ORIGINAL PAPER

Arch Phys Glob Res 2020; 24 (2): 23-28
DOI 10.15442/apgr.24.2.3

Effect of Task Specific Training on Central Post-stroke Pain in a Sub-acute Stroke Patient: A Case Report

Auwal Abdullahi
Department of Physiotherapy, Bayero University Kano, Nigeria

Abstract

Background: Task specific training is a movement rehabilitation technique that involves repetitive practice of functional tasks with the affected limb. The aim of this case report is to report its effect on central post stoke pain (CPSP) in a sub-acute stroke patient.

Case Presentation: The patient was a 45 year old man with signs and symptoms suggestive of ischaemic stroke. Diagnostic criteria form and the douleur neuropathique 4 questionnaire (DN4Q) were used to assess the patient. The pain was a severe (a score of 10 on visual analogue scale, VAS) hemibody biting cold sensation, with a score of 5 on DN4Q. Patient practiced with the affected upper limb: picking up a cup and drinking from it, teeth brushing, drawing a circle, transferring his cell phone from one side to another on a table and taking his hand to the temple of his head. Each task was practiced 20 times per session, 3 times a day for 4 weeks. Similarly, forward, backward, sideward, and inward stepping were practiced with the affected lower limb. Each task was practiced 25 times per session, 3 times a day for 4 weeks**.** At 2 weeks, the pain intensity decreased (a score of 4 on VAS) and a score of 2 on DN4Q. At 4 weeks, the pain completely disappeared. **Conclusion:** TST improved CPSP in a patient with acute stroke. However, further studies are required to confirm the finding of this report especially considering the limitations of case reports.

Keywords: Neuropathic pain, stroke, task specific training, Neuroplasticity

Introduction

One of the functions of the brain is the control of pain and temperature sensation which is mediated by the spino-thalamo-cortical pathways [1]. Following a stroke, this control may be impaired and cause central post stroke pain (CPSP), a persistent neuropathic pain characterized by an intermittent burning or freezing or scalding sensation [2]. Its prevalence rate ranges from 1 to 20% [3-6]. Although it is not a very prevalent condition, it is very difficult to treat and pain reduction is the main goal of treatment [6]. This is because CSPS can significantly affect one's ability to carry out daily activities and psychosocial wellbeing both of which can have negative implications on quality of life [7]. However, even for the pain reduction, there seems to be no goal standard treatment yet [6]. The aim of this case report is to report the effect of task specific training (TST) on CPSP.

TST is a motor rehabilitation technique which involves repetitive practice of everyday tasks such as brushing teeth, forward stepping and writing with the affected limb [8-11]. Similarly, use of stumps in functional tasks with the of aid prosthesis has been shown to decrease phantom limb pain sensation in patients with upper limb amputation [12]. Phantom limb pain is also a neuropathic pain just like CPSP [13]; thus, it is possible that TST may improve the latter. However, there seems to be no any report yet on this.

Case presentation

Participant

The patient was a 45 year old community dwelling adult in Kano, Nigeria who had signs and symptoms (right hemiplegia, facial deviation and headache) suggestive of ischaemic stroke (feeling of weakness of the right side of the body started gradually) 4 months earlier. The diagnosis of the stroke was made through interviewing the patient on his condition and screening for CPSP using DN4 questionnaire (DN4Q). The diagnosis was made by the author (AA) who is a Physiotherapist in Neurological Rehabilitation with many years of experience and a publication on the prevalence of CPSP [3]. In addition, complex regional pain syndrome was ruled out since the pain was not accompanied by changes in skin colour or temperature and swelling in any part of the affected side. According to the patient, when he had the stroke he reported at a General hospital where he was being told to have had stroke, and hypertension. He was prescribed some anti-hypertensive medications, but he discontinued taking them after a short while. However, brain imaging result was not available as it was not accessible in the local facility.

