More symmetrical gait after split-belt treadmill walking does not modify dynamic and postural balance in individuals post-stroke.

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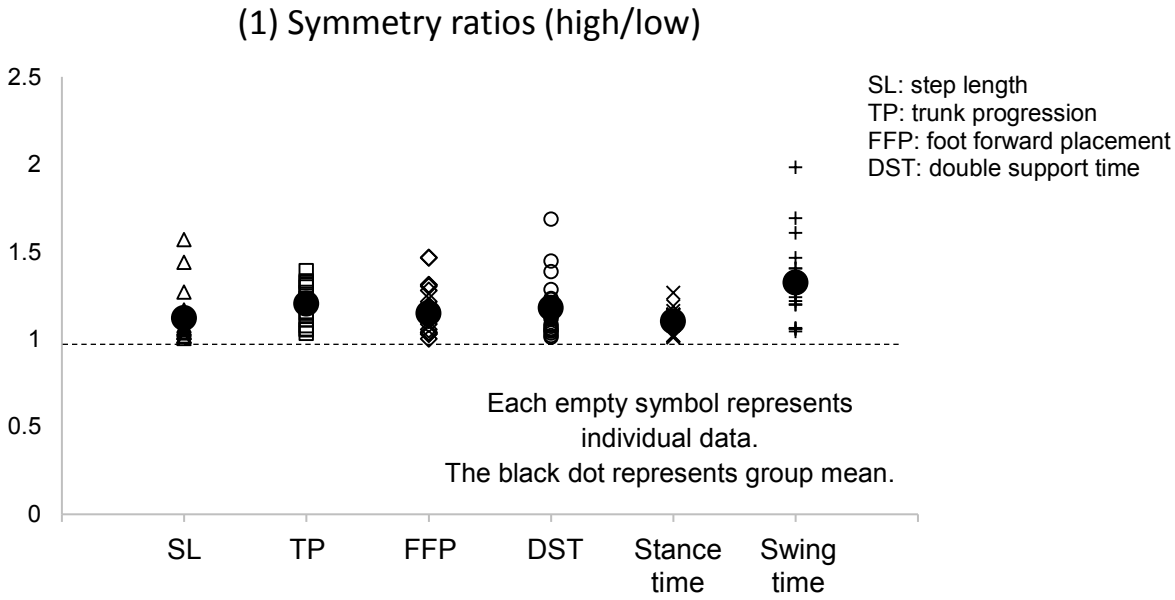
Calculation of the global index of symmetry

Various sensorimotor deficits, such as those due to stroke, affect the spatiotemporal parameters during walking. There is currently no support to consider one of these parameters as more important than the others. Thus, we develop a global index of symmetry to aggregate several parameters into one value. Here we present the steps to compute this global index of symmetry.

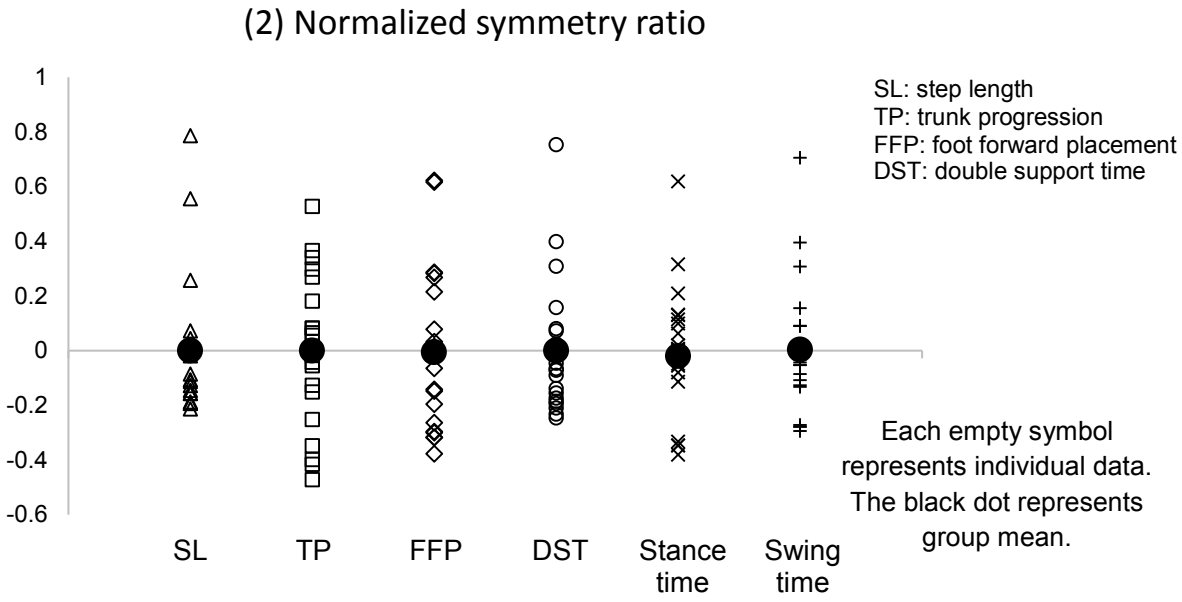
First, the asymmetry ratio was calculated for each symmetry variable (step length (SL), trunk progression (TP), foot forward placement (FFP), double support time (DST), stance time, and swing time):

