Cueing and Question Reliability

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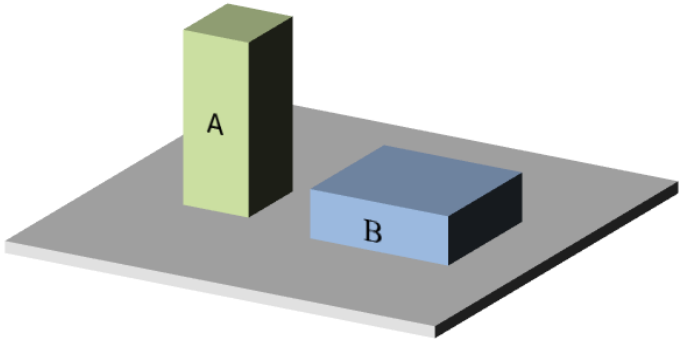
Students often confuse similar or related concepts thus their ability to answer questions related to those concepts can often be influenced by asking about these concepts together vs in isolation.

Two blocks of wood are placed on a table. The blocks are of different shapes, but have the *same mass* and the *same total volume*. You are going to compare the forces that these two blocks exert on the table and the pressures that these two blocks exert on the table.

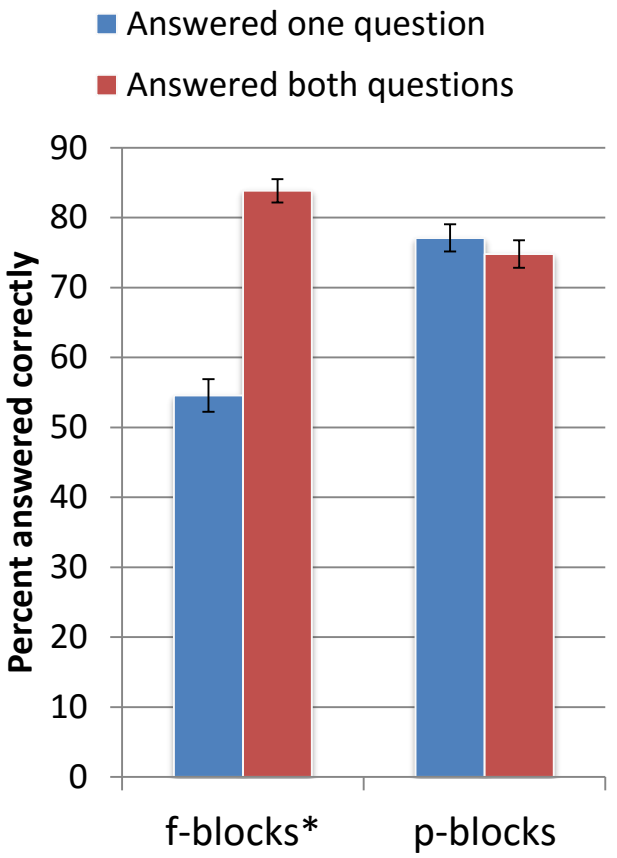


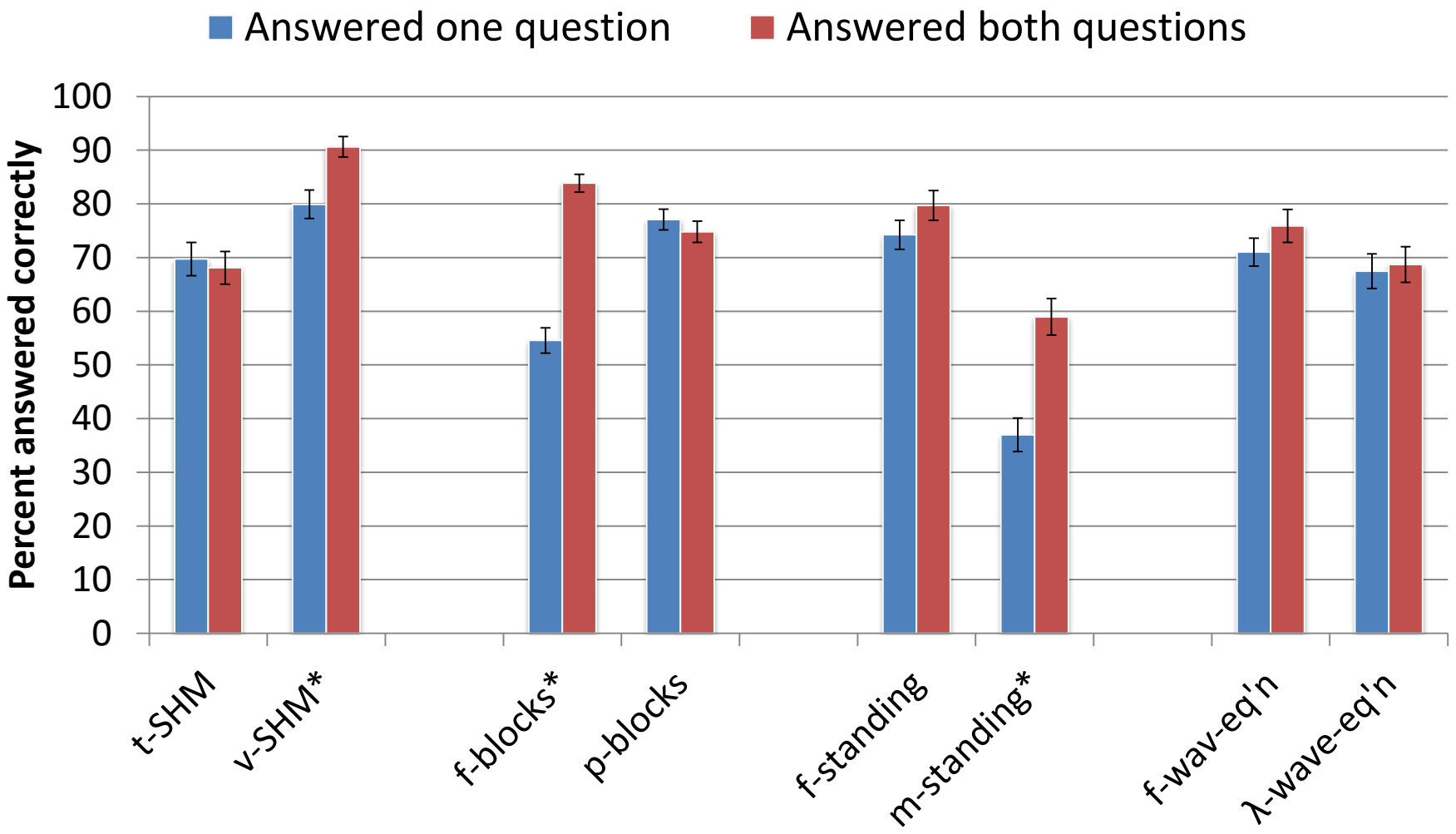
"f-blocks": Which block exerts the greater *force* on the table?

A) Block A exerts the greater force on the table
B) Block B exerts the greater force on the table