Following, the diagnosis, the author referred the patient to a nearby secondary health facility (a facility usually without adequate human and material resources). However, the patient came back to the author after being referred to a tertiary health facility, a teaching hospital (with diverse specialists and better facilities) from the secondary health facility, citing financial challenges. Consequently, a decision was made to help the patient. He was then assessed using diagnostic criteria form, DN4Q and visual analogue scale (VAS). The pain was a severe (a score of 10 on visual analogue scale, VAS) hemi-body biting cold sensation, with a score of 5 on DN4Q. Additionally, it was the continuous type, with the same intensity throughout the day. According to the patient, it started about 3 months after the stroke**.** However, the patient did not have any significant residual motor impairment at the time of the assessment before the intervention, as he could perform daily functional tasks.

Intervention

Patient practiced with the affected upper limb the following tasks: picking up a cup and drinking from it, teeth brushing, drawing a circle, transferring his cell phone from one side to another on a table and taking his hand to the temple of his head. Each task was practiced 20 times per session, 3 times a day (making a total of 300 per day) for 4 weeks. Similarly, he practiced with the affected lower limb the following tasks: forward, backward, sideward, and inward stepping. Each task was practiced 25 times per session, 3 times a day (making a total of 300 per day) for 4 weeks (see table 1)**.** Additionally, the patient was asked to keep log of the tasks practice and report every other day. These enabled assessment of compliance and adherence to treatment protocol. The intervention was taught to the patient on the first day by the therapist for him to perform at home every day without supervision and once every week under the supervision of the author.

Outcomes

The instruments used in this study are DN4Q and VAS. The DN4Q is a reliable scale that consists of 4 items with a maximum score of 10 in which a score of at least 4 points indicates the presence of CPSP [14-15]. The VAS is a scale consisting of a 10 cm line in which a patient is asked to indicate a point that corresponds to the intensity of his pain [16-17]

The patient complied excellently with the treatment protocol (the compliance was 100%; it was high as no repetition or session was missed). Compliance of >90% indicates high adherence

with the intervention protocol [18]. At 2 weeks post intervention, the pain intensity decreased (a score of 4 on VAS) and a score of 2 on DN4Q. At 4 weeks post intervention, the pain completely disappeared. See figures 1 and 2 for the descriptions of the result. Additionally, participant did not report any adverse event or effect when asked. See figure 3 for the study timeline.

Discussion

The result showed that, 600 repetitions of functional tasks per day for 4 weeks during TST improved CPSP at 2 and 4 weeks post intervention. Previously, TST for the upper limb was reported to improve motor function [8, 11-19]; but not pain in patients with stroke. However, use of stumps in functional tasks with the aid of prosthesis has been shown to decrease phantom limb pain sensation following upper limb amputation in a non-stroke population [9]. The authors argued that, the decreased pain sensation could be as a result countervailing use-dependent, afferent-increase type of cortical reorganization that reversed the phantom limb pain. Therefore, it is also possible that the repetitive task practice used by the patient in this report resulted in use-dependent plasticity that offset the central post-stroke pain. This is because TST improves motor function through cortical reorganization [19]. Additionally, brain functions such as cognitive, motor and sensory functions (including pain sensation) are intricately controlled by the same areas of the brain [20]. Therefore, the finding of this report may not be totally surprising. Furthermore, phantom limb pain just like CPSP is also a neuropathic pain [13]; and the same mechanism argued by Weiss and colleagues for its improvement following functional tasks practice may apply to CPSP [9].

One of the important strength of this report is that no adverse event or effect was reported. This is unlike other forms of treatments for CPSP such as antidepressants, opiods deep brain stimulation and transmagnetic stimulation that may have side effects such as dependence and withdrawal effects or they may be costly [21-25]. Another additional strength of this report is that, the patient did not take any medication throughout the period of the intervention. However, this report may be limited by the inability to control confounding variables such as psychological influence of pain sensation, lack of control group, the use of a self report tool for compliance and the lack of formal stroke diagnosis which may also explain the improvement experienced by the participant. According to the patient himself, '*I began to get relief from the pain sensation few days after I started these trainings. This is the reason you don't see me coming to complain to you.*'

Conclusion

Task specific training (TST) seems to help improve CPSP, though the mechanism through which this happens is not clear. Therefore, there is a need for further studies to determine how TST helps improve CPSP after stroke.

