CRITICALLY APPRAISED TOPIC

FOCUSED CLINICAL QUESTION

In 30 year old females who have cervical neck pain and postural dysfunction (including forward head, rounded shoulders, and increased thoracic kyphosis) due to a desk job, would patient education on ergonomics plus therapeutic exercise that emphasizes neuromuscular re-education of postural muscles help decrease neck pain more effectively than therapeutic exercise alone.

AUTHOR

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CLINICAL SCENARIO

The patient is a 30 year old female who works as an analyst for a software development company. The patient's posture is impaired due to sitting in front of a computer several hours each day and is complaining of neck pain.

Neck pain is experienced by around 43 to 69%[1] of clerical workers potentially due to repetitive musculoskeletal strain from improper office ergonomics equipment, repetitive upper extremity movements and muscle tension, sedentary behavior, and stress.[1-10] Half of office workers that utilize their computers for at least 15 hours each week tend to develop upper extremity musculoskeletal injuries within their first year of working.[4] Ergonomics education can improve behaviors in the workplace that could potentially avoid future injuries and improve posture, like adjustments of the computer, keyboard, and office chair.[6] Women have a greater tendency to develop neck pain compared to men[4], so it is best to understand if patient education on the topic of office ergonomics plus exercise interventions can effectively help with cervical neck pain in this patient population, or if exercise alone will be sufficient.

SUMMARY OF SEARCH
[Best evidence appraised and key findings]

- Three electronic databases were utilized to find and select 10 articles with the best evidence. The articles included one Systematic Review, five Randomized Controlled Trials, two Cluster Randomized Controlled Trials, one Cohort study and one Longitudinal Cohort study.
- Three studies (1 Systematic Review and 2 Randomized Controlled Trials) were chosen and thoroughly reviewed and assessed.
  - There is strong evidence for the use of muscle strengthening and endurance exercises to treat neck pain in desk workers.[1]
  - Lesser evidence was found to confirm that posture-related exercises and stretching were effective in the treatment of neck pain in this patient population.[2,3]
  - There is limited evidence that supports the effectiveness of ergonomics education plus neuromuscular re-education postural exercises to treat neck pain in female clerical workers. [2,3,4,5,6,7] While many studies utilized ergonomics education as one of their interventions (either as a control or with a treatment), only one study[6] explicitly stated that it aided in neck pain treatment and recovery.[2,3,4,5,6,7]

CLINICAL BOTTOM LINE

There is limited evidence that supports the effectiveness of neuromuscular re-education and posture-related exercise along with ergonomics education in the treatment of neck pain in female office workers. While there was strong evidence to suggest that muscle strength and endurance exercises help this patient population, there is also some limited evidence to suggest that other physical therapy treatment interventions, including flexibility, posture re-training, and ergonomics education can successfully help this patient population improve their neck pain. More high quality randomized controlled trials are needed to determine the effectiveness of this treatment combination (postural neuromuscular re-education plus ergonomics education) for neck pain in female clerical workers.

This critically appraised topic has been individually prepared as part of a course requirement and has been peer-reviewed by one other independent course instructor

The above information should fit onto the first page of your CAT

SEARCH STRATEGY

Terms used to guide the search strategy			
Patient/Client Group	**I**ntervention (or Assessment)	**C**omparison	**O**utcome(s)
female adult* desk job "desk job" "cervical neck pain" "neck pain" posture "posture dysfunction" "forward head posture"	education "patient education" ergonomics "therapeutic exercise" exercise "neuromuscular re-education" "neuromuscular re-education"	"therapeutic exercise" exercise "neuromuscular re-education" "neuromuscular re-education"	decrease pain

Final search strategy:

Show your final search strategy from one of the databases you searched. In the table below, show how many results you got from your search from each database you searched.

Web of Science Search Strategy (58 results in #8):

1. TS=(desk job* OR office worker* OR desk worker* OR clerical worker*)
2. TS=("neck pain" OR "cervical pain")
3. TS=(posture OR "postural dysfunction" OR "forward head posture")
4. #3 AND #2 AND #1
5. TS=(exercise*)
6. #5 AND #4
7. #5 AND #3 AND #1
8. **#5 AND #2 AND #1**

I also attempted to add the following to include ergonomics, which yielded very few results:

9. TS=(ergonomics)
10. #9 AND #3 AND #1
11. #4 AND #5 AND #9
12. #1 AND #2 AND #5 AND #9

Databases and Sites Searched	**Number of results**	**Limits applied, revised number of results (if applicable)**
PubMed	**4**	**N/A**
Web of Science	**58**	**Limit: English only - changed result to 55**

