

Are cervical pillows effective in reducing neck pain?

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ABSTRACT

A systematic review was undertaken to determine if cervical pillows are effective in decreasing neck pain. A comprehensive search of relevant electronic databases was conducted from the earliest time available to May 2005 using the terms pillow, cervical pillow, neck support, neck pain, cervical pain and neck ache. Additional articles were identified through citation tracking. Articles were included if the participants complained of neck pain and the effect of a cervical pillow on their neck pain had been assessed using an outcome measure for pain. Articles were excluded if the participants had received concurrent therapy or their neck pain was due to a systemic disease. Articles were assessed for quality using the PEDro scale. Of 127 articles identified, 5 articles of low quality met the selection criteria. There was not enough evidence to conclude if cervical pillows reduce chronic neck pain. Further research using high quality randomised controlled trials is required. **Shields N, Capper J, Polak T, Taylor N (2006): Are cervical pillows effective in reducing neck pain? New Zealand Journal of Physiotherapy 34(1): 3-9.**

Key Words: Neck pain, cervical pillow

INTRODUCTION

Physiotherapists use various management strategies when treating patients with neck pain including advice on pillow adaptation or selection. Neck pain can have a significant impact on an individual's quality of life, reducing a person's capacity to work and compromising their quality of sleep (Lavin et al., 1997; Burns, 1999).

A variety of cervical pillows are marketed as reducing neck pain as a result of better cervical posture and comfort during sleep (Persson and Moritz, 1998). Many of these products are endorsed by health professional associations and are recommended by clinicians as part of a pain management programme (Ambrogio et al., 1998; Persson and Moritz, 1998). The Australian Physiotherapy Association recommend the use of down or urethane pillows for most people (Australian Physiotherapy Association, 2005); and in their position statement on the management of neck pain conclude that they are unable to clearly state the benefits of cervical pillows since only one randomised controlled trial was located (Costello and Jull, 2002).

Manufacturers report the positive effects of cervical pillows are due to the restoration and maintenance of the cervical lordosis (Hagino et al., 1998). Although physiotherapists provide advice on the use of cervical pillows, it is not known what constitutes a suitable pillow for a patient with neck pain or whether the pillow shape, size or composition are important factors. To assist physiotherapists in this regard a systematic review

was conducted to investigate the effect of cervical pillows on neck pain.

METHODS

Search Strategy

Relevant articles were identified by searching the following electronic databases: Medline (1966 to May 2005), CINAHL (1982 to May 2005), AMED (1985 to May 2005), Embase (1988 to May 2005), Pubmed (1966 to May 2005), Sports discus (1830 to May 2005), Cochrane library (Accessed 27th May 2005), DARE, CENTRAL, AMI (1968 to May 2005), Ausport and PEDro (1929 to May 2005). The search terms used were pillow, cervical pillow, neck support, neck pain, cervical pain and neck ache. These searches were supplemented by citation tracking and searching the reference lists of articles identified. Additional articles were also sought by directly contacting the manufacturers of cervical pillows.

Inclusion and Exclusion Criteria

Articles were included in the review if (1) the study participants (no age restrictions) were described as having acute or chronic neck pain and (2) the study investigated the efficacy of a cervical pillow on the participant's neck pain using at least one pain outcome measure. Articles were excluded if (1) the cervical pillow had been used in conjunction with another form of treatment or the participant was receiving concurrent therapy, because it would be difficult to attribute any change to a specific intervention and (2) the participant's

neck pain was the result of a systemic disease for example, rheumatoid arthritis. There were no language restrictions.

Quality assessment

Two reviewers, (TP and NS), independently assessed the methodological quality of the articles using the PEDro scale. This 11 point scale is based on the Delphi list developed by Verhagen et al. (1998). It assesses the internal and external validity of a study using the following criteria (1) were eligibility criteria specified, (2) were participants randomly allocated to groups, (3) was allocation concealed, (4) were groups similar at baseline with regard to the most important prognostic indicators, (5) was there blinding of all participants, (6) was there blinding of all therapists who administered the therapy, (7) was there blinding of all assessors who measured at least one key outcome, (8) were measures of at least one key outcome obtained from more than 85% of the participants initially allocated to groups, (9) were outcome measures available for all participants who received the treatment or control condition as allocated or, if not, was data for at least one key outcome analysed by intention to treat, (10) were the results of between-group statistical comparisons reported for at least one key outcome, (11) were point measures and measures of variability provided for at least one key outcome. One point is awarded when each of the criterion 2-11 is satisfied. The reviewers were not blinded with regard to the author's institution and journal of the articles. Differences were resolved by discussion.

