

**Treatment Critically Appraised Topic:**

Is daily passive muscle stretching effective at preventing losses of range of motion in adult spinal cord injured patients within a rehabilitation environment?

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**CLINICAL SCENARIO:**

Spinal cord injured patients are at high risk for contractures secondary to immobility and spasticity which can create a loss of extensibility. (Schneider, 1985) In rehabilitation, stretching is often used as a treatment to prevent decreases in range of motion and as such contracture formation. (Yarkony, Bass, Keenan, Meyer, 1985) Passive stretching is very resource intense and as such, one needs to examine current best evidence for preventing losses of range of motion in adult spinal cord injured patients within a rehabilitation environment.

**FOCUSSED CLINICAL QUESTION:**

Is daily passive muscle stretching effective at preventing losses of range of motion in adult spinal cord injured patients within a rehabilitation environment?

**SUMMARY of Search, 'Best' Evidence' appraised, and Key Findings:**

- Five studies that met the inclusion and exclusion criteria were identified from the database search. All of the five studies were assessor blinded randomized controlled trials. All five of the studies have a classic level of evidence of Ib.
- The reviewed studies do not support the use of passive stretching as when statistically significant treatment effect was shown to have occurred it was too small to be considered clinically worthwhile.
- Two of the five studies showed a small but statistically significant effect of increased ankle dorsiflexion but the effect was below what had been determined priori to be clinically worthwhile.
- One study looking at the effect of stretching into ankle dorsiflexion found no statistically significant effect.
- The study that was investigating the effect of passive stretching on hamstrings found no statistically significant effect.
- The study looking at the effect of static stretch on thumb abduction found no statistical difference between controls and intervention group

**CLINICAL BOTTOM LINE:**

Grade D evidence exists for the use of passive stretch to prevent contractures in the adult rehabilitation spinal cord population.

**Limitation of this CAT:** This critically appraised topic has not been peer-reviewed by one other independent person.

**SEARCH STRATEGY:**

**Terms used to Guide Search Strategy:**

**Patient/client group:** Spinal cord injured adults admitted to a rehabilitation facility.

**Intervention:** Daily passive muscle stretching performed for 20 to 30 minutes by a physiotherapist or physiotherapy assistant.

**Comparison:** Typical rehabilitation activities without passive stretching performed in physiotherapy for this client group. These would include bed mobility activities, transfer training, balance training, gait training where appropriate, strengthening and aerobic exercises, skin care education, wheelchair training and pain management when required.

**Outcomes:** The prevention of contractures and maintenance of range of motion for performance of activities of daily living and self-care activities.

**Citations:**

Ben, M., Harvey, L., Denis, S., Glinsky, J., Goehl, G., Chee, S., et al. (2005). Does 12 weeks of regular standing prevent loss of ankle mobility and bone mineral density in people with recent spinal cord injuries? *The Australian Journal of Physiotherapy*, 51(4), 251-256.

Harvey, L., de Jong, I., Goehl, G., & Mardwedel, S. (2006). Twelve weeks of nightly stretch does not reduce thumb web-space contractures in people with a neurological condition: A randomised controlled trial. *Australian Journal of Physiotherapy*, 52(4), 251-258.

Harvey, L. A., Batty, J., Crosbie, J., Poulter, S., & Herbert, R. D. (2000). A randomized trial assessing the effects of 4 weeks of daily stretching on ankle mobility in patients with spinal cord injury. *Archives of Physical Medicine & Rehabilitation*, 81(10), 1340-1347.

Harvey, L. A., Byak, A. J., Ostrovskaya, M., Glinsky, J., Katte, L., & Herbert, R. D. (2003). Randomised trial of the effects of four weeks of daily stretch on extensibility of hamstring muscles in people with spinal cord injuries. *The Australian Journal of Physiotherapy*, 49(3), 176-181.

Harvey, L. A., Herbert, R. D., Glinsky, J., Moseley, A. M., & Bowden, J. (2009). Effects of 6 months of regular passive movements on ankle joint mobility in people with spinal cord injury: A randomized controlled trial. *Spinal Cord: The Official Journal of the International Medical Society of Paraplegia*, 47(1), 62-66.

Useful Databases and sites searched	Search Terms	Limits used	Yield	Hits	Obtained
PEDro	Therapy: stretching, mobilizations  Problem: muscle shortening Sub-discipline: neurology	None	67	6	5
OTseeker	Stretching	None	22	2	1 *
	Flexibility	None	12	0	0
	Spinal Cord injury	None	36	2	1
Medline Ovid	Spinal cord injury, contracture (MESH) and stretch, or stretching, or passive range of motion or flexibility or neurological disease: subheadings: nervous system disease, trauma, central nervous system disease	Human, Adults, English language Clinical Trial No limits on dates	143	No new hits	No new studies or systematic reviews
PUBMED	Spinal cord injury+Contractures (MESH)	English, human, Control trials, meta analysis, reviews No date limits.	18	2	No new studies or systematic reviews
	Each above AND individually -Stretching, flexibility, self care activities, passive range of motion (Text)		>50	0	
CINAHL	Stretching, flexibility: ( <i>Exact word major subject heading</i> ); ( <i>word in major subject heading</i> ); ( <i>text</i> )  Spinal cord injury: ( <i>exact word in major subject heading</i> ); ( <i>word in major subject heading</i> );( <i>text</i> )Contractures ( <i>word in major subject heading</i> ); ( <i>text</i> )-Self care activities ( <i>word in major subject heading</i> ); ( <i>text</i> )-Neurological Injury ( <i>text</i> )  Two authors commonly repeating in search therefore: <i>Author search:</i> Harvey LA, Herbert RD	Scholarly journals, English, clinical trial, research No date limits	Multiple hits	None new	No new studies or systematic reviews
Cochrane Database of Systematic Reviews  Cochrane Database of Randomized Controlled Trials  Database of Abstracts of Reviews for Effects (DARE): Centre for Reviews and Dissemination	Stretching following the search tree to muscle stretching exercises. Stretching ( <i>keyword</i> )Passive range of motion, Spinal cord injury ( <i>Subject heading</i> ):	English	1	1	No new studies or systematic reviews  One new but not right study on closer examination
			32	2	
			49	0	

