

Supplementary File: Defining Trailing Limb Sub-Phases

Limited research has examined the trailing limb during a step descent and, as such, the trailing limb sub-phases of a single step negotiation have not been adequately defined. Of the few step descent studies investigating the mechanics of the trailing limb, analysis consisted of the entire trail limb stance phase [1], the single support phase of the trail limb to assess the lowering of the CoM [2], and the propulsive phase defined as the double support phase [3]. When analysing the entire trailing limb stance phase, van Dieën et al. [1] did not define specific trail limb sub-phases. However, discussion of the results in the study separated the trailing limb mechanics between those that were required to lower the CoM during single support and those required to propel the CoM forward during double support. To confirm these trailing limb sub-phase definitions, the CoM vertical displacement (Table S1) and ankle propulsion (Figure S2) were examined.

Table S1. The CoM vertical displacement (mean \pm SD) for both descent strategies during single support and double support

	Heel-Contact	Toe-Contact
<i>Single Support (cm)</i>	-0.13 ± 0.01	-0.11 ± 0.01
<i>Double Support (cm)</i>	-0.04 ± 0.01	-0.05 ± 0.01

The vertical displacement of the CoM was 5-9 cm greater in single support than double support (Table S1). While the CoM continued to lower during double support, the majority of CoM lowering occurred during single support. Similarly, Figure S2 denotes that the majority of propulsion occurred during double support even with some propulsion occurring earlier during single support. The results suggest that the requirements from the trailing limb to complete a step descent are adequately defined by single and double support.

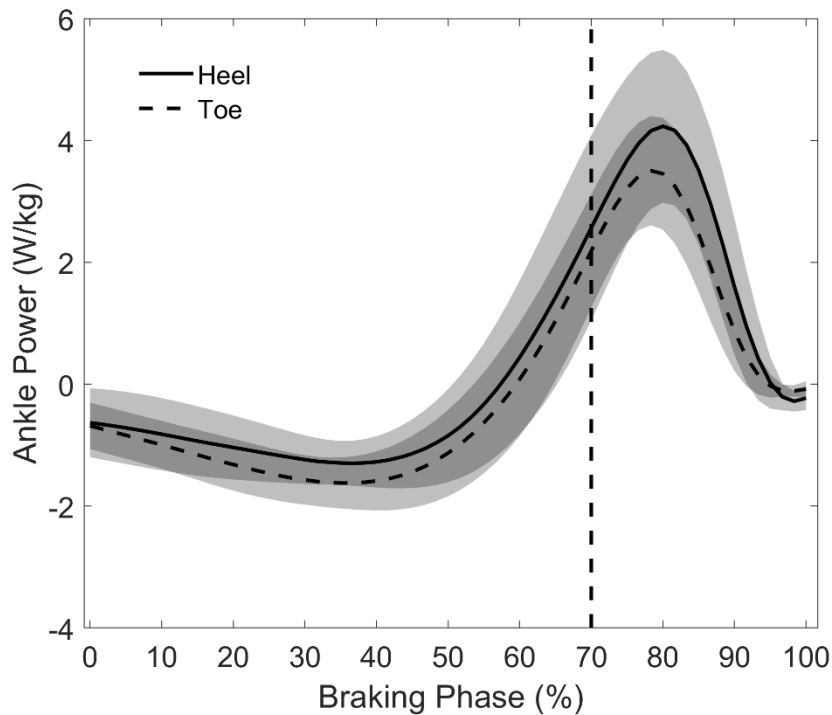


Figure S2. Trailing limb ankle joint power on the step platform from the first positive point in the trailing limb anterior-posterior ground reaction force to trailing limb toe-off. The vertical dashed line represents when leading limb initial contact occurred denoting the beginning of the double support phase.

References

1. van Dieën JH, Spanjaard M, Konemann R, Bron L, Pijnappels M. Balance control in stepping down expected and unexpected level changes. *Journal of Biomechanics*. 2007;40: 3641-3649. doi: <https://doi.org/10.1016/j.jbiomech.2007.06.009>.
2. Selfe J, Richards J, Thewlis D, Kilmurray S. The biomechanics of step descent under different treatment modalities used in patellofemoral pain. *Gait & Posture*. 2008;27: 258-263. doi: <https://doi.org/10.1016/j.gaitpost.2007.03.017>.
3. van Dieën JH, Spanjaard M, Konemann R, Bron L, Pijnappels M. Mechanics of toe and heel landing in stepping down in ongoing gait. *Journal of Biomechanics*. 2008;41: 2417-2421. doi: <https://doi.org/10.1016/j.jbiomech.2008.05.022>.