Most of the PEDro scale items have been validated by empirical evidence including randomisation, allocation concealment and blinding (Maher, 2000). The remaining items have face validity (Maher, 2000). This scale has been found to have an acceptable level of reliability for use in systematic reviews (Maher et al., 2003).

Data extraction

Two reviewers, (TP and JC), independently extracted the following data from the included studies: (1) demographic characteristics of the participants, for example age and gender, (2) the intervention received, including the type of cervical pillow used and the duration of use, (3) the primary outcome measure of pain, and any secondary outcomes such as activity limitations, sleep quality or the level of medication taken by participants, (4) study characteristics including the type of study, sample size and inclusion/ exclusion criteria and (5) additional information, for example satisfaction with the intervention, number of drop outs and adverse effects reported.

Data analysis

An effect size is a method of quantifying the difference between two data sets. Effect sizes

with 95% confidence intervals were calculated to compare the outcomes reported in the included articles. Cohen (1977) arbitrarily defined a small effect size as less than $d=0.2$, a moderate effect size as less than $d=0.5$ and a large effect size as $d=0.8$.

The method used to calculate an effect size was based on the type of research design used in a particular study. Where a study used a single group repeated measures design, effect sizes were calculated by subtracting the post-treatment mean pain score from the pre-treatment mean pain score and dividing by the standard deviation of the difference scores (Howell, 1987). A 95% confidence interval was calculated for each effect size using the critical value of t divided by the square root of the sample size (Howell, 1987). Effect sizes and 95% confidence intervals for the other types of study (comparative and randomised controlled trials) were calculated using the method described by Hedges and Olkin (1985) using web-based software (Schwarzer, 1995). Where a study was a comparative study, that is, it compared two different cervical pillows not usually used by the participant, the effect size was calculated by subtracting the mean pain score during one treatment phase from the mean pain score of the other treatment phase and dividing by the weighted pooled standard deviation of the pain scores. Where a study compared a cervical pillow to the participant's usual pillow (control phase), the effect size was calculated by subtracting the mean pain score from the control phase from the mean pain score of the intervention phase and dividing by the control phase standard deviation. A meta-analysis was not performed because of the heterogeneity of the study designs and outcome measures.

RESULTS

A total of 127 articles were identified by the search strategy. After reviewing the title and abstract 11 articles were identified for further review (Chattopadhyay, 1980; Smythe, 1994; Jochems et al., 1997; Lavin et al., 1997; Ambrogio et al., 1998; Erfanian et al., 1998; Hagino et al., 1998; Persson and Moritz, 1998; Burns, 1999; Gutenbrunner et al., 1999; Erfanian et al., 2004). Of these two articles were excluded because they included participants who did not complain of neck pain (Erfanian et al., 1998; Persson and Moritz, 1998). Single articles were excluded for the following reasons: participants were all diagnosed with a systemic condition, fibromyalgia (Ambrogio et al., 1998) or were receiving concurrent physiotherapy treatment (Gutenbrunner et al., 1999); the study did not investigate the efficacy of using a cervical pillow on the participants' neck pain (Smythe, 1994); and an outcome measure for cervical pain was not included (Chattopadhyay, 1980). Therefore 5 articles met the inclusion criteria of the study

“it is not known... whether the pillow shape, size or composition are important factors.”