**Date of Search:** January/February 2009

**Summary of Study:** [Harvey et al., 2009](#)

**Population:**

- N=20 community dwelling wheelchair dependant tetraplegics with spinal cord injury.
- Participants had mild to moderate ankle stiffness defined as less than 101 degrees of dorsiflexion with a 12 Nm torque applied to the ankle
- They had to have an arc of at least 15 degrees of motion
- Participants had to have paralysis around both knees and ankles
- Participants had to have carers to perform the intervention
- No further defined exclusion criteria

Intervention: passive stretching daily over six months as a therapy to prevent contractures and maintain range of motion

**Outcomes:**

- **Ankle Dorsiflexion:** Measured as the difference in inclination of the footplate and tibia measured with a digital inclinometer (Measured at 2 Nm 5Nm, 7Nm, 8Nm and 10Nm,12Nm.)
- Reliability of the range of motion procedure: ICC 0.95 95%; confidence interval of 0.92-0.98.

**Flow of Study:**

Community tetraplegics were invited to participate.

- 20 participants or 40 ankles were randomized using a within participant design.
- Participants were stretched daily for 6 months.
- There were no drop outs in this study.
- Complete data sets were obtained for all participants.
- One participant incurred a fractured ankle for reasons unrelated to the intervention. This caused a cessation of the intervention for 14 weeks.
- There was a 96% adherence to the treatment protocol

**APPRAISAL:** PEDro score of 8/10

- This study was a within subject assessor blinded randomized controlled trial.
- Sample size determined by power analysis
- Randomization was done by a computer and concealed.
- Participants were analysed in the groups they were randomized to with intention to treat.
- Due to the within subject design demographics of the intervention and control group were identical.
- Was not possible to blind participants and carers performing intervention.
- This study found no clinically worthwhile intervention effect and a small statistical effect of 4 degrees over 6 months at CI of 95% 2-6 P=0.0002
- Number needed to treat as well as absolute risk and relative risk cannot be calculated due to lack of presentation of raw data. Means at different torque ratios were presented as data.
- Records, phone calls and visits were used to improve compliance and prevent co-intervention and contamination but it may have occurred but would have likely occurred in both the control and intervention ankles.
- The patient population is similar to out-patients seen at The Ottawa Hospital Rehabilitation Centre
  - Participants had American Spinal injury Association (ASIA) neurological levels ranging from C2-C7.
  - 11 participants had ASIA A lesions and 9 participants had ASIA B lesions.
  - Median age since injury was 39 (34-44) years and time since injury 8 years (4-14). 3 participants were women and 17 were men
- As there were no clinically worthwhile effect found clinicians should consider alternatives to maintaining range of motion such as use of TENS for spasticity reduction, frequent change of position etc..

## SUMMARY AND APPRAISAL OF STUDY: Harvey et al., 2009 Randomized Controlled Trial

Research Design	Strengths	Limitations	Conclusions
<p>Purpose: To determine the effectiveness of passive movements administered over a 6-month period to the ankles of people with SCI. An intensive treatment was selected (that is 20 minutes of passive movements five times a week)</p>	<ul style="list-style-type: none"> <li>-Within subject randomized design</li> <li>Sample size determined by power analysis</li> <li>Community living tetraplegics: Participants had American Spinal injury Association (ASIA) neurological levels ranging from C2-C7.</li> <li>11 participants had ASIA A lesions and 9 participants had ASIA B lesions.</li> <li>Median age since injury was 39 (34-44) years and time since injury 8 years (4-14). 3 participants were women and 17 were men</li> <li>Clinically worthwhile significance determined in priori</li> <li>- No dropouts</li> <li>-reliable outcome tool</li> <li>-Intention to treat analysis</li> <li>-blinded assessors</li> <li>-long term follow up</li> <li>-appropriate statistical analysis</li> </ul>	<ul style="list-style-type: none"> <li>Outcome tools not validated</li> <li>Participants were invited to participate – volunteer bias</li> <li>Potential for compliance issues with the treatment – follow-up by phone occasional visits and with a treatment record – does not ensure compliance</li> </ul>	<p>Passive dorsiflexion over the 6-month period increased slightly to a median of 91 degrees from a mean of 88 degrees. Thus the overall between group mean difference was 4 degrees (95% CI, 2-6 , P=0.0002 Removal of the data of participants with the 4% compliance issues at 12Nm there was little to no effect on the results (5 degrees, 95% CI 3-7 degrees)</p>

## Conclusion

Harvey et al., 2009 found Grade D evidence for the use of passive stretch to prevent contractures in the adult rehabilitation spinal cord population. This study does not support the use of passive stretching the treatment effect was too small to be considered clinically worthwhile. Clinically, this means the potential of alternative methods of maintaining range of motion such as regular frequent change in position, use of anti-spasticity drugs and electrical stimulation should be explored.