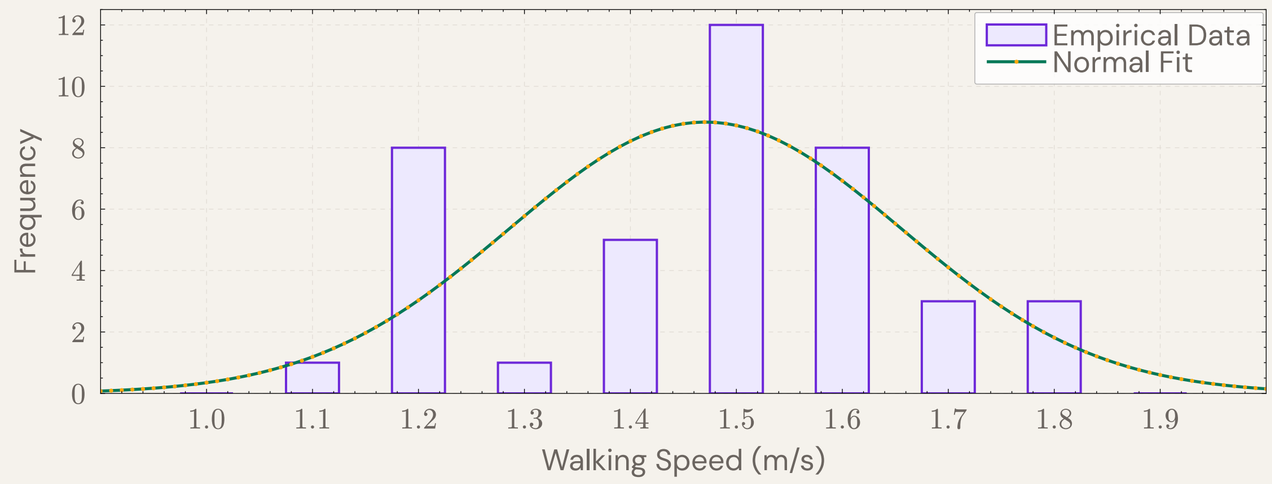
4. **Doors get rushed, not shared.**
Groups pass through a doorway as a cluster — once the first person goes, the rest follow without checking the oncoming stream. This effect is known as *bottleneck oscillation*.

> *Classes waiting outside a locked classroom don't just take up space — they expand to fill the entire corridor, blocking it completely, regardless of how wide the corridor is. Widening a corridor didn't help in our tests; only opening the door on time did.*

1.47 m/s

Free-walking speed, $\sigma = 0.19$ m/s, measured from 41 students walking alone and unhurried — the baseline every slower measurement in this experiment (corners, doors, obstacles) is measured against.

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