Academic Search Premier	**109**	**N/A**

INCLUSION and EXCLUSION CRITERIA

Inclusion Criteria
• Studies that include adult females that are at least 30 years old • Studies that include only cervical neck problems related to postural dysfunction (not lumbar spine pain/conditions) • Includes information about ergonomics in an office setting • Includes information about therapeutic exercises related to postural muscle neuromuscular re-education. • Measures patients pain using a VAS (or other outcome measure to measure pain)
Exclusion Criteria
• Articles not published in English • Abstracts only • Editorials

RESULTS OF SEARCH

Summary of articles retrieved that met inclusion and exclusion criteria

For each article that meets your inclusion and exclusion criteria, score for methodological quality on an appropriate scale, categorize the level of evidence, and note the study design (e.g., RCT, systematic review, case study).

Author (Year)	Study quality score	Level of Evidence	Study design
Sihawong et al (2011)[1]	**AMSTAR: 9/11**	**1a**	**Systematic Review of Randomized Controlled Trials**
Pillastrini et al (2016)[2]	**PEDro: 9/11**	**1b**	**Randomized Controlled Trial**
Tunwattanapong et al (2016)[3]	**PEDro: 9/11**	**1b**	**Randomized Controlled Trial**
Lidegaard et al (2013)[4]	**PEDro: 6/11**	**1b**	**Randomized Controlled Trial**
Anderson et al (2011)[5]	**PEDro: 10/11**	**1b**	**Randomized Controlled Trial**
Mahmud et al (2015)[6]	**PEDro: 6/11**	**2b (<80% follow-up)**	**Cluster Randomized Controlled Trial**
Ma et al (2011)[7]	**PEDro: 5/11**	**2b (<80% follow-up)**	**Randomized Controlled Trial**
Sihawong et al (2014)[8]	**PEDro: 7/11**	**2b (<80% follow-up)**	**Cluster Randomized Controlled Trial**

Wegner et al (2010)[9]	**Downs and Black: 13/29**	**4**	**Cohort Study**
Hush et al (2009)[10]	**Downs and Black: 13/29**	**4**	**Longitudinal Cohort Study**

(All 10 articles should appear in the reference list at the end)

BEST EVIDENCE

The following 3 studies were identified as the 'best' evidence and selected for critical appraisal. Reasons for selecting these studies were:

- **Sihawong et al (2011)[1]**: This study provided the highest level of evidence (1a), scored well on the AMSTAR, and also confirmed that exercise improved neck pain in office workers by utilizing other high quality studies.
- **Pillastrini et al (2016)[2]**: This RCT scored well on the PEDro scale and is a higher level of evidence. Additionally, the study utilizes ergonomics interventions in addition to "global postural re-education" interventions, which appeared to be similar to neuromuscular re-education, to help participants with their neck pain.
- **Tunwattanapong et al (2016)[3]**: This RCT scored well on the PEDro scale and also provides a higher level of evidence. This study confirmed that exercise aids in the treatment of neck pain for office workers, and also utilized ergonomics education in the study.

SUMMARY OF BEST EVIDENCE

(1) Description and appraisal of *Exercise therapy for office workers with nonspecific neck pain: a systematic review* by *Sihawong et al (2011)[1]*

Aim/Objective of the Study/Systematic Review:

The objective of this systematic review was to evaluate effectiveness of exercises to cure and/or prevent nonspecific neck pain in desk workers.

Study Design

Systematic Review of Randomized Controlled Trials

Search Strategy

The authors searched for literature between 1980-April 2010 from PubMed, The Cochrane Library, Science Direct, PEDro, Scopus, PsycNet, ProQuest, and CINAHL Plus with full text. Key words included "neck pain, cervical pain, exercise, strengthening, stretching, endurance, office workers, visual display unit, visual display terminal, and computer users."[1(p.63)]

Selection Criteria

Two independent reviewers picked applicable articles using the following selection criteria:

1. The studies were Randomized Controlled Trials (RCTs) that had exercise(s) as the chief intervention.
2. The article was full text, published in English, and was *not* just an abstract, letter, book, poster, or conference proceeding.
3. The samples of the studies were "computer users"[1(p. 63)], clerical workers, or "visual display unit/terminal operators".[1(p. 63)]
4. The diagnosis of nonspecific neck pain was incorporated in the article. Serious neck pain pathology, including fractures, tumors, or dislocation, were left out.

