The Effect of Neck Proprioceptive Exercise on Recovery from Cervical Whiplash-Associated Disorders (WAD)

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Outline

- Background
- Rationale
- Search Methods
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- Implications for Research and Practice



- Whiplash-associated disorders (WAD)
 - A collection of signs and symptoms attributed to acceleration and deceleration forces experienced in motor vehicle accidents and other neck trauma
 - 50% of WAD patients continue to have neck symptoms one year post injury (Carroll et al., 2008)
 - Account for extensive social and economic costs (Sterling et al., 2006)

Whiplash-Associated Disorder (WAD) Classification System

Quebec Task Force Classification Grade	Clinical presentation
0	No complaint about neck pain No physical signs
Ι	Complaint of pain, stiffness or tenderness only No physical signs
II	Neck complaint Musculoskeletal signs including: Decreased range of movement Point tenderness
III	Neck complaint Musculoskeletal signs Neurological signs including: Decreased or absent deep tendon reflexes Muscle weakness Sensory deficits
IV	Neck complaint and fracture or dislocation

Knowledge Gap

• Despite the high incidence of WAD, there is no known gold standard rehabilitation intervention strategy by which to guide treatment

(Ask et al, 2009), (Sarig-Bahat, 2003),(Cote et al., 2009),(Hurwitz et al., 2008)

Common Signs and Symptoms of WAD I and II

- Hyperalgesia, movement loss, posttraumatic stress symptoms and varying levels of pain and disability (Sterling and Kenardy, 2008)
- Alterations in sensorimotor function (Treleaven, 2003)

Background Rationale

- The impairment in orienting the head in space is analogous to joint position deficits documented in the extremities post-injury (Loudon et al., 2008, Cooper at al. 2005)
- Reasonable to hypothesize that proprioceptive training would result in reduced impairment and improved function in those with cervical dysfunction.

Research Question

Do cervical proprioceptive exercises, alone or in conjunction with other therapeutic interventions, effectively reduce perceived pain and improve physical functional ability in adults with whiplash-associated disorder (WAD) I and II?

Search Strategy

Electronic databases

- MEDLINE (OvidSP)
- CINAHL, EMBASE, CENTRAL, Cochrane Database of Systematic Reviews, and PEDro

Grey literature

• Papers First, Proceedings First, Dissertations and Thesis, Government statistics

Reference lists

Table of contents of pertinent publications

• Spine, Journal of Manipulative & Physiological Therapeutics, Clinical Rehabilitation

Clinical experts

Search Methods

- Electronic databases were searched from their inception until May 2011 including:
 - MEDLINE, CINAHL, EMBASE, CENTRAL, SPORTDiscus, PEDro, and the Cochrane Database of Systematic Reviews
- Subsequent searches were conducted every 4 months from July 2010 to May 2011. Medical subject heading (MeSH) terms in the initial search included:
 - "whiplash injuries," "neck injuries," "cervical vertebrae,"
 "neck muscles," "exercise," "posture," "proprioception," and
 "stabilization"



Search Methods

- Search strategy results based on titles and abstracts were screened by two independent reviewers for relevance and accordance with inclusion criteria
- Inclusion criteria consisted of criteria such as articles written in English that involved adult participants with WAD I, II, or III
- Applicable full text articles were then reviewed

Study Characteristics

Types of Studies

- Randomized controlled trials (RCT) written in English
- Clinical controlled trials would have been considered, but none met the inclusion criteria

Types of Participants

 Adults age 18 and over diagnosed with either acute, subacute, chronic WAD I or WAD II

Study Characteristics

Types of Interventions

 Cervical proprioceptive exercise as a sole treatment or as an adjunct to a multimodal intervention

Types of Outcome Measures

- Pain
 - Neck Pain Index, Visual Analog Scale
- Neck Functional Ability
 - Neck Disability Index, Pain Disability Index

Inclusion Criteria

Title/Abstract

- Patients included in the study suffer from whiplashassociated disorder (WAD I, II or III)
- Treatment for whiplash includes a neck exercise intervention
- Outcome measures include pain or functional ability
- Patients involved in this study are adults 19+
- Study Design: randomized control trial, clinical control trial, or cohort study