Table 1 Summary of the included studies

Study	PEDro Score	Study type	Age (yrs)	Gender	Sample Size	Presenting condition	Intervention Details	Trial Length	Outcome Measures	
									Primary	Secondary
Burns (1999)	5	Prospective cohort	25-68yrs Group 1 51.7±11.1 Group 2 41.2±12.4	15F 5M	20	Chronic neck pain	Group 1: Purity health pillow (n=10) Group 2: Commerical 'travel' pillow (9x12") (n=10) 10 day trial period	10 days	Borg pain scale	None
Erfanian et al. (2004)	3	RCT	Treatment group 34.1±9.5 Control group 30.2±7.7	17F 8M	25	Chronic neck pain ± headache (>3 months duration)	Treatment: Semi-customised cervical pillow prototype Control: Usual generic pillow	4 weeks	Daily pain diary	CMCC Neck disability index
Hagino et al. (1998)	3	Pre/ post intervention	39±9.4	14F 12M	28	Chronic neck pain (>2 months duration)	Align-Right Cylindrical Cervical Pillow	4 weeks	VAS	Medication use
Jochems et al. (1997)	4	Open randomised 2 phase cross-over	51.9 ± 8.6 (40.7-67.1)	11F 9M	20	Chronic neck and shoulder region pain	The Pillow – orthopaedic pillow Usual generic pillow	4 weeks with a 6 week follow up	VAS- am/pm pain	Awakenings Hours rest AM stiffness Satisfaction AROM & PROM
Lavin et al. (1997)	3	Randomised cross-over	48 (26-76)	21F 20M	41	Chronic neck pain (88% of cases were >6 months duration)	Cervi-Garde roll pillow Mediflow water based pillow Participants' usual pillow	1 week own pillow 2 weeks each for other pillows	VAS	Sleep questionnaire Sickness impact profile Satisfaction rating

F= female; M=male; RCT= randomised controlled trial; yrs= years; VAS= visual analogue scale; CMCC= Canadian Memorial Chiropractic College; AROM= active range of motion; PROM= passive range of motion

(Jochems et al., 1997; Lavin et al., 1997; Hagino et al., 1998; Burns, 1999; Erfanian et al., 2004) (see Table 1).

Participants in the included studies all had chronic neck pain, were aged in the middle years and included more females than males. These demographic data are consistent with the expected age range (Hill et al., 2004) and gender distribution (Cote et al., 2004) for neck pain. The quality assessment score for the included studies ranged from 3 to 5 out of 10 on the PEDro scale, with a median score of 3. No study met the PEDro scale quality assessment items 3-7 on the PEDro scale. These scale items related to the blinding of subjects, therapists and assessors, concealed allocation of participants to groups and whether the treatment groups were similar at baseline. In only two (Jochems et al., 1997; Burns, 1999) out of five studies did all the participants receive the treatment or control condition as allocated; in the other three included studies, the data were not analysed by intention to treat (Lavin et al., 1997; Hagino et al., 1998; Erfanian et al., 2004).

Each of the studies investigated the efficacy of a different type of cervical pillow (see Table 2). Three studies compared the participant's usual pillow with a cervical pillow (Jochems et al., 1997; Lavin et al., 1997; Erfanian et al., 2004). Two studies (Lavin et al., 1997; Burns, 1999) compared two types of cervical pillow, while one study (Hagino et al., 1998) investigated the use of one cervical pillow in a pre-post intervention trial.

Effect of the intervention on neck pain

The outcome measures used to measure pain levels varied between the five studies. Four studies measured pain intensity daily using a visual analogue

scale (Jochems et al., 1997; Lavin et al., 1997; Hagino et al., 1998; Erfanian et al., 2004). A fifth study utilised the Borg pain scale at the beginning and the end of the study period (Burns, 1999).

Effect size calculations were completed for 4 studies (see Figure 1). An effect size was not calculated for a fifth study (Jochems et al., 1997) as they did not report standard deviation values for their data. As the figure shows, there was no difference in the reported pain scores for two types of cervical pillow (roll and semi-customised) when compared to the participants' usual pillow but a positive effect was demonstrated when a water-based cervical pillow was compared the participants' usual pillow. A decrease in neck pain scores was also reported when a cervical pillow was compared to a travel pillow (Burns 1999) and for a trial using a repeated measures design with no control.