Methods

The PEDro scale was utilized and the score for each study was added from questions 2-11 (the first question was excluded since it assesses "external validity of trial results"[1(p. 63)]). Scoring at least 50%, or 5/10, yielded a "high quality study"[1(p. 63)], while less than 50% yielded a "low quality study"[1(p. 63)]. If an article's PEDro score was calculated and verified on "Physiotherapy Evidence Database (www.pedro.org.au)"[1 (p.63)], that score was utilized in this study. Data was obtained from the studies from the same independent reviewers, and the "consensus method"[1 (p. 63)] with a third reviewer was utilized if there was a disagreement.

Setting

Cannot be determined from the study characteristics in this systematic review.

Participants

- 9 RCT studies were included in this systematic review (8 RCTs, 1 Cluster RCT)
- All of the participants in the RCTs were "office workers"[1 (pp.66-67)], and studies ranged in sample size from 19 to 549 in the 9 studies.
- 7 of the 9 RCTs utilized males and females as participants, while 2 of the 9 RCTs only utilized females.
- 6 of the 9 RCTs had participants with nonspecific neck pain, 1 of the 9 had participants that were either healthy or had nonspecific neck pain, 1 of the 9 RCTs had only healthy subjects, and 1 of the 9 did not say whether neck pain or healthy participants were studied.
- In the 7 RCTs that studied participants with nonspecific neck pain, 2 of the 7 RCTs looked at participants with "chronic pain"[1(p. 65)], while the other 5 RCTs did not specify the type of pain.
- 5 of the 9 RCTs observed the success of certain exercise types. 4 of the 9 RCTs looked at two joint "exercise therapies"[1 (p. 65)] or rest breaks/"postural training"[1 (p.65)] with "exercise therapy"[1 (p. 65)].
- 5 of the 9 RCTs evaluated exercise with other interventions, while 4 of the 9 RCTs compared the "effectiveness of exercise therapy to no intervention"[1 (p.65)].
- 8 of the 9 RCTs randomly allocated their participants into groups (as seen from the PEDro scores in Table 1).
- 5 of the 9 RCTs had participant groups that were similar at baseline (as seen from the PEDro scores in Table 1).
- 6 of the 9 RCTs assessed outcomes between a 3 week to 7.5 month follow-up period. 3 of the 9 RCTs assessed outcomes at a 12-month follow-up period.

The mean participant age, recruitment strategy, dropout, illness/disease duration, and number available for follow-up for the 9 RCT studies are not known from this Systematic Review

Intervention Investigated

Control

Control interventions from the 9 RCTs include:

- No interventions (4 out of 9 RCTs)
- Education on anatomy, stretching, exercise, or promoting health (3 out of 9 RCTs)
- Adjusting the participant's workstation (1 out of 9 RCTs)
- Ankle pumps and deep breathing exercises 2x/day at work (1 out of 9 RCTs)

Experimental

Experimental interventions from the 9 RCTs include:

- Rest breaks during work
- Stretching and/or strengthening exercises for the neck, trunk, and/or upper and lower extremities
- "Nonspecific exercise"[1 (p. 67)]
- Adjusting the patient's work station (in addition to exercises and/or rest breaks)
- "Relaxation training"[1 (p.66)]
- "Posture and movement guidance"[1 (p. 66)]

Outcome Measures (Primary and Secondary)

Specific outcome measures were not mentioned for the 9 RCTs analysed, but they considered one or more of the following "outcomes" . The article does not explain how the outcomes were measured, did not provide a maximum possible score and range for each outcome, and did not explain how, where, and by whom the outcomes were administered.:

- Discomfort
- Frequency, duration, severity, and/or intensity of pain
- Productivity
- Sick Leave

- Recovery
- "Pressure pain threshold"[1 (p. 66)]
- Disability
- Prevalence
- "Work ability"[1 (p. 66)]