Full Text

• Treatment intervention must include neck proprioceptive exercise

Exclusion Criteria

Title/Abstract

- WAD IV
- The paper is not written in English

Full Text

• Intervention not well defined and not able to obtain information from author

Quality Assessment

- At least two independent reviewers assessed study quality
- Methodological quality was determined using the PEDro scale
- Articles with PEDro scores of 6/10 or greater were included in the study

PEDro Scale

Criteria				
1. eligibility criteria were specified				
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)				
3. allocation was concealed -> external randomization service				
4. the groups were similar at baseline regarding the most important prognostic indicators -> subjects stratified prior to randomization				
5. there was blinding of all subjects				
6. there was blinding of all therapists who administered the therapy				
7. there was blinding of all assessors who measured at least one key outcome				
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups				
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat"				
10. the results of between-group statistical comparisons are reported for at least one key outcome				

11. the study provides both point measures and measures of variability for at least one key outcome

PEDro Scores

	1	2	3	4	5	6	7	8	9	10	11	Total Score
Bunketorp et al. (2006)	V	V	√	\checkmark			\checkmark	\checkmark	\checkmark	N	\checkmark	8/10
Jull et al. (2007)	\checkmark	\checkmark	V	\checkmark				\checkmark	\checkmark	V	\checkmark	7/10
Soderlund et al. (2000)	V	\checkmark	\checkmark	V			V	V	√	V	N	8/10
Ask et al. (2009)	$\overline{\mathbf{v}}$	$\overline{\mathbf{v}}$	$\overline{\mathbf{v}}$	\checkmark			V		V	V	N	7/10

Data Collection and Analysis

- At least two independent reviewers collected data from selected full text articles
- Information obtained included:
 - study design, purpose of study, participants, comparison groups, and outcome measures

Data Synthesis

- A meta-analysis was not feasible for this systematic review
- Due to the inconsistency of outcome measures utilized by various studies, criteria for homogeneity were not met

Results

- Four trials were selected which studied WAD I and II:
 - Soderlund et al. (2000)
 - Acute, 0-6 weeks
 - Bunketorp et al. (2006), Ask et al. (2009)
 Subacute, 6 weeks-3 months
 - ^o Jull et al. (2007)
 - Chronic, 3 months-2 years

- Compared two different home exercise programs for patients with acute WAD
- 3 and 6 month follow-ups
- n=59
- Average 20 days post-MVA

Both Groups

- Advice
 - Alternating rest with activities
 - Keeping the neck from getting cold
 - Walking a fair distance every day
 - Keeping the upright body posture intact while sitting, standing or walking
 - Not to lift or carry heavy items
 - Not to remain seated with their head bent forward during the first weeks after the injury

Both Groups

- Exercise (at least three times a day)
 - Looking over each shoulder in turn, 3-5 times
 - Moving the arms up and down anteriorly, 2-3 times
 - Taking a deep breath and lifting the shoulders upwards, exhaling, and relaxing the shoulders

Experimental Group

- Same as control, PLUS an exercise to improve kinaesthetic sensibility (at least three times a day)
 - While supine, participants imagined a "quadrangle" under the head and gently pressed each angle against the floor, followed by the diagonal angles



Findings

• At 3 and 6 month follow-up

- No significant between group differences on pain VAS and Pain Disability Index
- Significant within group differences relative to baseline for both groups
- Experimental group improved their "ability to decrease pain", an item on the Coping Strategies Questionnaire

- Evaluated the effects of a supervised physical training program, tailored to meet the needs of patients with subacute WAD versus a home training program
- 3 and 9 month follow-ups
- n=47
- Average 64 days post-injury

Both Groups

- Neck pain pamphlet
- Ergonomic advice
- At least 20 minutes of low-intensity aerobic exercise, twice a week

- Intervention Group 1 (Home Exercise)
 - Home exercise program to be completed twice a day, with physiotherapist consults available once every two weeks
 - Lifting and rolling the shoulders
 - Scapular adduction
 - Passive cervical rotation
 - Rowing exercise using elastic rubber band
 - Neck stretches



http://vikalpphysio.in/vikalp/?page_id=547

- Intervention Group 2 (Supervised Training)
 - 60-90 minute physiotherapy sessions, twice a week
 - Warm-up on stationary bike
 - Cervical rotation over a wedge-shaped pillow
 - Supine deep neck flexor exercises (discrete nodding motion)
 - Dynamic neck and shoulder exercises
 - Functional lifting
 - Abdominal and lower extremity strengthening

