การพัฒนาเครื่องมือในการตรวจคัดกรองเพื่อทำนายอาการปวดบริเวณคอ/บ่า
และระดับภาวะทุพพลภาพ ในผู้ที่ทำงานสำนักงาน

นางสาวอาภาลักษณ์ พรรคสายชล

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
สาขาวิชากายภาพบำบัด ภาควิชากายภาพบำบัด
คณะสหเวชศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2557

THE DEVELOPMENT OF SCREENING TOOL FOR PREDICTING NECK PAIN AND DISABILITY IN OFFICE WORKERS

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A Dissertation Submitted in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy Program in Physical Therapy
Department of Physical Therapy
Faculty of Allied Health Sciences
Chulalongkorn University
Academic Year 2014

Thesis Title	THE DEVELOPMENT OF SCREENING TOOL FOR PREDICTING NECK PAIN AND DISABILITY IN OFFICE WORKERS
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วิทยานิพนธ์รูปแบบใหม่

ภาควิชา กายภาพบำบัด	ลายมือชื่อนิสิต .....
สาขาวิชา กายภาพบำบัด	ลายมือชื่อ อ.ที่ปรึกษาหลัก .....
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	ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

5377406637 : MAJOR PHYSICAL THERAPY

KEYWORDS: NECK PAIN / PREVENTION / RISK FACTORS / COMPUTER

ARPALAK PAKSAICHOL: THE DEVELOPMENT OF SCREENING TOOL FOR PREDICTING NECK PAIN AND DISABILITY IN OFFICE WORKERS. ADVISOR: ASSOC. PROF.PRAWIT JANWANTANAKUL, Ph.D., CO-ADVISOR: ASST. PROF.PRANEET PENSRI, Ph.D., ASST. PROF.CHAIPAT LAWSIRIRAT, Ph.D., pp.

New version of thesis.

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Academic Year:	2014	Co-Advisor's Signature	.....
		Co-Advisor's Signature	.....

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and deepest appreciation to Associate Professor Dr. Prawit Janwantanakul, my principal advisor. He always supervises me with excellent knowledge, valuable suggestions, proofreading of this manuscript, and encourages me to improve my work and life throughout the study.

The deepest gratitude also goes to Assistant Professor Dr. Chaipat Lawsiirirat, my co-advisors, for his excellent comments and statistical advices. I wish to express my warm and sincere thanks to Assistant Professor Dr. Praneet Pensri, my co-advisors, for her valuable advice and friendly help.

I wish to thank my examiner, Assistant Professor Dr. Premtip Thaveeratitham, Lecturer Dr. Montakarn Chaikuman, Assistant Professor Dr. Rotsalai Kanlayanaphotporn, and Associate Professor Dr. Rungthip Puntumetakul for their kindness, guidance, and valuable suggestions.

I am particularly indebted to the Thai Health Foundation and Chulalongkorn University Centenary Academic Development Project (#12) for their financial support.

I would like to give special thanks to all subjects for their cooperation and participation. I would like to thank my research assistances and members of work-related musculoskeletal injury research unit for their support and friendship.

Finally, the completion of the thesis is possible with love, special care, support, and understanding from my parents and brother. I hope this thesis is the best thing that represents my thankfulness to all of them.

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CHAPTER I

General introduction

1.1 Outline of the thesis

The thesis consists of five chapters. The first chapter provides an overview of the study consisting of background and rationale, objectives, scopes, and benefits of the study. The second chapter is a systematic review of office workers' risk factors for the development of non-specific neck pain. The third chapter presents a risk score to predict nonspecific neck pain with disability in office workers. The fourth chapter presents a path analysis model of contribution of biopsychosocial risk factors to non-specific neck pain in office workers. The fifth chapter presents a general conclusion of the study. The second to fourth chapters were originally written as separate articles for publication in scientific journals. Therefore, some overlaps between the chapters exist. The last chapter provides general conclusion, which consists of summary of the results, limitations of the study, and suggestions for further study.

1.2 Background and rationale

Non-specific neck pain is neck pain (with or without radiation) without any specific systematic disease being detected as the underlying cause of the complaints (1). Neck pain is a significant health problem in workers (2) and office workers are among those with the highest frequency of neck pain (3). Between 42% to 69% of office workers experience neck pain in the preceding 12 months (4, 5) and about 34% to 49% reported the new onset of neck pain during a 1-year follow up (6, 7). Neck pain is viewed as an episodic occurrence over a lifetime with variable recovery between episodes (8). In a working population, 60% to 80% of workers with neck pain report neck pain 1 year later (9). Neck pain causes considerable personal suffering due to pain, disability and impaired quality of work and life in general, which can be a great socio-economic burden on both patients and society (2, 10).