Main Findings

- **<u>Neck Pain Treatment:</u>**
  - The analysis of the RCTs in this systematic review demonstrated strong evidence from three good quality RCTs that supported the effectiveness of muscle strengthening exercises, and two good quality RCTs for the effectiveness of muscle endurance exercises for neck pain *treatment*. The RCTs demonstrated strong evidence with their PEDro scores ranging from 5/10 to 8/10.
  - Conflicting evidence was present for the effectiveness of stretching (2 good quality and 1 poor quality RCT) and "nonspecific"[1 (p.67)] (1 good quality and 1 poor quality RCT) exercises for treating neck pain in this patient population.
- **<u>Neck Pain Prevention</u>**:
  - Conflicting evidence exists related to the use of strengthening exercises to *prevent* neck pain in this patient population based on two good quality RCTs (PEDro scores ranging from 6/10-7/10), and no evidence (from a good quality RCT (PEDro score 6/10)) to support the use of "nonspecific exercises"[1(p. 65)] to *prevent* neck pain in office workers.
- **<u>Neck Pain Disability Reduction</u>**
  - Reasonable evidence was found from one good quality RCT (PEDro score 7/10) that muscle endurance exercises helped reduce disability related to neck pain contrasted with education.
  - Four good quality RCTs (PEDro scores ranging from 5/10-8/10) found no evidence that muscle strengthening exercises reduced disability related to neck pain. Two good quality RCTs (5/10 and 8/10, respectively) found no evidence that stretching exercise reduces the disability related to neck pain.
  - Conflicting evidence exists about "nonspecific exercise"[1(p.68)] effect on disability related to neck pain by one good quality (6/10) and one poor quality RCT (3/10).

Numerical or statistical data were not provided in this systematic review.

Original Authors' Conclusions

Following the review and investigation of nine RCTs that examined exercise effectiveness for treatment and/or prevention of nonspecific neck pain in clerical workers, strong supportive evidence exists for the usefulness of muscle endurance and strengthening exercise for neck pain treatment. A lesser amount of evidence demonstrated that neck pain related disability can be reduced by utilizing muscle endurance exercises. More studies are necessary in this area.

Critical Appraisal

Validity

The strengths of this systematic review include a 9/11 AMSTAR score which incorporated a complete literature search, list of studies, and two independent data reviewers. This systematic review also utilized only high quality RCTs to review and analyse, as opposed to articles with lower levels of evidence. The evidence of high (or low) quality RCTs is seen in their table depicting the PEDro scores. The limitations of the study, as seen in the AMSTAR score, are the lack of statistical tests or graphs to assess the possibility of publication bias, and the lack of conflict of interest for the included RCT studies. Additionally, the study limitations stated in the article included a limited search strategy of full articles in English, with the possibility of selection and publication bias. There was also "heterogeneity"[1 (p. 69)] in the characteristics of the study. An additional limitation (not stated in the article) includes a lack of objective outcome measure results within the nine study characteristics. The study only offered outcomes like productivity and recovery without stating how they objectively observed these outcomes, making it difficult to determine the clinical significance of their findings.

Interpretation of Results

The findings of this systematic review show that muscle strength and endurance exercises should be a key part of the treatment of neck pain in clerical workers. Unfortunately, the study did not have statistical data or objective outcome measures to back up the effectiveness of these interventions, making it difficult to determine the effect size and clinical significance. Additional research (with statistical data) is needed to find the best

clinically significant intervention to prevent and treat neck pain in this patient population.

(2) Description and appraisal of *Effectiveness of global postural re-education in patients with chronic nonspecific neck pain: randomized controlled trial.* by *Pillastrini et al (2016)*[2].

Aim/Objective of the Study/Systematic Review:

The objective of this randomized controlled trial was to determine if "Global Postural Re-education (GPR)"[2(p.1409)], was effective in treating patients with nonspecific neck pain (specifically, their pain and disability) compared to manual therapy (MT).

Study Design

Randomized Controlled Trial (RCT)

- All participants attained informed consent, and the trial procedures were performed in accordance with the "Declaration of Helsinki"[2(p.1409)].
- Randomization occurred with the use of a computer software program.
- "Fixed-size"[2(p.1410)] randomization design.
- Allocation was concealed with a 1:1 ratio (47 participants assigned to "GPR"[2(p.1409)], 47 participants assigned to MT)
- Primary outcome measures: Pain (measured using a visual analogue scale (VAS)) and Cervical Disability (measured by the Neck Disability Index (NDI) - Italian version)
- Outcome measures were measured at baseline, 1 month, and 6 months following the intervention by an assessor that was blinded to the participant's group assignment.
- An intention-to-treat analysis was performed to consider the dropout effect on the outcome measures.

Setting

The location of the study cannot be determined from the information provided in the randomized controlled trial.