Secondary outcome measures

Effect of the intervention on medication use

One study (Hagino et al., 1998) investigated the effect of a cervical pillow on the number of analgesic medications taken. The reported reduction in analgesic use, from an average of four pills per day to one pill per day between the start and end of the study, was not statistically significant ($F= 1.88$, $p= 0.13$, 95% CI 2 pills).

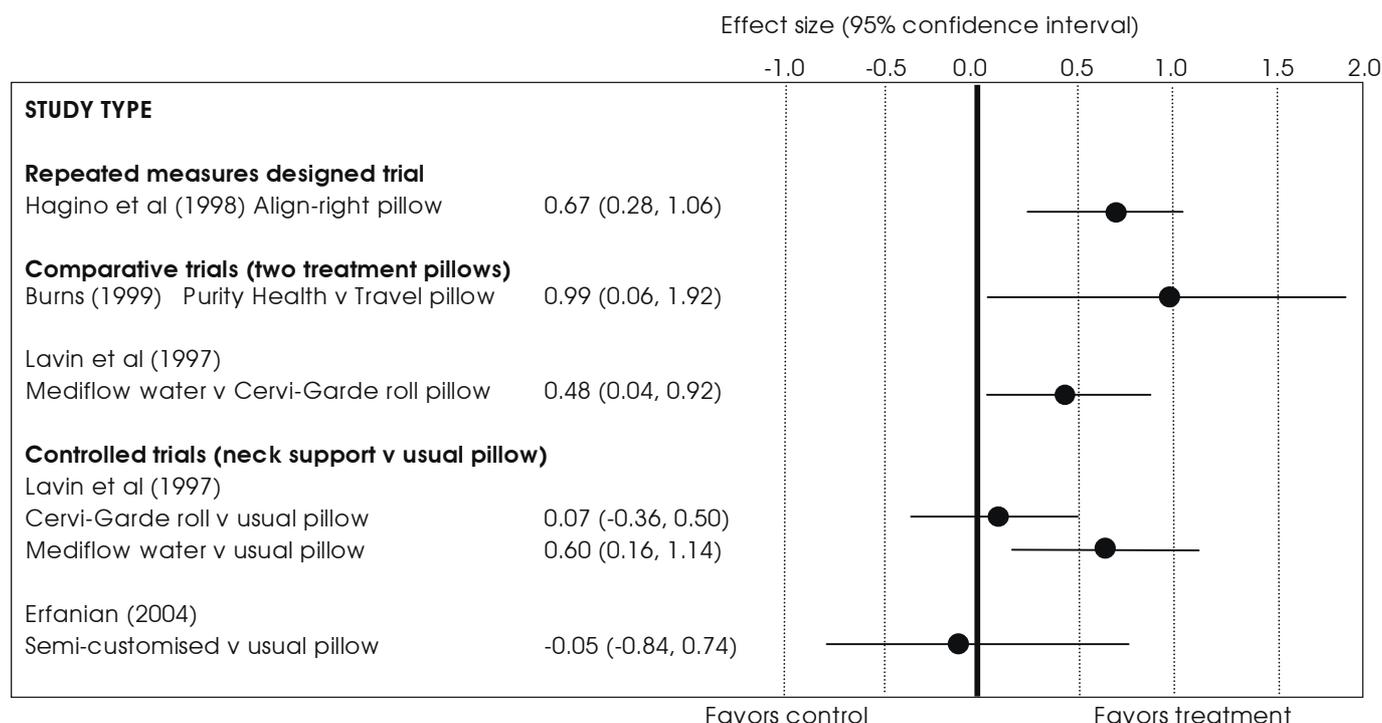
Effects of the intervention on sleep

Two studies examined the effect of a cervical pillow on sleep (Jochems et al., 1997; Lavin et al., 1997). Participants in one study (Lavin et al., 1997) were asked to complete a daily sleep questionnaire every morning to assess aspects of their sleep including duration and quality of sleep. There were no differences between the cervical pillows

