The effects of stroke on weight transfer before a voluntary lateral and forward step

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Introduction

- Falls most commonly occur in the home[1] during walking, turning and transfers.[2]
- Stepping in different directions is essential for navigating in the home thus, understanding whether one direction of movement is more impaired may be important for understanding falls.
- Before a step, the transfer of weight laterally is necessary to stabilize the body for single leg support.
- Thus, the ***purpose*** of this study was to compare the effects of stroke on voluntary lateral and forward steps in chronic stroke.

Methods

- Twenty community-dwelling individuals >6 months post-stroke and ten healthy controls.
- Participants performed 10 voluntary light-cued choice reaction steps in the lateral and forward direction (**Fig. 1**).
- Outcome measures: weight transfer (WT) onset time, weight transfer (WT) duration, mediolateral center of pressure (ML COP) velocity, ML COP displacement, hip abductor joint torque (**Fig. 2**).

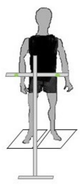


Fig. 1. Light cued voluntary choice reaction step.

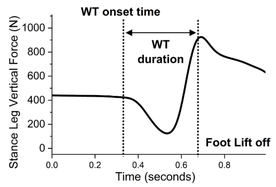


Fig. 2. Weight transfer measures.

- Clinical outcome measures: Timed Up and Go (TUG), Community Balance & Mobility Scale, Chedoke McMaster Stroke Assessment (subscale leg and foot)
- Repeated measures ANOVA was used to analyze the outcome measures between paretic, non-paretic, and control legs and step direction.

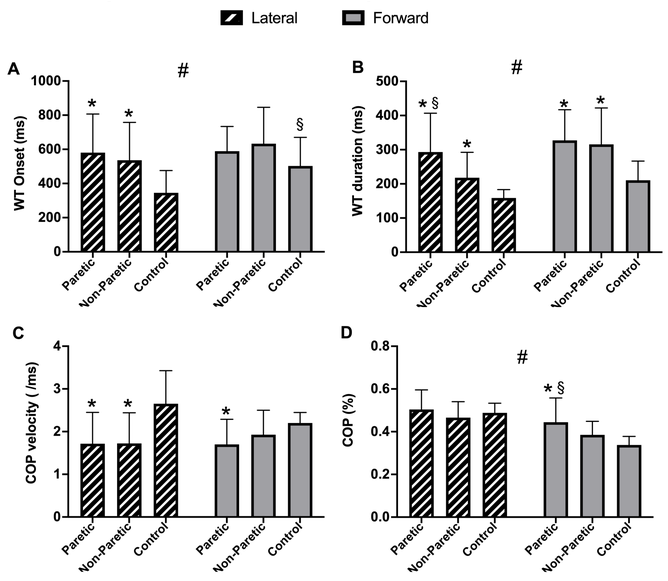
Results

Table 1. Demographics and clinical outcome measures

	Stroke Group (N=20)	Control Group (N=10)
Age (years)	61.6 ± 7.4	64.8 ± 8.9
Time Post-stroke (years)	8.0 ± 10.0	--
Side of Paresis	6 Right / 14 Left	--
Timed Up and Go (s)	14.0 ± 8.8	7.1 ± 1.1 *
Community Balance & Mobility Scale (/ 96)	37.4 ± 13.0	73.0 ± 12.2 *
CMSA (leg + foot, /14)	9.2 ± 3.18	--

*$P<0.05$ between groups
CMSA, Chedoke Master Stroke Assessment

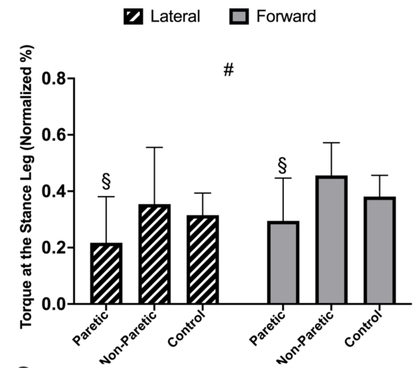
Fig. 3. The weight transfer before a lateral step was initiated and executed faster with a greater COP displacement. The paretic and non-paretic legs were more impaired during the lateral step than the forward step.



# $P<0.05$ different between step direction; * $P<0.05$ different from controls;
§ $P<0.05$ different from non-paretic

Results

Fig. 4. Greater hip abductor torque was produced in the forward direction in the stance leg. The hip abductor torque of the paretic leg was reduced compared to the non-paretic leg.



# $P<0.05$ different between step direction; § $P<0.05$ different from non-paretic

Conclusions

- The weight transfer before a lateral step was quicker and initiated earlier, with a larger ML COP displacement.
- Regardless of the leg used, the paretic and non-paretic legs were slower in initiating and executing the weight transfer before the lateral step. In contrast, only the paretic leg was impaired during the forward step.
- The hip abductor torque was greater before a forward step than a lateral step but was reduced in the paretic leg in both step directions.
- This may place individuals at greater risk of instability after a stroke when stepping laterally.
- The findings may indicate that practicing quick movements may be necessary for improving weight transfer.

References
1. Jalayondeja C, Sullivan PE, Pichaiyongwongdee *Geriatr Gerontol* 2014.
2. Hyndman D, Ashburn A, Stack.. Arch Phys Med Rehabil.2002.

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