Participants

- 94 total participants in the study with chronic nonspecific neck pain were recruited from S. Orsola-Malpighi University Hospital (purposeful sample). 47 participants were placed in the experimental group ("GPR"[2(p.1409)]), and 47 participants were placed in the control group (MT).
- 72 women and 22 men participated in the study.
- Average Age: 47.5 years (SD=11.3).
- Participants had to have the *nonspecific neck pain* for at least three months.
- All participants were medically examined by an "occupational health physician"[2 (p.1409)], but the article does not explicitly state if the groups were comparable at baseline.
- 7 participants were not included in the final analysis due to:
  - Being absent at the initial visit (1 "GPR"[2(p.1409)])
  - Lost to the first follow up (2 "GPR"[2(p.1409)], 2 MT)
  - Lost to the second follow up (1 "GPR"[2(p.1409)], 1 MT)
- 87 participants completed the study and were analysed (43 "GPR"[2(p.1409)] participants, 44 MT participants)

Intervention Investigated

Control

- Manual Therapy (MT) intervention took place over nine, one hour, one-on-one sessions, that occurred once or twice a week (depending on the participant's needs)
- Five specialist in neck pain treatment administered the MT program
- Therapeutic techniques included:
  - "Axial cervical general traction"[2(p.1411)] and "mobilization of muscle fascia"[2(p.1411)], including the pectoralis minor, sternocleidomastoid, levator scapulae, scalene, and upper trapezius muscle took place for at least 30

minutes.

- "Maitland's technique"[2(p.1411)] of passive posterior/anterior mobilization (grade II) was slowly and gently applied from C0-C1 to C7-T1 for around one minute at each level of the cervical spine.
- Massage (utilizing almond oil) was performed to the neck and shoulders for the final 15 minutes.
- Participants in the control group were told to continue breathing normally during their session.

- Participants in the MT group were also given "written ergonomics suggestions"[2(p.1410)] and a home exercise program of exercises taught during the first physical therapy session that should be completed for 15 minutes, twice a week.
  - The MT participants had a different HEP than the "GPR"[2(p.1409)] participants, including active range of motion and stretching exercises

The time and location of the control group's treatment was not stated in this randomized controlled trial.

Experimental

- "Global Postural Re-education (GPR)"[2(p.1409)] intervention took place over nine, one hour, one-on-one sessions, that occurred once or twice a week (depending on the participant's needs).
- 3 physical therapists who were experts in "GPR"[2(p.1409)] administered the "GPR"[2(p.1409)] program
- Two supine "GPR"[2(p.1409)] positions were chosen for interventions, including "supine posture with leg extension"[2(p.1410)] and "supine posture with hip flexion"[2(p.1410)], which stretched the anterior and posterior muscle chains, respectively. The participant stayed in each posture for 20 minutes.
  - Manual cervical and lumbar traction were applied with isometric contractions of inflexible muscles to create a "post-isometric relaxation"[2(p.1410)] during the "GPR"[2(p.1409)] treatment.
- 10 minutes of the session was dedicated to the "GPR"[2(p.1409)] participants practicing maintaining their corrected posture in standing while completing cervical movements.
- The last portion of the session was dedicated to the "GPR"[2(p.1409)] participants' utilizing their corrected posture during simulated functional daily activities.
- Participants in the "GPR"[2(p.1409)] group were also given "written ergonomics suggestions"[2(p.1410)] and a home exercise program of exercises taught during the first physical therapy session that should be completed for 15 minutes, twice a week.
  - The "GPR"[2(p.1409)] participants had a different HEP than the MT participants, including a "'posture' routine"[2(p. 1410)].

The location of the experimental group's treatment was not stated in this randomized controlled trial.

Outcome Measures (Primary and Secondary)

- Primary Outcome Measures
  - Pain
    - Measured on a 0-100 Visual Analogue Scale (VAS), but was rescaled to 0-50 so that it could be compared with the Neck Disability Index.
    - "Mean rates of perceived pain during the last 24 hours"[2(p.1411)]
    - A higher score indicates greater pain.[11]
  - Disability
    - Measured on the Neck Disability Index (NDI) - Italian version
    - There is scoring on a 0-50 scale (0=best, 50=worst).[12] The score might also be provided as a percentage (0-100%).[12]
- Secondary Outcome Measures
  - Kinesiophobia
    - Measured on the 13 item Tampa Scale of Kinesiophobia (Italian Version) that had two subscales: Activity Avoidance (TSK-1) and Harm (TSK-2).
    - Higher scores demonstrate greater kinesiophobia.[13]
  - "Perceived effect of the intervention"[2(p.1411)]
    - Measure on the "5-point Likert-type scale"[2(p.1411)] Global Perceived Effect Questionnaire (GPE)
    - 1 = "really helped"[14(p.914)], 5 = "made things worse"[14(p.914)]

- The GPE data was not discussed in detail within the article and not included in the data tables.
- Patient satisfaction
  - Measured on the Physical Therapy Patient Satisfaction Questionnaire (PTPSQ-I[15], Italian version).
  - The PTPSQ-I data was not discussed in detail within the article and not included in the data tables.
- Cervical ROM
  - Measured utilizing two "gravity-dependent goniometers, one compass dial, and a head-mounted frame"[2(p.1411)] with the participant in the seated position. This allowed measurements in all three planes (rotation, lateral flexion, and flexion/extension).
  - "Mean normative values of cervical ROM"[2(p.1411)] = 52 degrees for cervical flexion, 71 degrees for cervical extension, 43 degrees for cervical lateral flexion.
- A blinded assessor administered the outcome measures, but it was not stated where the outcome measures were administered within the RCT.