C) Both blocks exert equal force on the table

"p-blocks": Which block exerts the greater *pressure* on the table?

A) Block A exerts the greater pressure on the table
B) Block B exerts the greater pressure on the table
C) Both blocks exert equal pressure on the table

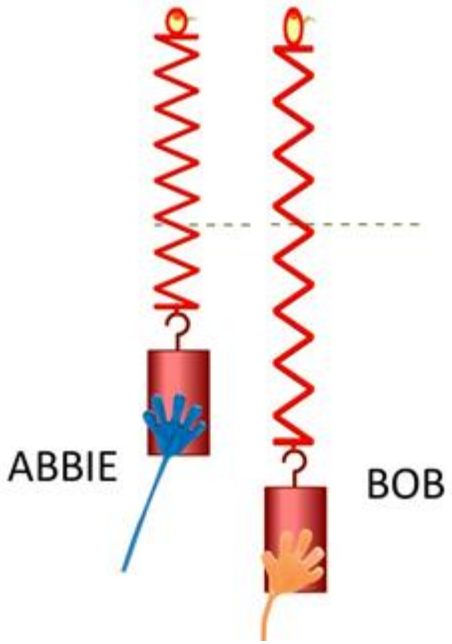




* $p < 0.001$ for two-tailed t-test

N varies from 195 to 485

Two friends, Abbie and Bob, are using a setup consisting of two *identical springs* and two *identical masses* to investigate the behaviour of masses oscillating up and down on springs. They both pull their masses down, but Bob pulls his down further than Abbie.



"SHM-t": If they both release their masses at the exact same time, which mass will oscillate up and then back down and return to that person's hand in the shortest time?