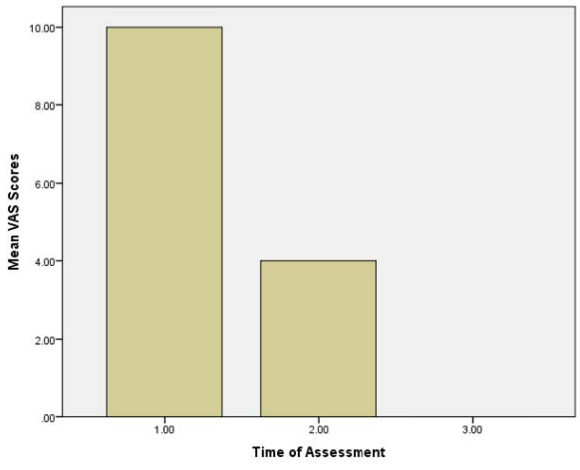

Figure 1: Pain scores measured using visual analogue scale (VAS) at baseline (1); and 2 weeks (2) and 4 weeks (3) post intervention

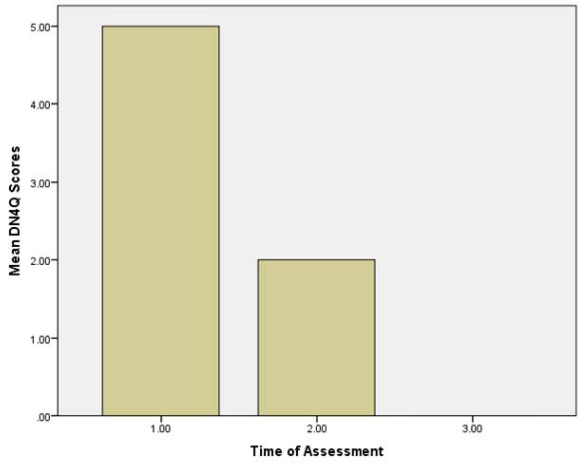

Figure 2: DN4Q scores at baseline (1); and 2 weeks (2) and 4 weeks (3) post intervention

Table 1: Upper and Lower Limbs Tasks Practiced by the Study Participant

Limb	Task	Dose
Upper Limb	Picking up a cup and drinking from it, teeth brushing, drawing a circle, transferring his cell phone from one side to another on a table and taking his hand to the temple of his head	20 times each per session, 3 times a day, 7 times a week for 4 weeks
Lower Limb	Forward, backward, sideward, and inward stepping	25 times each per session, 3 times a a day, 7 times a week for 4 weeks