Main Findings

For the purpose of this CAT, only statistical findings of the VAS outcome measure will be discussed in this section, although there were several outcome measures within the study.

- VAS between group difference (T2-Baseline): -11.0 (-21.7, -0.3), CI=95%.
- VAS between group difference adjusted for baseline score (T2-baseline): -7.5 (-15.9, 0.9), CI = 95%
- VAS effect size between groups (T2-Baseline, Cohen *d*): 0.4
- VAS *P*= .0043 (based on related *F* tests), which is <.05 (the P value chosen for the study)
- The unadjusted between group differences appear to be statistically significant, but when they are adjusted for baseline, they are not statistically significant. The P value is less .05, which also demonstrates statistical significance.
- The MCID for a pain VAS with a 0-100 range is 30mm[15], but a VAS with 0-50 does not have an established MCID, so it is hard to determine if the differences between groups is clinically significant.

Original Authors' Conclusions

The authors suggest that treating patients with nonspecific neck pain with "GPR"[2(p.1409)] was more effective in decreasing disability and pain than utilizing MT due to the emphasis of entire "kinetic chain"[2(p.1413)] is involved with "GPR"[2(p.1409)] treatments, versus the "regional treatment"[2(p.1413)] of the MT.

Critical Appraisal

Validity

The strengths of this article begin with a good PEDro scale score of 9/11, demonstrating a higher level of evidence. The aspects of higher evidence include blinding of the assessors who administered the outcome measures, reporting the between group statistical comparisons for all of the outcome measures, and utilizing an intention to treat analysis. Another strength of this article includes pictures and descriptions of the "GPR"[2(p.1409)] interventions within the article, providing the reader with a greater understanding of the interventions. Weaknesses of the article (both stated and not stated within the article) include the fact that the randomization did not provide homogeneity in the groups, causing potential bias in the study. Additionally, the home exercises were not explicitly stated in the article, requiring the reader to look elsewhere for that information. Finally, although the authors provided the names and descriptions of the outcomes measures utilized in the study, they did not provide the numerical ranges of most of them, making it difficult for the reader to know if higher or lower scores were "better" for this patient population. The pain outcome measure (VAS) was also adjusted to be compared to the NDI, making it difficult to determine if there is a clinical significance since a MCID cannot be determined.

Interpretation of Results

Based on the results of this study, it is difficult to determine if postural re-education, or "GPR"[2(p.1409)], is a helpful intervention for office workers with neck pain. While the between group difference results (prior to adjustment for baseline) reflected statistical significance for reduction of neck pain on the VAS, the adjustment of the pain outcome measure made it difficult to determine if there is a clinical significance. While the authors suggest that "GPR"[2(p.1409)] was more effective than manual therapy due to the incorporation of the entire spine and pelvis, more research is necessary to determine the effectiveness of this intervention.

(3) Description and appraisal of *The effectiveness of a neck and shoulder stretching exercise program among office workers with neck pain: a randomized controlled trial* by *Tunwattanapong et al (2016).*

Aim/Objective of the Study/Systematic Review:

The objective of this study was to establish if a stretching program would be effective in reducing neck pain and improving neck function and quality of life in desk workers compared to just ergonomics education.

Study Design

Randomized Controlled Trial

- "Study protocol was conducted in accordance with the ethical principles stated in the more recent version of the Declaration of Helsinki."[3(p.65)]
- Participants were recruited via poster advertisements in the hospital.
- Participants were randomly assigned to a control or treatment group via randomized numbers generated by a computer, with the study codes placed in "sealed opaque envelops"[3(p.66)].
- Participants were *not* blinded.
- Outcome measures were measured by a blinded assessor.
- The outcome measures were assessed at baseline and when the study was complete.