Evidence suggests that neck pain in workers is non-traumatic and assumed to be of multi-factorial origin (2). The relationship between risk factors and neck pain is a complex one, meaning that neck pain is likely caused by multiple serial exposures rather than by the direct effect of a single exposure (2). Different occupations are exposed to different working conditions and the nature of work has influenced the health of workers. Predisposing factors for neck pain are likely to be population-specific (2). Previous studies have identified several individual factors associated with neck pain in office workers, including older age, female, high body mass index, lack of physical exercise, smoking, alcohol drinking and previous symptoms (6, 11, 12). Work-related risk factors, such as accumulated computer usage, sitting for long period or with forward head posture, poor workstation ergonomics, have been linked to increased risk of neck pain (6, 11, 12). Some psychosocial problems, such as high stress, high job demand, job strain and low coworker support, were associated with neck pain (6, 7, 13).

Having a screening tool for neck pain is necessary for several reasons. First, a screening tool provides information about individuals' risk of developing neck pain, which will guide health professionals and individuals in joint decisions on further intervention. Identification of persons at risk would also mean the enhancement of resource allocation to those most in need and most likely to benefit from it. Without a screening tool, a large number of people would receive intervention, which is likely to compromise its effectiveness (14, 15). Second, a screening tool allows an examination to be held in primary health care and workplace settings where full clinical examinations are impractical due to limited personnel and time (16). Lastly, a screening tool is beneficial for selecting relevant individuals for therapeutic research (15). To our knowledge, no screening tool to identify office workers at risk for developing neck pain and disability has been established.

1.3 Objectives of the study

1.3.1 To systematically review prospective cohort studies to gain insights into risk factors for the development of non-specific neck pain in office workers as well as to assess the strength of evidence

1..3.2 To develop a screening tool based on the model to assist health care providers in identifying office workers who are at risk of developing neck pain with disability.

1.3.3 To test a hypothesized model of the direct and indirect effects of various risk factors involved in the development of non-specific neck pain in a sample of office workers using path analysis.

1.4 Scope of the study

A 1-year prospective cohort study was conducted in healthy office workers. Participants were recruited from four large-scale enterprises in Bangkok. The enterprises participating in this study were a public university and three ministry's head offices. Office workers were invited to complete a self-administered questionnaire and undergo a physical examination by trained physical therapists according to standardized protocol. The researcher returned to collect the diaries from participants every month over a 1-year period until office workers became symptomatic, withdrew from the study, or completed the 12-month follow up.

1.5 Benefits of the study

The results of the present study would provide a screening tool to assist health care providers in identifying office workers who are at risk of developing nonspecific neck pain with disability which is easy and quick for primary health cares. A screening tool would be useful to prevent nonspecific neck pain with disability in office workers. Furthermore, a conceptual model describing the causal relationship between risk factors and neck pain in office workers would be obtained which is necessary for effective interventions to prevent nonspecific neck pain in office workers.

CHAPTER II

Office workers' risk factors for the development of non-specific neck pain: A systematic review of prospective cohort studies

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Published as: Arpalak Paksaichol, Prawit Janwantanakul, Nithima Purepong, Praneet Pensri, Allard J. van der Beek. Office workers' risk factors for the development of non-specific neck pain: A systematic review of prospective cohort studies. *Occupational and Environmental Medicine*, 2012 Sep;69(9):610-8 (2013 ISI impact factor = 3.215).

Abstract

Objectives: The purpose of this study was to systematically review prospective cohort studies to gain insights into risk factors for the development of non-specific neck pain in office workers as well as to assess the strength of evidence.

Methods: Publications were systematically searched from 1980 - March 2011 in several databases. The following key words were used: neck pain paired with risk or prognostic factors and office or computer or visual display unit or visual display terminal. Relevant studies were retrieved and assessed for methodological quality by two independent reviewers. The strength of the evidence was based on methodological quality and consistency of the results.

Results: Five high-quality and two low-quality prospective cohort studies investigating the predictive value of 47 individual, work-related physical and work-related psychosocial factors for the onset of non-specific neck pain in office workers were included in this review. Strong evidence was found for female gender and previous history of neck complaints to be predictors of the onset of neck pain. Interestingly, for a large number of factors that have been mentioned in the literature as risk factors for neck pain, such as high physical leisure activity, low social support, and high psychosocial stress, we found no predictive value for future neck pain in office workers.

