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# The Clinical Feasibility of the Re-Link Trainer in Acute Stroke Rehabilitation: Preliminary Results\*

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**Abstract**— The Re-Link Trainer (RLT) is a 4-bar linkage end-effector that attaches to the paretic limb via a footplate, constraining the limb to a normal gait trajectory. This study aimed to determine the feasibility of using the RLT in a hospital setting, by measuring ease of getting into the RLT and set up time with acute or sub-acute stroke patients. This paper presents preliminary results from two stroke patients who have participated in the study so far. Both patients were set up in the RLT with assistance from two therapists, and both were able to stand and walk in the device with varying levels of assistance.

## I. INTRODUCTION

Stroke is a leading cause of long-term adult disability. The most common rehabilitation goal is restoration of walking ability. Traditional gait rehabilitation is labour intensive, which limits the duration of a training session and therefore therapy dose. We have recently developed and fabricated a prototype Re-Link Trainer (RLT). The device consists of a 4-bar linkage design that attaches to the patient’s paretic limb via a footplate. The paretic limb is guided through a normal gait trajectory when using the device as part of rehabilitation. Robotic-based interventions may enhance gait rehabilitation by providing repetitive, task-oriented rehabilitation that may promote greater brain plasticity and motor recovery post-stroke. By utilizing the RLT during early gait rehabilitation, there may be an increase in intensity and repetition than could be achieved by traditional methods of gait rehabilitation.

This study aimed to determine the clinical feasibility of using the device in an acute stroke ward, by measuring ease of getting in and out of the RLT and set up times with acute or sub-acute stroke patients.

## II. METHODS

### A. Participants

This was an observational feasibility study conducted at Auckland City Hospital. The study was approved by the Northern B Health and Disabilities Ethics Committee (17/NTB/173) and Auckland District Health Board (A+7780). All participants provided written informed consent.

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### B. Procedures

The time taken to set the participant up in the RLT was recorded, alongside perceived exertion (Modified Borg Scale) and the level of assistance required. The participant was asked to stand up in the device, and the level of assistance was recorded. If participants were able to stand in the RLT, they were asked to walk 5m. The time to walk the 5m was recorded, alongside perceived exertion and the level of assistance required. The primary outcome was whether a participant could stand in the RLT, and if they could walk 5m (with or without assistance).

## III. RESULTS

Preliminary results from two male patients with a right-side infarct are presented in Table 1. Time since stroke  $14.5 \pm 10.6$  days. Age  $66.5 \pm 23.3$  years.

TABLE I. TIME AND EXERTION LEVELS FOR PATIENT SET-UP, STAND AND WALKING IN THE RLT

	STRK1	STRK2
<b>Set-up:</b>		
- Time (s)	36.32	12.51
- Assistance	2xA	2xA
- RPE	-	-
<b>Stand:</b>		
- Time: sit to stand (s)	78.60*	31.84
- Assistance	SBA	1xA
- RPE	1.5	3
<b>Walk:</b>		
- Time: 5m walk (s)	46.85	26.03
- Steps taken	13	13
- Assistance	2xA	2xA
- RPE	3	2.5

\*time included set-up to full upright standing. 1xA – assistance of 1 therapist; 2xA – assistance of 2 therapists; RPE – rate of perceived exertion; SBA – stand by assistance

## IV. DISCUSSION & CONCLUSION

Both patients were set up in the RLT with assistance from two therapists, and were able to stand with varying levels of assistance. The preliminary results are promising, but further participants are required to draw significant conclusions regarding the feasibility of the RLT in acute/ sub-acute stroke rehabilitation.