Setting

"Outpatient setting of the Rehabilitation Medicine Department, Faculty of Medicine Siriraj Hospital, Mahidol University".[3(p.65)]

Participants

- 96 participants were recruited for the study (48 in the control group, 48 in the treatment group), via advertisements in the hospital (purposive sample).
- The participants had to have neck or shoulder pain at a self-rated $\geq$ 5/10 on the visual analogue scale (VAS) for >3 months.
- Average age of the participants in the control group was 36.5 $\pm$ 8.7. Average age of the participants in the treatment group was 34.2 $\pm$ 9.0.
- 43/48 participants in the control group and 44/48 participants in the treatment group were female. 5/48 (control group) and 4/48 (treatment group) were male.
- The average sitting time for participants in the control group was 6.8 hours/day ($\pm$ 1.7 hours). The average sitting time for participants in the treatment group was 6.9 hours/day ($\pm$ 1.7 hours).
- The average computer use (hours/day) in the control group was 5.9 hours/day ($\pm$ 2.1 hours) and 5.7 hours/day ($\pm$ 1.8 hours) in the treatment group.
- 17% (control) and 18% (treatment) of the participants had comorbidities like hypertension, chronic joint inflammation, and high cholesterol.
- 39/48 (control) and 35/48 (treatment) participants did not have a history of muscle injury.
- The participant demographics data were comparable at baseline.
- 9 participants dropped out of the study (7 in the treatment group, 2 in the control group).
- 87 participants completed the study (41 in the treatment group, 46 in the control group).

Intervention Investigated

Control

- A brochure providing ergonomics education about correct position and desk ergonomics during the work day.
- Participants were asked to refrain from utilizing any other interventions, including other exercises, pain medication, physical therapy, acupuncture, massage, and pain management therapy.
- "Rescue therapy"[3(p. 66)] was 50 mg of tramadol and only used in the case of intolerable pain. If participants chose to take this medication, they were asked to record the number of pills.

Experimental

- A brochure providing ergonomics education about correct position and desk ergonomics during the work day.
- A recommended home stretching exercise program provided by a "rehabilitation doctor"[3(p. 66)]. The program was recommended to be performed 2 times/day, 5 days each week for 4 weeks. The duration was between 10-15 minutes for the two sessions. The stretching program included 20-30 repetitions of the following exercises:
  - Neck stretches
  - Shoulder stretches
  - Trunk stretches
  - Shoulder rolls
  - Back Extension
- Participants were asked to refrain from utilizing any other interventions, including other exercises, pain medication, physical therapy, acupuncture, massage, and pain management therapy.
- It was requested that the participants record their exercise frequency in a logbook that they would bring to the researchers at the end of the study.
- "Rescue therapy"[3(p. 66)] was 50 mg of tramadol and only used in the case of intolerable pain. If participants chose to take this medication, they were asked to record the number of pills.

Outcome Measures (Primary and Secondary)

- The primary outcome measure was pain, measured with a visual analogue scale (VAS). The scale was 0-10cm, with a high score indicating a higher level of pain.
- The secondary outcome measures were quality of life and neck function.
  - Quality of life was assessed utilizing the Short Form-36. This outcome measure has two dimensions, physical and mental.
  - Neck function was measured using the Northwich Park Neck Pain Questionnaire. The score ranges from 0-36, and then changed into a percentage. A higher percentage indicates a higher level of disability.

The outcome measures were calculated by one of the article's authors who was blinded to the allocation. The article did not explicitly state where or by whom the outcome measures were administered.

Main Findings

For the purpose of this CAT, only statistical findings of the VAS outcome measure will be discussed in this section, although there were several outcome measures within the study.

- Mean differences between the control and treatment groups for VAS: -1.2 points difference between groups (-1.8, -0.5), CI = 95%.
- VAS p-value: .001

The mean differences between groups and p-value show that the between group differences are statistically significant. The MCID for a pain VAS is 1.4[16], so the between group differences results are not clinically significant. The treatment group had greater improvements than the control group in terms of pain improvement (-1.8 vs -0.6).

Original Authors' Conclusions

The authors found that stretching the neck, shoulders, and trunk two times a day, five days a week, for a four week period greatly reduced neck pain and improved shoulder and neck function in desk workers with $\geq$5/10 shoulder or neck pain. The study demonstrates that participants utilizing a stretching program for neck pain can start to see improvement in a four week time frame, and that the exercise frequency of at least three times a week relates to improvement of quality of life and function.

