The Use of a Rehabilitation Dog as a Gait Aid for Post-Stroke Patients : A Case Report

Janick Charbonneau, Geneviève Savard, Claudia Benjamin, Michalina Kwiatkowska, Linda Rondeau, Hélène Corriveau

UNIVERSITÉ DE SHERBROOKE

Faculté de médecine et des sciences de la santé, Université de Sherbrooke (Canada)

CENTRE DE RÉADAPTATION ESTRIE

BACKGROUND

- In Canada, 315 000 people are living with debilitating sequelae from a stroke, making it the main cause of disability[1]. One of the most critical goals in post-stroke rehabilitation is to increase functional gait. The cane is the most widely used as a walking aid. However, it induces a slower walking speed, and asymmetric walking pattern[2].
- An innovative approach is to use a rehabilitation dog as a walking aid. There are only a few studies on this topic[3,4]. It could have more benefits compared to using a usual walking aid. Nevertheless, identifying the optimal walking aid remains a clinical priority for this clientele

PURPOSE

To explore quantitative changes in temporo-spatial parameters and gait stability with post-stroke patients while using a rehabilitation dog aid in comparison to a cane

METHODS

◊ ***Design:*** Case report design

◊ ***Participants*:** Two post-stroke survivors

◊ ***Inclusion criteria*:** 1) hemiplegia secondary to a stroke, 2) cognitive functioning within normal limits; "3MS" > 25th percentile, 3) motor function of the affected leg >3 (Chedoke-McMaster); and 4) ability to stand up without help.

◊ ***Exclusion criteria*:** 1) severe hemineglect, 2) significant visual problems, 3) serious uncontrolled medical problems, and 4) allergy to dog-hair.

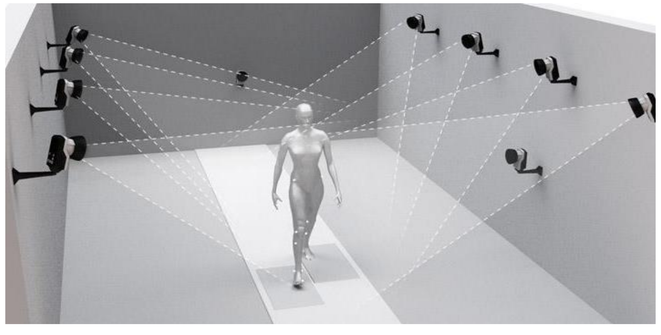

Figure 1. Laboratory setup

Table 1. Characteristics of sample (n = 2)

		Participant 1	Participant 2
Age (years)		54	46
Diagnostic		Right Sylvian ischemic stroke	Hemorrhagic stroke in the basal ganglia
Time post-stroke (days)		119	63
Hemiparetic side		Left	Left
Chedoke	**Shoulder pain**	4	4
	Postural control	4	5
	Arm	2	2
	Hand	2	2
	Leg	4	4
	Foot	3	2
Walking speed (m/s) (measured over 10 m)		0.35	0.22
Berg (/56)		46	48
TUG (s)		25.6	26.8
Tonus	**Hamstrings**	Light spasticity	Hypotonic
	Quadriceps	Close to normal	Moderate spasticity
	Calf	Light spasticity	Moderate spasticity
Ankle ROM	**Dorsal flexion**	0	10
Clonus		+	+

◊ ***Independent variables:***

Conditions and Data collection: Participants walked for a 10-meter distance, alternatively with the cane and with the rehabilitation dog. The rehabilitation dog was trained by MIRA.

◊ ***Outcomes measures and instruments***

Temporo-spatial gait parameters and stability measure:

- Gait parameters: 1) walking speed, 2) cadence, 3) stride time and length and 4) step time
- Gait stability: 1) medio-lateral displacement (M\L) (mm) (RMS value) and 2) area of the displacement (mm^2) of the COM

Instrument : A capture system of passive movement using a model with 39 markers (VICON Motion Capture System).

