

INVESTIGATION QUESTION

How does bipedal locomotion compare to quadrupedal locomotion in efficiency and load-carrying ability, and how does that difference connect to the evolution of larger brains in the hominin lineage?

HYPOTHESIS

Hint: try writing it as "If _____, then _____, because _____."

MATERIALS

Marked walking path (10 to 15 feet), small objects to carry, two bowls or cups, stopwatch, step counter or self-counted steps, paper and pencil for recording

DATA TABLE

Test	Upright Steps	Upright Time	All Fours Steps	All Fours Time
Round 1: Baseline (avg of 3)				
Round 2: Load Carry (objects/trip)				
Round 3: Multitask Sort (accuracy)				

ROUND 2: LOAD CARRY DETAIL

Upright: objects carried per trip _____, time per trip _____

All fours: objects carried per trip _____, time per trip _____

Percentage difference in objects carried: _____% more upright than on all fours

Show your calculation here:

ROUND 3: MULTITASK SORT DETAIL

Upright: objects sorted correctly per trip _____, time per trip _____

All fours: objects sorted correctly per trip _____, time per trip _____

What happened to accuracy and speed when sorting on all fours?

ANALYSIS

Which round showed the biggest difference between upright and all fours? Why do you think that round was most affected? What does the multitasking round tell you that the baseline round alone cannot?

CONCLUSION

Research has shown that humans use about 75% less energy per unit of distance walking bipedally compared to chimpanzee knuckle-walking. Based on your data and that finding, explain in your own words why bipedalism may have been a key factor in the evolution of larger brains in the hominin lineage. Connect energy savings, calorie availability, and brain metabolism in your answer.

CONNECT IT

The Laetoli footprints in Tanzania are about 3.7 million years old and show clear evidence of bipedal walking. Look them up. Who made them, and what do they tell us about when upright walking evolved? How much time separates the Laetoli footprints from the first evidence of significantly enlarged brains in the hominin fossil record? What does that gap suggest about the relationship between bipedalism and brain size?

THINK FURTHER

Bipedalism came with real costs: it made early hominins slower than most four-legged predators and exposed vital organs. Look up the obstetric dilemma and explain how the same wide pelvis that makes efficient bipedal walking possible also creates problems for human birth. How does the human body try to balance these two competing demands? What does that tradeoff tell you about how evolution works?