Table 2 Types of pillows used in the included studies

Study	Pillow Type	Description
Erfanian et al. (2004)	Semi-customised cervical pillow	A prototype pillow with foam quadrants that allowed the user to choose between four heights.
Burns (1999)	Purity Health pillow	Consisted of a mesh case that allowed air flow through the pillow once it was filled with triclosan (plastic) beads. The participants filled this mesh case with beads to a personal comfort level.
	Travel pillow	A commercial Walgreen drugstore brand pillow (size 9 x 12")
Hagino et al. (1998)	Align-right cylindrical cervical pillow	This pillow was filled with a trade-marked polyester fibre and was designed to support the cervical lordosis for supine sleep and the neck and head for side posture sleep.
Jochems et al. (1997)	The Pillow	A 36cm x 63cm polyester orthopaedic pillow which consisted of a soft upper layer and a hard bottom layer with a depression in the middle allowing a supine sleep position.
Lavin et al. (1997)	Mediflow water based pillow	Consisted of 4" of soft polyester fibre over a 3.8cm water base at the bottom of the pillow that was filled with 2,360ml of water. The water pouch was covered by a thermal reflector fabric to prevent heat transfer from the skin of the user to the pouch. The water volume could be adjusted to change the pillow's firmness.
	Cervi-Garde model 1540	A cylindrical polyester fibre-filled roll pillow (43 cm length x 17.8 cm diameter)

Figure 1 Individual effect size calculations for pain intensity scores



trials in this study and the duration of time required to fall asleep or the number of awakenings during the night but participants did report significantly better overall sleep quality for a water based (Mediflow) pillow. The duration of sleep was significantly affected by pillow type ($p < 0.05$) with the participant's usual pillow and the water based (Mediflow) pillow associated with a significantly longer sleep duration than the roll (Cervi-Garde) pillow ($p < 0.025$ for each). Participants in another study (Jochems et al., 1997) reported no difference in the number of times they woke up during the night as recorded in a daily diary.

Effect of the intervention on activity

Two studies measured the impact of a cervical pillow on the function of the participants using the neck disability index (Erfanian et al., 2004) and the sickness impact profile (Lavin et al., 1997). Neck Disability Index scores were not significantly different between the intervention and control group ($d = 0.57$ 95% CI -0.24 to 1.38) (Erfanian et al., 2004). Lavin et al. (1997) reported a significantly lower total score on the sickness impact profile for the water based (Mediflow) pillow compared to both the participant's usual pillow ($p < 0.01$) and a roll (cervi-garde) pillow ($p < 0.025$).

Compliance and adverse effects

Only one study (Hagino et al., 1998) reported on participant compliance with the intervention pillow during the trial periods and stated that participants used the allocated pillow an average of 7 ± 2 hours nightly. The method by which this level of compliance was determined was not reported.

Drop-outs were recorded in three out of five included studies (Lavin et al., 1997; Hagino et al., 1998; Erfanian et al., 2004). Eleven participants (30%) failed to complete one trial (Erfanian et al., 2004). Six of these eleven participants did not complete all the required questionnaires and therefore were not included in analysis, four participants experienced unexpected problems (for example stress at work, a death in the family, sports injuries) and did not complete the study as a result and one participant reported the cervical pillow was uncomfortable and withdrew from the study during the second week of the trial. Fifteen participants (36.6%) did not complete a second study (Lavin et al., 1997); 10 participants dropped out during the trial and gave uniformly negative comments regarding the roll pillow. An additional two participants did not record any responses on the VAS scale indicating in the comments section that they could not tolerate the roll pillow. One participant stopped using the standard pillow before the end of the trial and two participants discontinued the water-based pillow prematurely. Hagino et al (1998) reported 2 dropouts (7%) who did not complete the trial as they were unable to tolerate the discomfort experienced when using the pillow. There were no drop-outs reported in the other two included studies (Jochems et al., 1997; Burns, 1999). Jochems et al. (1997) however, reported that nine participants complained of adverse effects they experienced while using the intervention pillow. Two participants complained of passing pain in the earlobe, 5 participants complained of migraines or headaches, 1 about pain in the fingers and 1 about 'flu-like' symptoms.