(1) Symmetry ratio = Higher value/lower value of the variable obtained on either side



Considering that the range of ratios differed between symmetry variables (e.g. stance time vs. swing time), it was necessary to normalize each ratio in order not to give a larger weight to the one with larger values when they would be averaged together. Thus each individual ratio was normalized to the group range of the ratio as follows:

(2) Normalized symmetry ratio = (symmetry ratio – symmetry ratio$_{\text{group mean}}$)/(symmetry ratio$_{\text{max}}$ – symmetry ratio$_{\text{min}}$)

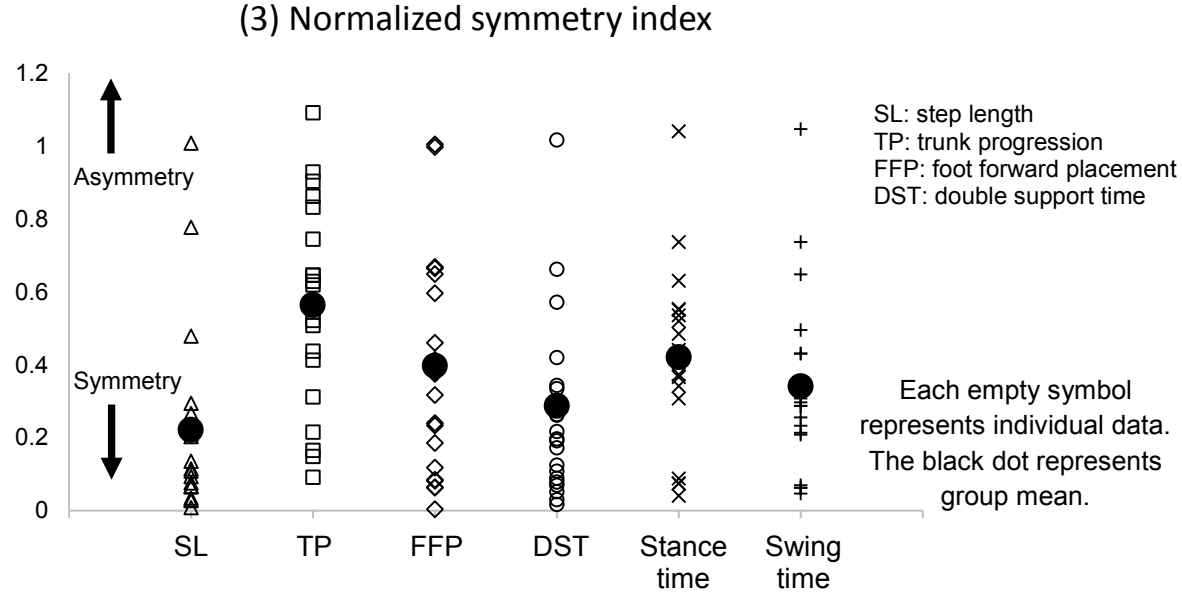


This results in the mean group data centered on 0 (mean group values represented as a black dot in (2)), with a total range of 1 between the minimal and maximal values of this normalized symmetry ratio. However, to keep a meaningful value of symmetry, the mean value can be expressed as a proportion of the total range, normalized to a range of 1 using the same approach as in (2):

(3) Normalized symmetry index = | (normalized symmetry ratio – relative normalized symmetry $ratio_{mean}$)/(normalized symmetry $ratio_{max}$ – normalized symmetry $ratio_{min}$) |

With

Relative normalized symmetry $ratio_{mean}$ = [(1 – Symmetry $ratio_{min}$)/(Symmetry $ratio_{max}$ – Symmetry $ratio_{min}$)] + normalized symmetry $ratio_{min}$



The relative normalized symmetry $ratio_{mean}$ (black dot in (3)) is the group average value of the Normalized symmetry ratio (2), calculated from 0 (perfect symmetry) as reference instead of being centered on 0 in the Normalized symmetry ratio. Thus, the Normalized symmetry index (3) still has a meaningful value of symmetry, with values close to 0 indicating more symmetry, and higher values indicating more asymmetry, and with the same range of 1 for each variable. The Normalized symmetry indexes can thus be averaged between symmetry variables into the Global index of symmetry.

Finally, to measure whether the global symmetry index changed between post-perturbation and baseline, the post-perturbation global symmetry index was subtracted from the baseline index. Positive values indicate global improvement in spatiotemporal symmetry, 0, no change in symmetry, and negative values a deterioration of ST symmetry.