

Metabolic Cost of Transport and the Persistence of Stride-to-Stride Fluctuations in Human Walking

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INTRODUCTION

- Humans tend to walk with a stride length and stride frequency that minimize metabolic cost of transport [1].
- Just as there is an optimum walking strategy that minimizes metabolic cost, there is also an optimum of stride-to-stride fluctuations in a healthy system [2].
- While metabolic cost is thought to be influenced by the magnitude of muscle force generation [3], another potential contributor may be the persistence in stride-to-stride fluctuations (i.e. how the gait pattern changes over time).
- The aim of this study is to determine the relationship between the metabolic cost of transport (MCOT) and the persistence in stride-to-stride fluctuations in healthy gait.**
- We hypothesize that the persistence in stride-to-stride fluctuations will co-vary with MCOT, such that both will be minimized near preferred walking speed.

METHOD (N = 1)

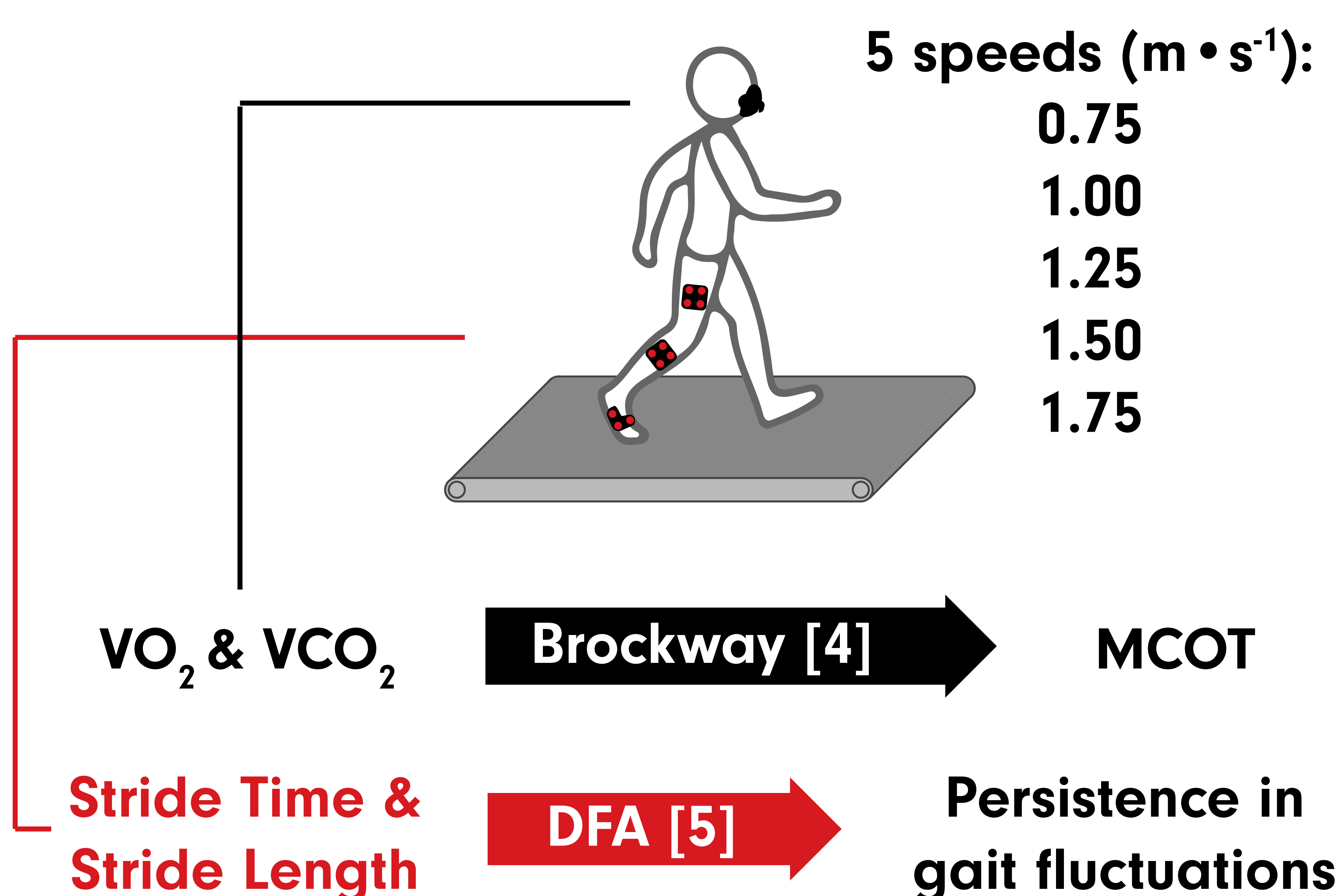


Figure 1. Metabolic cost of transport was calculated from VO_2 , VCO_2 [4] and walking speed. Persistence in stride-to-stride fluctuations was calculated from the stride time and stride length series using detrended fluctuation analysis (DFA) [5].