Findings

- At 3 month follow-up
 - Statistically significant difference in favour of supervised training on Pain Disability Index and analgesic consumption
- At 9 month follow-up
 - No statistically significant difference on all outcome measures between groups
 - No statistically significant difference on pain VAS within either group

- Compared the effect of exercise regimes with focus on either motor control training or endurance/strength training for patients with WAD in subacute phase
- 6 week and 1 year follow-ups
- n=25

Both Groups

- 30 minute one-to-one PT sessions once or twice a week for six weeks
 - Minimum 6 sessions, maximum 10 sessions
- Encouraged to perform home exercises and return to common activities as soon as possible

- Experimental Group 1 (endurance/strength)
 - High load recruitment of both superficial and deep neck muscles
 - Supine and prone head lifts
 - Elastic rubber band resisted cervical flexion, extension, and side flexion in sitting
 - Push-ups and dumbbell shoulder exercises



• Experimental Group 2 (motor control)

- Muscle re-education to reduce synergistic imbalances between the deep and superficial neck muscles
 - Supine craniocervical flexion exercises with progressive holds using an air-filled pressure sensor
 - Prone scapular adduction and retraction to train serratus anterior and lower trapezius
 - Postural correction exercises
 - Low load isometric cervical rotation to train cocontraction of flexors and extensors

Findings

- At 6 weeks and 1 year follow-up
 - Clinically important improvement in perceived disability (NDI) and pain VAS in ~50% of participants within each group
 - However, no statistically significant differences between groups in either outcome in the short or long term

- Questioned whether a multimodal program of physical therapies (MPT) was an appropriate management to be broadly prescribed for chronic WAD II patients versus a selfmanagement program (SMP)
- 10 week pre/post design, no long term follow-up
- n=71
- Averaged 12-13 months post-MVA

- Intervention Group 1 (SMP)
 - Provided with a booklet outlining the following:
 - Education about the mechanism of whiplash, assurance on recovery and the need to stay active
 - Ergonomic advice on activities of daily living, current work practices and work environment
 - Description of the exercise program which was to be completed twice a day

- Intervention Group 2 (MPT)
 - Multimodal program consisting of:
 - Same muscle re-education exercises as used by Ask et al. (2009)
 - Low velocity mobilising techniques
 - Same education as SMP group

• Findings

- At 10 weeks
 - Statistically significant difference between groups in favour of MPT with regards to perceived pain and disability
 - No long term follow-up conducted

Current Evidence

- There is evidence in the literature to support multimodal treatment (Kay et al., 2009), (Miller et al, 2010)
- There is no consensus regarding ideal treatment protocol for WAD (Miller et al., 2010)

Current Evidence

• Proprioceptive exercise:

- Effective for decreasing subjective pain and disability in chronic neck pain (Sarig-Bahat, 2003)
- Moderate evidence for long-term benefit for pain and disability in acute and subacute WAD patients (Kay et al., 2009)

Findings

- Long-term findings:
 No significant differences between groups
- Short-term findings:
 - Pain disability scores
 - Analgesic consumption
 - Coping Strategies Questionnaire
 - Perceived pain

Challenges

- Not able to isolate source of between-group differences due to multi-modal treatment interventions
- Unethical to have an experimental group compared to a control group in which no intervention is applied
- Definitive conclusions cannot be drawn

Summary

• Evidence is inconclusive to determine if proprioceptive exercise is effective at improving pain or functional ability in patients diagnosed with WAD I or II

Limitations

- Small sample size
- Non-compliance
- Concurrent treatment
- Unable to perform meta-analysis

Implication for Research

- Future studies should apply a standardized treatment
 - Including proprioceptive exercise to acute, subacute and chronic populations
- Experimental and control groups in the studies should be exposed to the same intervention with the exception of the proprioceptive exercise
- Homogeneity of outcome measures between studies would allow meta-analysis to be conducted

Implication for Practice

- A multimodal physiotherapy program, which includes cervical proprioceptive exercise performed under the guidance of a physiotherapist
- A physiotherapist-supervised exercise program which includes low load deep neck flexor exercises

Conclusion

- Active interventions along with proprioceptive exercise improve pain and functional ability in the short term
- Inconclusive evidence to prove that proprioceptive exercise has any effect on pain and functional recovery
- Further research is needed to determine if proprioceptive exercise is helpful in the recovery from a whiplash injury

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