Conclusion: Literature with respect to the development of non-specific neck pain in office workers is scant. Only female gender and previous history of neck complaints have been identified as risk factors that predict the onset of neck pain.

Key Indexing Visual display unit; Onset; Neck pain; Systematic review

INTRODUCTION

Non-specific neck pain is neck pain (with or without radiation) without any specific systematic disease being detected as the underlying cause of the complaints (1). Neck pain is a significant health problem in workers with office workers among those with the highest frequency of neck pain (2). Between 42% to 69% of office workers experienced neck pain in the preceding 12 months (3-5, 11, 17) and about 34% to 49% reported a new onset of neck pain during a 1-year follow up (6, 7, 18). Neck pain is viewed as an episodic occurrence over a lifetime with variable recovery between episodes (8). In a working population, 60% to 80% of workers with neck pain also report neck pain one year later (9). Neck pain causes considerable personal suffering due to pain, disability and impaired quality of work and life in general, which can be a great socio-economic burden on both patients and society (2, 10, 19, 20).

Evidence suggests that neck pain in workers is non-traumatic and assumed to be of multi-factorial origin (2). The relationship between risk factors and neck pain is a complex one, meaning that neck pain is likely to be caused by multiple serial exposures rather than by the direct effect of a single exposure (2, 21). In the past 10 years, a number of systematic reviews have been conducted about risk factors for neck pain in non-specific groups of population (2, 22-24). The Neck Pain Task Force (2) proposed that different occupations are exposed to different working conditions and the nature of work has influenced the health of workers. Thus, predisposing factors for neck pain are likely to be occupation-specific.

Office work is sedentary work, which mainly involves computer use, participation in meetings, giving presentations, reading and telephoning (25). Office work may require sitting for long hours on a computer, working in awkward positions or performing repetitive manual tasks. Studies have identified several individual factors associated with neck pain in office workers, including older age, female gender, high body mass index, lack of physical exercise, smoking, alcohol consumption, and previous symptoms (6, 11, 12). Work-related risk factors, such as accumulated computer usage, sitting for long periods or with forward head posture, and poor workstation ergonomics, have been linked to increased risk of neck pain (6,

11, 12, 17, 26, 27). Some psychosocial problems, such as high stress, high job demands, job strain and low coworker support, have also been associated with neck pain (6, 7, 13, 26, 27). However, a number of these studies were cross-sectional in design (11-13, 17, 26, 28) which only allowed for the association between exposures and outcome to be examined. It is therefore not possible to establish the causal relationship between exposures and outcome. Research to identify the risk factors of neck pain requires longitudinal research design, which permits the tracking of study participants over time (9).

Thus, the aim of this paper is to systematically review prospective cohort studies to gain insights into risk factors for the development of neck pain in office workers as well as to assess the strength of evidence. Such information would be of value for policy makers and healthcare providers to determine effective prevention measures for decreasing the incidence and burden of neck pain in the workplace.

METHODS

Data sources and search strategy

Online searches were conducted on PubMed, CINAHL Plus with full text, The Cochrane Library, ScienceDirect, PEDro, ProQuest and Scopus databases from 1980 - March 2011 using the following keywords: neck pain paired with risk or prognostic factors and office or computer or visual display unit (VDU) or visual display terminal (VDT). Articles were initially screened on the basis of title and abstract, and full text copies were then retrieved of articles that met all inclusion criteria. Subsequently, full text copies were read in order to make a final decision regarding inclusion or exclusion. The search and full inclusion process was performed by one reviewer (AP). After inclusion of the articles based on the selection criteria, references were searched for additional articles.

Selection of studies

A reviewer (AP) selected relevant articles from the articles retrieved using the search strategy. The selection criteria were:

(1) The study population was office workers or those working with computers or VDUs or VDTs.

(2) Study samples were free from neck pain at baseline assessment. Studies in a population with specific underlying pathology, such as tumours, fractures, infection, inflammatory disorders and osteoporosis, were excluded.

(3) The study design was a prospective cohort study with a follow-up period of 1 year or more. Experimental studies were excluded.

(4) The onset of neck pain was assessed separately from other musculoskeletal symptoms.

(5) Non-specific neck pain, that is, neck pain (with or without radiation) without any specific systematic disease being detected as the underlying cause of the complaints, was assessed in the study. Studies on whiplash-associated disorder were excluded.

(6) The article was a full, peer-reviewed report published in English. Letters, abstracts, books, conference proceedings and posters were excluded.