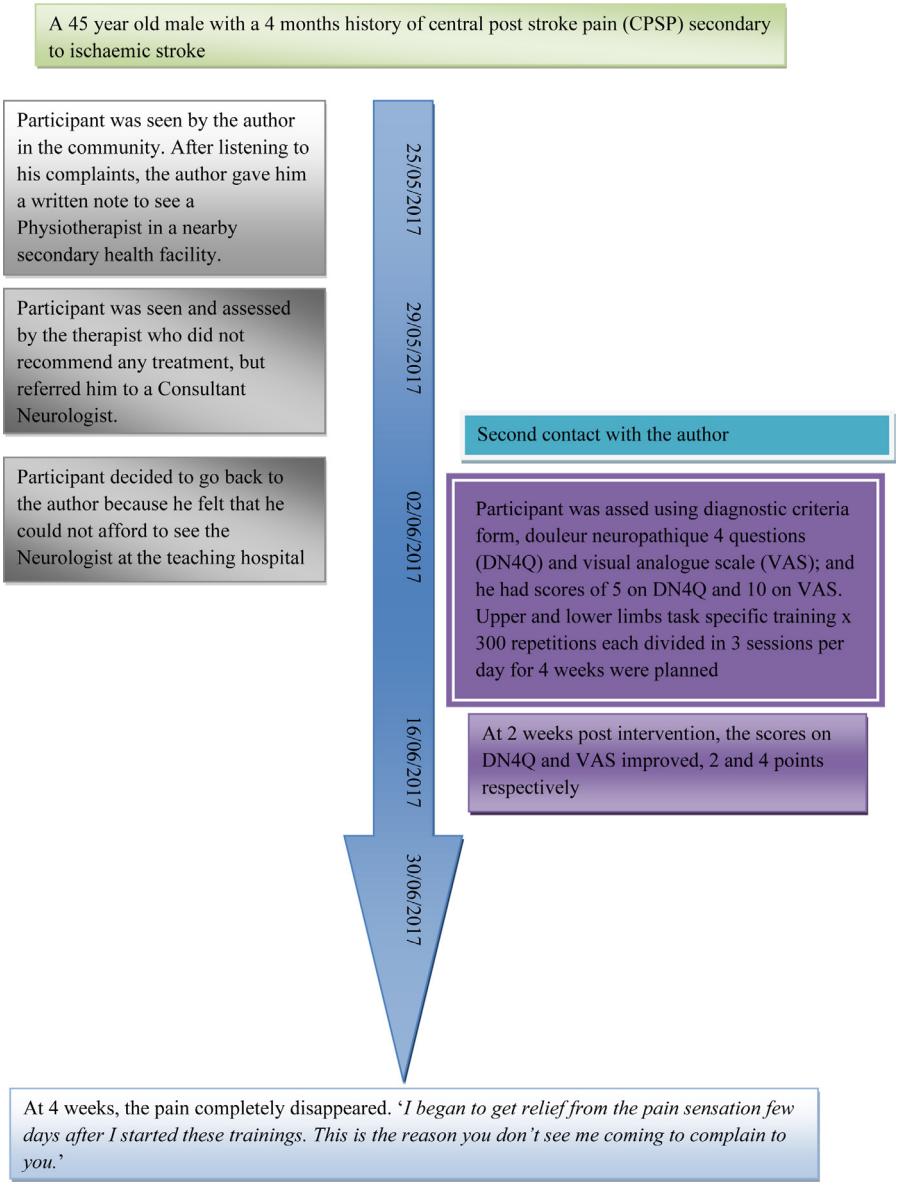

Figure 3: The study timeline.

Declarations

- Ethics approval and consent to participate. Not applicable. Participant was seen as a part of routine community service
- Consent to publish. Participants gave verbal as well as signed written consent to publish
- Availability of data and materials. The data and materials used in the study can be obtained on request from the author.
- Acknowledgements. I would like to acknowledge the participant for agreeing that his case can be published