A) Abbie's mass will return to her hand in the shortest time
B) Bob's mass will return to his hand in the shortest time
C) Each mass will take the same amount of time to return to the hand of the person that released it

"SHM-v": If they both release their masses at the exact same time, which mass will have the *highest maximum speed* while it travels up and then back down again?

A) Abbie's mass will have the highest maximum speed
B) Bob's mass will have the highest maximum speed
C) Both masses will have the same maximum speed

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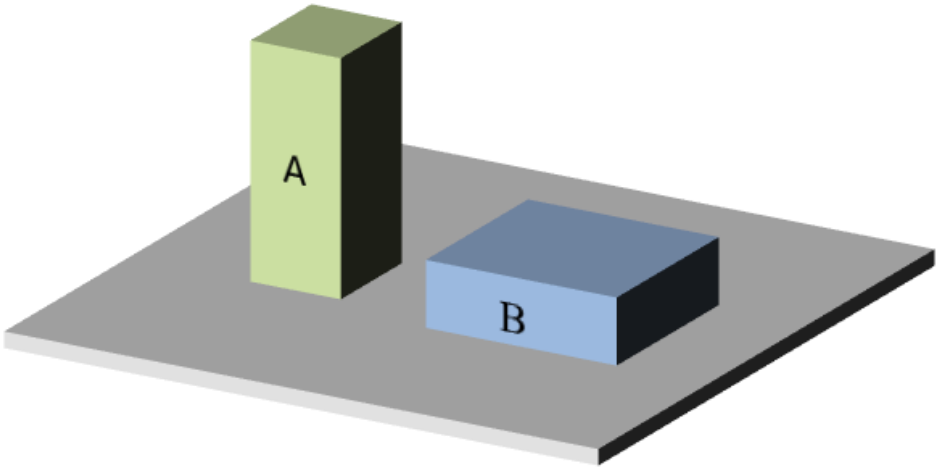

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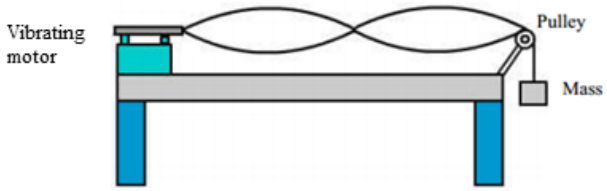
"p-blocks": Which block exerts the greater *pressure* on the table?

A) Block A exerts the greater pressure on the table
B) Block B exerts the greater pressure on the table
C) Both blocks exert equal pressure on the table

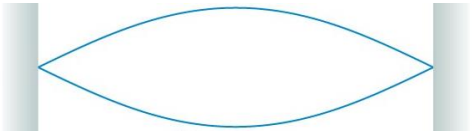
A standing wave is produced with a fixed-length string, one end of which is attached to a vibrating motor, and the other end of which is placed on a pulley and hung with a mass. Using the vibrating motor, the second harmonic standing wave is created as shown in the figure. Call this situation 1. For the questions below, the length between the vibrating motor and the pulley does not change.

"Standing-f": Starting with situation 1, the frequency of the vibrating motor is increased by a significant amount while the hanging mass and rope thickness remain the same. Which one of the following standing waves could you observe?

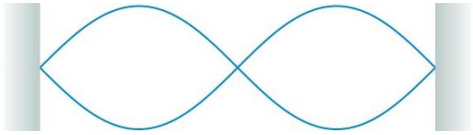
"Standing-m": Starting again with situation 1, the mass hanging from the string is increased be a significant amount while the motor frequency and rope thickness remain the same. Which one of the following standing waves could you observe?



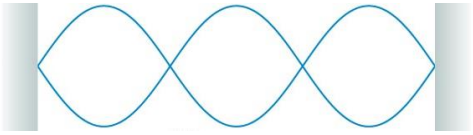
A)



B)



C)



The equation of a wave on a string is given below, where D and x are in meters, and t is in sec:

$D(x,t) = 3.0 \cdot \sin(2.0x + 10t + 4)$

"f-wave-eq'n": Which part of the equation contains information only about the frequency?

A) 3.0
B) sin(2.0x + 10t + 4)
C) 2.0x + 10t +4
D) 2.0x
E) 10t
F) 4

"λ-wave-eq'n": Which part of the equation contains information only about the wavelength?

A) 3.0
B) sin(2.0x + 10t + 4)
C) 2.0x + 10t +4
D) 2.0x
E) 10t
F) 4