Satisfaction with the intervention

Two studies (Jochems et al., 1997; Lavin et al., 1997) asked participants to rate their level of satisfaction with the cervical pillow on a satisfaction scale. One study (Lavin et al., 1997) found 22 participants were satisfied with the water based pillow compared to 7 participants with the roll pillow and 4 participants with the standard pillow. Participants commented that they did not like the roll pillow because it tended to flatten during use, it was difficult to maintain in position and the diameter was insufficient to support the head and neck simultaneously. Nineteen out of 20 participants in another study (Jochems et al., 1997) stated their preference for the experimental cervical pillow (compared to their usual pillow). Six weeks after the completion of the study 16 of the participants still used the experimental cervical pillow and 19 of them had recommended it to others.

DISCUSSION

The results of this systematic review make it difficult to determine whether cervical pillows decrease chronic neck pain. Analysis of effect sizes for studies that compared a cervical pillow with the participants' usual pillow found one water-based cervical pillow had a moderate effect on neck pain while two other pillows (roll and semi-customised) had no effect on neck pain (Lavin et al., 1997). Two other studies (Hagino et al., 1998; Burns, 1999) also reported a positive effect on neck pain with the use of a cervical pillow, but neither of these studies included a control group, and therefore it is more difficult to attribute any improvements specifically to the intervention. Due to the small number of included studies and their low methodological quality, the conclusion of this review is consistent with the APA position statement (Costello and Jull, 2002) that there is insufficient evidence to conclude that cervical pillows are effective in reducing neck pain.

The low quality of included studies means that the effects of the pillow being investigated may be over-estimated. There appeared to be a relatively large number of participants in the studies who dropped out of the trial. Between 7-36% of participants dropped out of three of the trials (Lavin et al., 1997; Hagino et al., 1998; Erfanian et al., 2004), with many of these participants reporting discomfort or poor toleration of the cervical pillow. Since intention to treat analysis was not always conducted to account for drop-outs, it is possible that the reported results may have exaggerated the effects of prescribing a cervical pillow to a patient with chronic neck pain. Also, none of the included studies used blinded assessors or used a concealed allocation technique. These limitations of research design are of particular concern as it has been reported that effect sizes, on average, can be exaggerated by 35% when assessment of outcomes is not blinded (Juni et al., 1999), and

by 30% when group allocation is not concealed (Egger et al., 2002). It is recommended that further studies into the effectiveness of cervical pillows on reducing neck pain be conducted using high quality randomised controlled trials, in accordance with the CONSORT statement (Moher et al., 2003). Future studies should pay particular attention to using a concealed random allocation method and ensuring that assessors are blinded to group allocation.

The intervention periods of the included studies was relatively short (10 days- 4 weeks), therefore the long term effect of cervical pillows on neck pain are unknown. Only one study included a follow-up six weeks after the completion of the study and reported that 16 out of 20 participants still used the cervical pillow (Jochems et al., 1997). It is possible that a longer trial period is required to allow a person to adjust to a new pillow and that this might have resulted in a better outcome. There was some anecdotal evidence reported by one study (Jochems et al., 1997) that some participants found the cervical pillow uncomfortable at the start but experienced positive results when they persevered. The introduction of a cervical pillow might also affect sleeping position, and it might take time to adjust to this alteration. With regard to the secondary outcome measures there was evidence from one low quality study to suggest that a water based cervical pillow was associated with better overall sleep quality and longer sleep duration. Improved sleep quality may help individuals to better cope with their neck pain (Nicassio and Wallston, 1992). It may also be that it takes some time for the benefits of improved sleep to be realised. It is recommended that rigorous studies further investigate water based pillows over at least a three-month intervention, to provide high-level evidence about their effect on neck pain, sleep duration and sleep quality.

CONCLUSION

The findings of this systematic review suggest that there is insufficient evidence to conclude if cervical pillows can reduce chronic neck pain. Further studies using high quality randomised controlled trials are required before the use of cervical pillows can be recommended for clinical practice.

Key Points

- A systematic search of the literature identified only 5 low quality studies that investigated the effect of cervical pillows on neck pain
- There is not enough evidence to recommend the use of cervical pillows to reduce chronic neck pain
- High quality randomised controlled trials are required to find out if cervical pillows can reduce neck pain

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