RESULTS

Use of a rehabilitation dog versus a cane presented:

- ↑ in walking speed, cadence, and stride length
- ↓ in stride time
- ↑ in the area of the displacement of the COM and the RMS M\L displacement.

Table 2. Temporo-spatial and stability parameters

Temporo-spatial Gait Parameters	Participant 1			Participant 2		
	Cane (mean ± SD)	Rehabilitation dog (mean ± SD)	Difference	Cane (mean ± SD)	Rehabilitation dog (mean ± SD)	Difference
Walking speed (m/s)	0.30 ± 0.01	0.43 ± 0.04	0.13	0.20 ± 0.05	0.37 ± 0.10	0.17
Cadence (steps/min)	62.96 ± 2.48	71.39 ± 6.21	8.43	48.96 ± 7.90	66.32 ± 12.73	17.36
Stride time (s)	1.92 ± 0.08	1.80 ± 0.40	-0.12	2.51 ± 0.44	1.88 ± 0.51	-0.63
Step time (s)	0.94 ± 0.39	0.96 ± 0.50	0.02	1.24 ± 0.20	0.91 ± 0.24	-0.33
Stride length (m)	0.29 ± 0.23	0.73 ± 0.05	0.44	0.49 ± 0.04	0.64 ± 0.10	0.15
Area of the displacement COM (mm^2)	134.99 ± 33.66	182.66 ± 53.54	47.67	109.27 ± 14.34	239.64 ± 75.96	130.37
M\L RMS displacement (mm)	54.30 ± 5.68	57.62 ± 13.98	3.32	61.71 ±13.72	76.77 ± 23.45	15.06

DISCUSSION

- The use of the dog showed improved spatio-temporal parameters and stability in both participants when walking with the rehabilitation dog, which may explain the improvement in their walking speed and the quality of their gait[3]. The result are encouraging because the participant 2 surpassed the MCID for the walking speed set at 0.16 m/s[5] in only one session.
- Furthermore, participant 1 changed from household amubulation class to the limited community ambulation (0.4-0.8 m/s)[6]. This is important for social participation for the patient as he could be walking outside with the dog.
- Both participants saw an overall increase in their area of displacement of the COM, but M/L excursion was almost the same (cane and rehabilitation dog). This may be explained by the fact that the dog helps the participant to walk faster and with greater strides, which illustrates a more fluid walking pattern (figure 2).

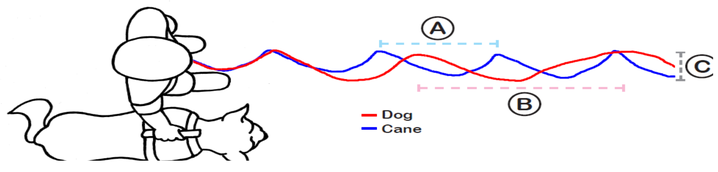

Figure 2. Typical M\L displacement of the COM with the cane and the dog: A) length of the walking cycle with the cane; B) length of the walking cycle with the dog; C) COM excursion in M/L direction.

LIMITATION: The small number of participants decreased the generalizability.

Conclusion

The results suggest that walking with a rehabilitation dog is superior than walking with a cane when looking at gait parameters and stability measures. Future studies should investigate body weight symmetry and muscle activity relevant to walking with a dog.Thereafter, it will be important to evaluate the impact of a specific gait training with a rehabilitation dog.

ACKNOWLEDGEMENTS: The authors would like to thank the study participants for their time and MIRA (http://www.mira.ca/). Finally, a special thanks to Mathieu Hamel and Antoine Guillerand, for their technical support.

REFERENCES: [1]Canadian Stroke Best Practice Recommendations, (2016); [2]Maguire et al., (2012). *BMC Neurol,* 30(12):18; [3]Rondeau et al., (2010). *NeuroRehabilitation*, *27*(2):155-163; [4]Abbud et al., (2014). *Physiotherapy Canada*, *66*(1):33-35; [5]Tilson et al., (2010). *PhysTher*, 90(2):196-208; [6]Bowden et al., (2008). *Neurorehabil Neural Repair*, 22(6):672-675.