Critical Appraisal

Validity

The strengths of this article start with the 9/11 PEDro score, demonstrating higher evidence. The quality of this score includes blinding of the outcome measure assessor, providing between-group statistical comparison data, and including an intention to treat analysis. The data was also organized in table format, and included participant demographics like hours of computer usage and sitting, which was really interesting and demonstrated why the participants might be having neck or shoulder pain in the first place. Weaknesses of the study (both stated and not stated within the article) includes the lack of blinding of the participants and "rehabilitation doctor"[3(p. 66)], which was difficult given the interventions. Additionally, the outcome measures

utilized could have more subjective, instead of objective, data from the participants. Also, the treatment group's exercise program was not described in detail (through text or pictures), requiring the reader to search for the information elsewhere. The exercise program was also subjectively reported by the participants, so participants could "have overstated their compliance"[3(p.71)]. Finally, while the VAS between group differences was statistically significant, it was not clinically significant, making it difficult for a clinician to clinically determine if a stretching program is adequate for this patient population.

Interpretation of Results

The article suggests that stretching exercises at a frequency and duration of two time/day, five days a week for a four week period can improve neck and shoulder pain in clerical workers, with the data demonstrating statistical significance. Unfortunately, the VAS between group differences did not meet the MCID of 1.4[16], so it was not clinically significant. The results show that stretching exercises may help this patient population improve their neck pain, but further research is needed to determine if there is a clinically significant difference between an intervention of ergonomics education alone or ergonomics education plus a stretching program in order to confirm that this intervention is effective.

EVIDENCE SYNTHESIS AND IMPLICATIONS

Female clerical workers are more prone to neck pain than their male counterparts[4], so physical therapists should be prepared to treat this patient population their clinics. There is limited evidence to determine if ergonomics education with neuromuscular re-education postural therapeutic exercises is more effective at treating neck pain in 30 year old female clerical workers compared with therapeutic exercises alone. The information analysed from the three studies demonstrated that strengthening, endurance, stretching, and postural exercises should all be considered when treating desk workers with neck pain.[1,2,3] Sihawong et al (2011) provided strong evidence that shows muscle strength and endurance exercises are good interventions to utilize in the treatment of neck pain.[1] The systematic review utilized good quality RCTs and found that strength and endurance training reduced the intensity, duration, and/or discomfort of neck pain in office workers.[1] While there was weaker evidence, Pillatrini et al (2016), and Tunwattanapong et al (2016) showed statistical significance for the use of "global postural re-education"[2(p.1409)] and a stretching program to assist this patient population with their neck pain.[2,3] Even ergonomics education, while it was not emphasised or explained in detail in the articles, was applied as an intervention in many of the reviewed studies. [2,3,4,5,6,7] One study by Mahmud et al (2015) found that behavioural changes took place in participants that utilized ergonomics education, including improved posture due to correct placement of their computer monitor, keyboard, and mouse.[6]

While these studies showed limited evidence of the effectiveness of postural therapeutic exercises and office ergonomics education to treat neck pain in office workers, the studies lacked clinical significance and in depth exercise intervention explanations (via picture or text). This makes it difficult for clinicians to determine an ideal, effective treatment plan for this patient population. While strong evidence only related to muscle strength and endurance training for office workers with neck pain, the results of the analysed studies demonstrate that many interventions may be suitable for this patient population. The greatest evidence was in favor of strength of resistance and endurance training to help decrease neck pain in office workers, but did not relate them to postural re-training or neuromuscular re-education.[1] One study that focused on postural re-education and suggested that it was more favorable than manual therapy did not provide the specific postural exercise types within the article, requiring the reader to look elsewhere.[2]

Physical therapists treating this patient population may want to combine strength or resistance training with neuromuscular education or postural retraining so that these female office workers can improve their postural muscle strength and endurance and avoid potential future neck injuries. Ergonomics education, although not explicitly mentioned in detail in the majority of the studies, might be a good addition to treatment interventions. Providing handouts of proper work station set-up might prevent further exacerbation of their neck injury and potential help prevent future neck problems. Based on the evidence provided in the articles, physical therapists can choose to treat the patient in the clinical scenario with a plan of care and interventions that emphasize muscle strength and endurance exercises for the cervical spine and trunk, while incorporating stretching and patient education on work station ergonomics.

Future Research: High quality randomized controlled trials are necessary to determine if postural exercises and office ergonomics education is more effective than postural exercises alone in 30 year old female office workers. The study participants should be recruited from office settings (instead of hospitals) and experience neck pain that is not related to any other medical conditions (fractures, cancer, etc). The interventions should be related to postural re-education and involve ergonomics education in the form of handouts that can be applied to their work setting. The studies should also utilize exercises that can be completed at home or in the office to increase the participants' compliance.

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