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THE ENERGETICS OF HOMINOID CARRYING AND ITS IMPLICATIONS FOR HUMAN EVOLUTION

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Hominoids are extremely competent carriers: large, dextrous hands and the ability to progress on three or two legs allows great flexibility in this behaviour. It is often suggested that one of the benefits of human-style habitual bipedalism is improved carrying ability that might allow the adoption of alternative food gathering strategies such as central point foraging. However carrying a load incurs energetic costs and these need to be quantified if we are to properly explore possible adaptive scenarios. Ideally we would measure oxygen consumption under controlled conditions but unfortunately this is not always possible. An alternative approach is musculoskeletal modelling which has been shown to produce accurate estimates for the energy cost of locomotion. This technique can be applied to short duration activities and to any vertebrate including fossil species where direct experimentation is obviously impossible. This paper reports the results of studies where musculoskeletal simulations are compared against direct experimental data for walking and carrying humans and then used to estimate carrying costs across a range of fossil and extant hominoids using a variety of carrying strategies. The study provides further evidence for the energetic benefits of upright walking but also illustrates the possible foraging and anti-predator advantages of squat-walking strategies that might help explain the retention of energetically costly flexed bipedal walking postures in great apes.

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