

# Feasibility Study: Virtual Walking Therapy in People with Neuropathic Pain after Spinal Cord Injury

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## Background and Aims

Chronic neuropathic pain is a highly prevalent comorbidity in patients after spinal cord injury (SCI) and medical treatment is still unsatisfactory in many cases. To meet this open need a novel therapy called virtual walking was set up and further developed at the Centre for Pain Medicine based on the work of Moseley<sup>1</sup> and the principles of mirror therapy. The feasibility was tested in a small group of SCI-patients in clinical setting.

Study aims included investigation of satisfaction with, acceptance of and adherence to the novel therapy as well as gathering information about the experience of the patients and to get feedback for possible improvements of the setup.

## Methods

Four patients (clinical data refer to **Tab. 1**) conducted the therapy in which they were seated in a modified wheelchair mimicking the movement of the pelvis during walking and seeing themselves virtually walking through a forest from a third person perspective. The imagination was achieved by a computerized projection of walking legs merged with the upper body of the patient (**Fig. 1**).

Patient ID	Gender (female, male)	Age	Time since injury (years)	Pain duration (years)	Pain type	Level of lesion	ASIA	Spasticity
VR-001	female	22	1.5	1.5	At-Level	TH 10	D	yes
VR-002	male	39	4	4	Below-Level	TH 7	A	no
VR-003	male	60	37	37	At-Level	TH 8	A	no
VR-004	male	45	6	6	Below-Level	TH 4	A	no

**Table 1:** Summary of socio-demographic characteristics from the study cohort. Abbreviations: VR, Virtual Reality; TH, Thoracic spine



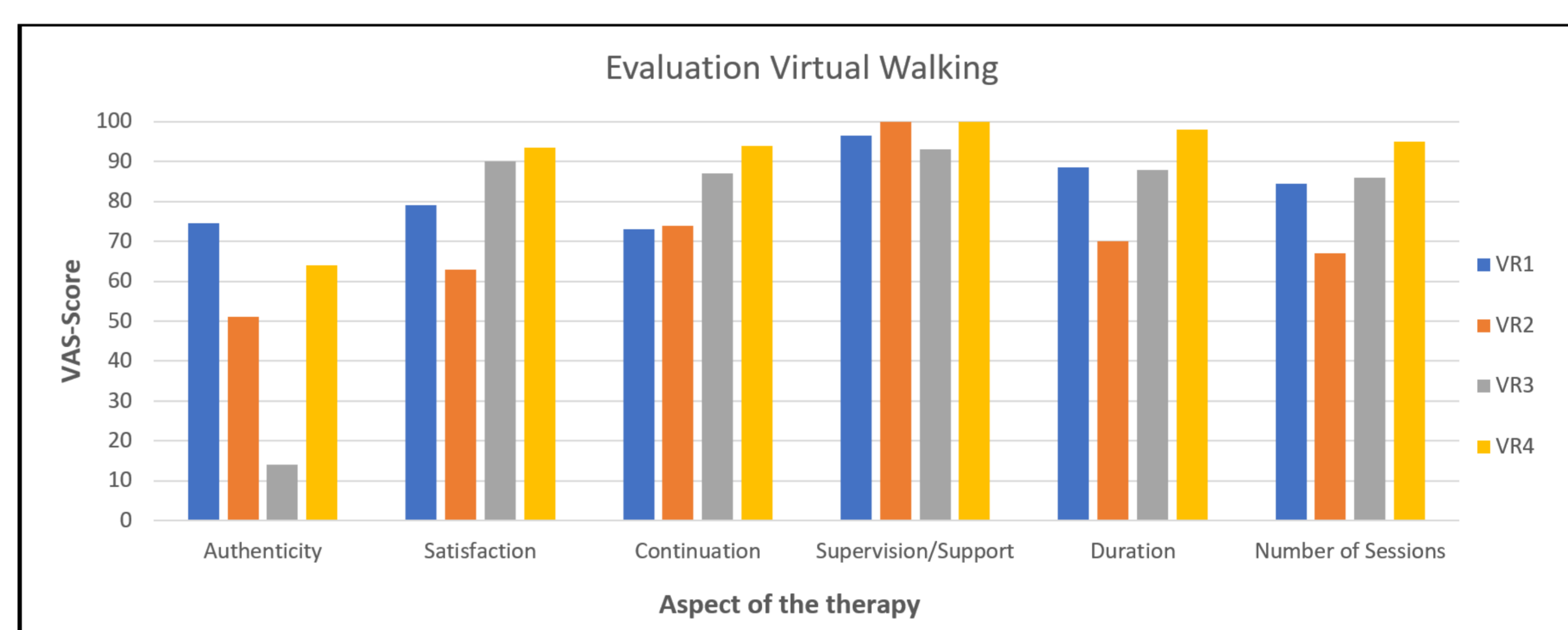
**Figure 1:** Clinical setting of virtual walking: The imagination of walking is realized by projecting the upper body of the patient merged on «walking legs» instead of the wheelchair by computer technique. The wheelchair used in this setting provides an alternating side to side tilting to simulate the movement of the pelvis for a more authentic walking impression.

