ENGINEERING

Experience Doesn't Matter, but the Direction Does

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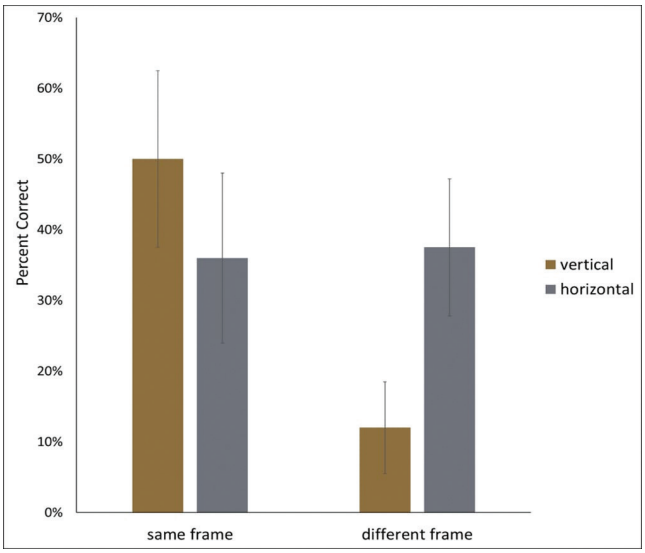
There is disconnect between students' intuitive expectations for object motion and normative scientific concepts that define such motion. As people gain intuition and understanding of physics through observing and interacting with their surroundings, one might expect that this disconnect would disappear. However, many students have extensive experiences where they behave correctly yet continue to construct incorrect explanations. In this study, 53 non-STEM undergraduate students enrolled in a physics course that had yet to cover the topic of relative motion were given a survey of common relative motion physics problems. The problems differed in the direction an object is thrown—either vertically or horizontally—and the frame of reference in which the reader is placed. The questions then involved subjects who were either stationary or moving, such as being on a skateboard or a bus.



The percentage of correct answers has a strong correlation to the frame of reference of the subject in the survey.

We found that the direction of the throw relative to the motion of the person (i.e., vertical or horizontal) and the reference frame in which the reader is placed affected the accuracy of student responses. This may be due to participants using different embodied experiences when imagining throwing a ball vertically to oneself than when throwing an object horizontally to another person, meaning that reenacting physical scenarios might provide a small benefit for more embodied tasks such as tossing a ball in a moving bus. Considering these results, future research should investigate students' reasoning when completing relative motion problems that differ in direction and reference frame to fully understand the nature of the disconnect.

Research advisor Jason Morphew writes: "Hailey's research examines the ways in which the framing of assessment questions rather than students ability or knowledge can affect the accuracy of their responses. The findings from this study provide a framework for further research examining the resources students draw upon when answering relative motion questions."

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