-The participant walked for 15 minutes at each speed, while gas exchange, stride time, and stride length were measured (Fig 1).

RESULTS

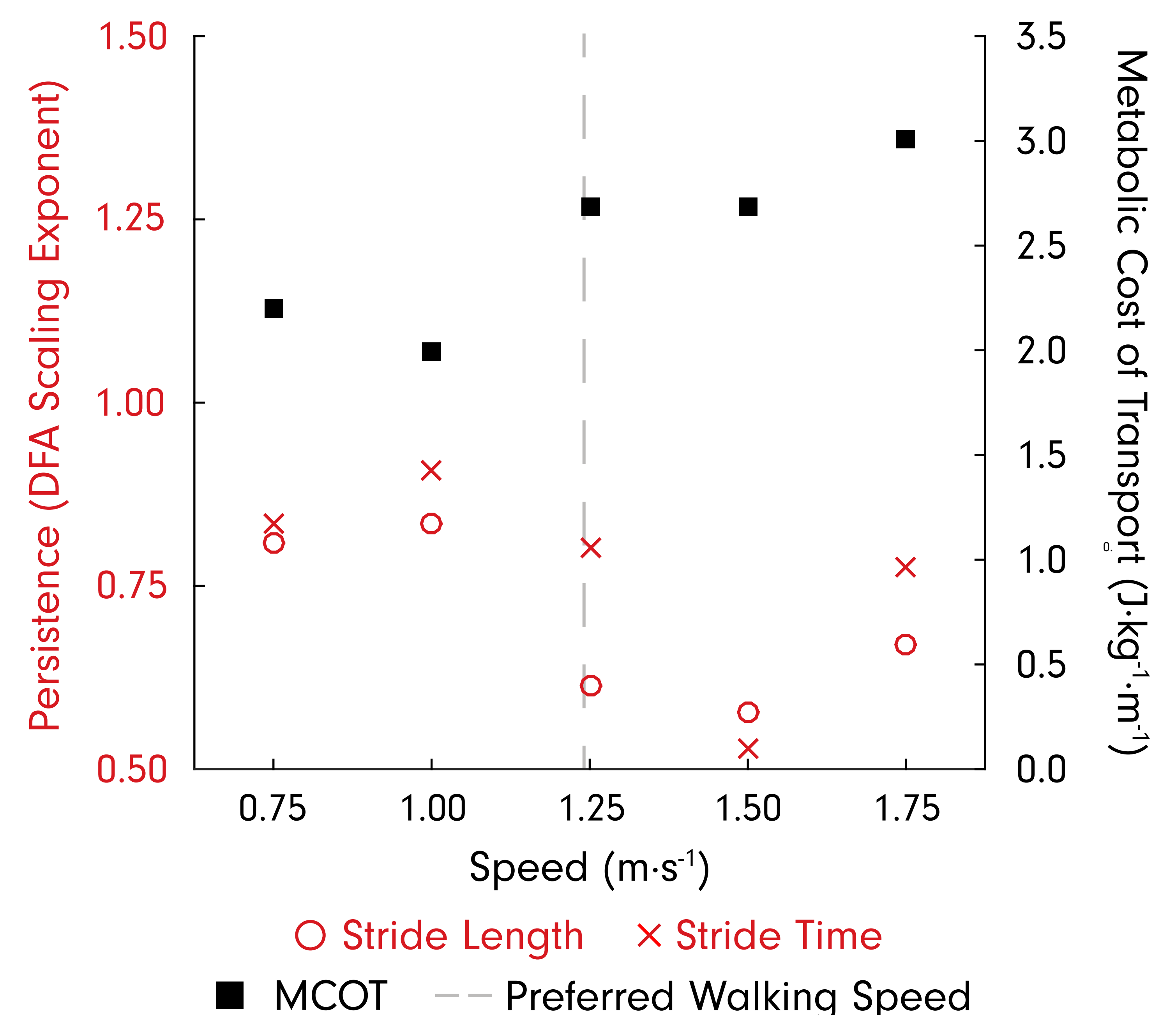


Figure 2. Metabolic cost of transport (black) and the persistence of stride length and stride time (red) were lowest on opposing sides of the estimated preferred walking speed ($1.24 \text{ m} \cdot \text{s}^{-1}$, vertical dashed line).

-DFA values close to 0.50 indicate more randomness, with increasing values denoting higher statistical persistence.

CONCLUSIONS

- The persistence of stride-to-stride fluctuations in gait may co-vary with metabolic cost of transport with respect to walking speed (Fig. 2).
- This relationship will be further explored as we continue this study with additional participants.
- Future studies will aim to determine if changes in the persistence of stride-to-stride fluctuations at a constant speed can cause changes in metabolic cost of transport.

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