Prior to therapy all patients underwent a preparation phase of 4 weeks including a right and left discrimination task, which is an essential component of graded motor imagery treatment<sup>1</sup>. Two training schedules were performed: (1) Two sessions per week, five weeks in total. (2) Five sessions per week, two weeks in total. Patients were asked to fill in a pain diary, Short-Form McGill Pain questionnaire (SF-MPQ), Chronic Pain Grading System (CPGS), Mainz pain staging system (MPSS), Schmerz Beschreibungliste (SBL), Fragebogen zum habituellen Wohlbefinden (FW-7), Depression Anxiety and Stress Scale (DASS); Posttraumatic Growth Inventory (PTGI), Quality of Life questionnaire (QOL), Pain Catastrophizing Scale (PCS), Patient Global Impression of Change (PGIC, only post) (summary refer to **Tab. 2**). Additionally, authenticity, satisfaction, willingness to proceed, support, duration and number of sessions and acceptance of the therapy was evaluated with an additional questionnaire using VAS-scores. All outcomes were then descriptively analyzed.

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Assessment (range of values)	VR1	VR2	VR3	VR4	
	pre   post	pre   post	pre   post	pre   post	
CPGS	pain intensity (0-100) (≤ 49 low, ≥ 50 high)	40   40	47   60	83   30	87   83
	disability grade (0-4)	1   1	1   3	4   1	4   4
DASS	(0-21)				
	anxiety	2   5	3   3	13   1	5   6
	depression	2   5	6   3	16   3	20   20
	stress	7   8	12   9	14   2	14   16
FW7	(0-35)	24   23	12   15	9   7	4   6
MPSS	stadium (1-3)	2   -	3   -	3   -	3   -
PCS	(0-52)	16   11	21   17	29   8	35   40
PTGI	(0-42)	22   32	25   24	40   12	7   15
QoL	(0-10)				
	life	7   7	4   5	7   5	1   2
	body	6   7	0   2	7   6	1   2
	mood	8   8	1   6	6   6	1   2
SBL	(0-12)	2   2	5   8	12   3	6   11
Self-efficacy	(0-30)	20   20	15   15	25   19	8   11
SF-MPQ-D T					
	sensory	11   7	13   16	30   11	26   24
	affective	1   1	6   7	7   1	8   7
PGIC	(1-7)	n.a.   5	n.a.   4	n.a.   7	n.a.   5

**Table 2:** Overview Questionnaires. CPGS: Chronic Pain Grading System; DASS: Depression Anxiety and Stress Scale; FW7: Fragebogen zum habituellen Wohlbefinden; MPSS: Mainz pain staging system (only pre); PCS: Pain Catastrophizing Scale; PGIC: Patient Global Impression of Change; PTGI: Posttraumatic Growth Inventory; QoL: Quality of Life questionnaire; SBL: Schmerz Beschreibungliste; SF-MPQ-D T: Short-form McGill Pain Questionnaire; n.a.: not applicable.



**Figure 2:** Results from the evaluation questionnaire. Patients rated six aspects of the therapy with a VAS-Score. Patients were asked how authentic their experience with the virtual walking was, how satisfied they were with the therapy, if they would continue the therapy if they could, how they perceived the supervision and the support by the therapist, if they were happy with the overall duration of the therapy and if the number of single sessions was appropriate. Higher scores indicate greater satisfaction or greater agreement with the single statement or question.

## Results

There was a sound satisfaction and good acceptance amongst participants. Support, duration and number of sessions were perceived well and acceptable. With respect to continuation of the therapy the results show a high degree of willingness (**Fig. 2**). The authenticity of the setup was criticized with regard to perspective as well as synchronicity and movement of the pelvis. Pain intensity as a second outcome did not change during or post therapy, but in one patient only (results not shown).

## Conclusion

The results indicate that the therapy is feasible for patients with neuropathic pain after SCI. All participants accepted the therapy and were adherent to the single sessions. To draw conclusions about the effectiveness and therapeutic outcome on pain a further study with more patients is needed.

<sup>1</sup> Moseley, G. Lorimer, Butler, David S., Beames, Tim B. Giles, Tom J.; "The Graded Motor Imagery Handbook"; First edition 2012 ISBN: 978-0-9872467-5-2