References

1. Boivie J , Leijon G, Johansson I. Central post-stroke pain — a study of the mechanisms through analyses of the sensory abnormalities. Pain 1989; 37(2): Pages 173-185. https://doi.org/10.1016/0304-3959(89)90128-0
2. Klit H, Finnerup NB, Jensen TS. "Central poststroke pain: a population-based study." Pain 2011; 152:818–824.
3. Halliru BA, Abdullahi A, Abba MA, Mukhtar NB. "Central Post Stroke Pain (CPSP): Its Profile among Stroke Survivors in Kano, Nigeria." Behav Neurol 2017. https://doi.org/10.1155/2017/9318597
4. Kong KH, Woon VC, Yang SY. "Prevalence of chronic pain and its impact on health-related quality of life in stroke survivors," Arch Phys Med Rehabil 2004; 85: 35–40.
5. Andersen G, Vestergaard K, Ingeman-Nielsen M, Jensen TS, "Incidence of central post-stroke pain." Pain 1995; 61:187–193.
6. Henry JL, Lalloo C, Yashpal K. Central poststroke pain: An abstruse outcome. Pain Res Manag 2008; 13(1): 41–49.
7. Brainin M, Barnes M, Baron JC, Gilhus NE, Hughes R, Selmaj K, Waldemar G; Guideline Standards Subcommittee of the EFNS Scientific Committee. Guidance for the preparation of neurological management guidelines by EFNS scientific task forces–revised recommendations 2004. Eur J Neurol 2004;11:577– 81.
8. Abdullahi A (2018): Effects of Number of Repetitions and Number of Hours of Shaping Practice during Constraint-Induced Movement Therapy: A Randomized Controlled Trial. Neurology Research International. https://doi.org/10.1155/2018/5496408
9. Etoom M, Hawamdeh M, Hawamdeh Z, et al. Constraint-induced movement therapy as a rehabilitation intervention for upper extremity in stroke patients: systematic review and metaanalysis. Int J Rehabil Res. 2016;39(3):197–210. http://doi.org/10.1097/MRR.0000000000000169
10. Arya KN, Verma R, Garg RK, Sharma VP, Agarwal M, Aggarwal GG. Meaningful task-specific training (MTST) for stroke rehabilitation: a randomized controlled trial. Top Stroke Rehabil. 2012;19(3):193-211. doi: 10.1310/tsr1903-193.
11. Khallaf ME, Ameer MA, Fayed EE. Effect of task specific training and wrist-fingers extension splint on hand joints range of motion and function after stroke. NeuroRehabilitation 2017;41(2):437-444. DOI: 10.3233/NRE-162128
12. Weiss T, Miltner WHR, Adler T, Bruckner L, Taub E. Decrease in phantom limb pain associated with prosthesis-induced increased use of an amputation stump in humans. Neurosci Letters 1999; 272, 131–134.
13. Probstner D, Thuler LCS, Ishikawa NM, Alvarenga RMP. Phantom limb phenomena in cancer amputees. *Pain Practice*. 2010;10(3):249–256
14. Bouhassira D, Attal N, Alchaar H. "Comparison of pain syndromes associated with nervous or somatic lesions and development of a new neuropathic pain diagnostic questionnaire (DN4)." Pain 2005;114 (1-2):29–36,.
15. Benzon HT. "The neuropathic pain scales," Regional Anesthesia and Pain Medicine 2005; 30: 417–421.
16. Carlsson AM. Assessment of chronic pain. Aspects of the reliability and validity of the visual analogue scale. Pain 1983; 16 (1): 87-101
17. Bijur PE, Silver W, Gallagher EJ. Reliability of the visual analog scale for measurement of acute pain. Acad Emerg Med. 2001;8(12):1153-7
18. Page SJ, Levine P, Leonard A, Szaflarski JP, Kissela BM. Modified constraint-inducedtherapy in chronic stroke: results of a single-blinded randomized controlled trial. Phys Ther. 2008;88(3):333-40. doi: 10.2522/ptj.20060029.
19. Abdulahi A. Number of Repetitions as Measure of Dose of Shaping Practice in Acute Stroke: Preliminary Results of a Randomized Controlled Trial. Neurorehabil Neural Repair 2018; 32(4-5):402-403. DOI:1177/1545968318765498.
20. Mawase F, Uehara S, Bastian AJ, Celnik P. Motor Learning Enhances Use-Dependent Plasticity. J Neurosci 2017; 37 (10) 2673-2685. DOI: https://doi.org/10.1523/JNEUROSCI.3303-16.2017

21. Frese A, Husstedt IW, Ringelstein EB, Evers S. Pharmacologic Treatment of Central Post-Stroke Pain Clin J Pain 2006;22:252–260

22. Attal N, Guirimand F, Brasseur L, Gaude V, Chauvin M, Bouhassira D. "Effects of IV morphine in central pain: a randomized placebo-controlled study." Neurol 2002; 58:554–563.

23. Khedr EM, Kotb H, KamelNF, Ahmed MA, Sadek R, Rothwell JC. "Longlasting antalgic effects of daily sessions of repetitive transcranial magnetic stimulation in central and peripheral neuropathic pain," J Neurol Neurosurg Psych 2005; 76: 833–838.

24. Rasche D, Rinaldi PC, Young RF, Tronnier VM. "Deep brain stimulation for the treatment of various chronic pain syndromes," Neurosurgical Focus 2006; 21:E8.

25. Ramachandran VS, McGeoch PD, Williams L, Arcilla G, "Rapid relief of thalamic pain syndrome induced by vestibular caloric stimulation." Neurocase 2007;13: 185– 188.

Corresponding author address:

Auwal Abdullahi,

Department of Physiotherapy, Faculty of Allied Health

Sciences, College of Health Sciences, Bayero University Kano, Nigeria.

Email: aabdullahi.pth@buk.edu.ng, phone: +2347035267375