Quality assessment of studies

The articles that met the selection criteria were independently evaluated by two reviewers (AP and NP) to determine methodological quality. The methodological quality of each study was assessed by using the 21-item checklist for quality appraisal developed by van der Windt et al (29) and Ariëns et al (22) (Table 1). The checklist was divided into two parts, the internal validity (11 items) and descriptive quality (10 items) of studies. Each item was scored as positive (1), negative (0) or unclear (if insufficient information was available for a specific item) (0). The scoring for each item of the two reviewers was compared. Disagreements between the reviewers on individual items were identified and discussed in an attempt to achieve consensus. The inter-rater agreement of this quality assessment was derived by calculating the percentage agreement as well as Cohen's kappa for categorical items, both before and after the consensus discussion. If agreement could not be reached, a third reviewer (PJ) was consulted to achieve a final judgment. Studies scoring a

minimum of 6/11 (>50%) for internal validity with a total score of 11/21 (>50%) or greater were deemed “high quality” (22, 29-32).

Table 1 Methodological quality criteria

Item	Score
Internal validity criteria	
Study population	
1. Positive if the participation rate is >80% or if participation rate is 60%–80% and non-response is not selective (data presented)	+/-/?
2. Positive if the response at main moment of follow up is >80% or if the non-response is not selective (data presented)	+/-/?
Exposure assessments, physical load at work (if not included in the design, not applicable [NA])	
3. Method for measuring physical load at work: direct measurement and observation (+), interview or questionnaire only (–)	+/-/?
4. Positive if more than one dimension of physical load is assessed: duration, frequency or amplitude	+/-/?
5. Positive if more than one aspect of psychosocial factors is assessed: work demands, job control, social support	+/-/?
Outcome assessments	
6. Positive if data were collected for >1 year	+/-/?
7. Method for assessing neck pain: physical examination blinded to exposure status (+), self-reported: specific questions relating to neck pain or use of manikin (+), single question (–)	+/-/?
Analysis and data presentation	
8. Positive if the appropriate statistical model is used (univariate or multivariate model)	+/-/?
9. Positive if measures of association are presented (OR/RR), including 95% CIs and numbers in the analysis (totals)	+/-/?
10. Positive if the analysis is controlled for confounding or effect modification is studied	+/-/?
11. Positive if the number of cases in the multivariate analysis is at least 10 times the number of independent variables in the analysis (final model)	+/-/?

Descriptive quality criteria	
Study objective	
12. Positive if a specific, clearly stated objective is described	+/-/?
Study population	
13. Positive if the main features of the study population are described (sampling frame and distribution of the population by age and gender)	+/-/?
Exposure assessments, physical load at work (if not included in the design, not applicable [NA])	
14. Positive if data are collected and presented about physical load at work	+/-/?
15. Positive if the data on physical load at work were collected using standardized methods of acceptable quality[a]	+/-/?
Exposure assessments, psychosocial factors at work (if not included in the design, not applicable [NA])	
16. Positive if data are collected and presented about psychosocial factors at work	+/-/?
17. Positive if the data on psychosocial factors at work were collected using standardized methods of acceptable quality[a]	+/-/?
Exposure assessments, other	
18. Positive if data are collected and presented about physical or psychosocial exposure during leisure time	+/-/?
19. Positive if data are collected and presented about history of neck pain	+/-/?
Outcome assessments	
20. Positive if data were collected at least every 3 months	+/-/?
21. Positive if the data on outcome were collected using standardized methods of acceptable quality[a]	+/-/?

+ = positive, - = negative and ?= unclear

[a]This item was scored positive if one of the following criteria was met: (i) for direct measurements, intraclass correlation coefficient >0.60 or kappa >0.40; (ii) for observational methods, intraclass correlation coefficient >0.60 or kappa >0.40 for the inter- or intraobserver reliability; and (iii) for self-reported data, intraclass correlation coefficient >0.60 or kappa >0.40 for the inter- or intraobserver reliability.

Data extraction

Data extraction was performed by the first reviewer (AP). For each article, the first author and year of publication, study population, sample size, drop-out rate,

outcome measured (pain, disability), duration of follow-up, risk factors, the strength of the association between risk factors and the onset of neck pain in terms of OR, HR or RR with their 95% confidence interval were extracted.

Data analysis

The strength of evidence for risk factors associated with the development of non-specific neck pain was assessed by defining five levels of evidence based on the number of studies and the quality score of studies (23):

- *Strong evidence:* consistent findings from two or more high-quality cohorts.
- *Moderate evidence:* consistent findings from at least one high-quality study and one or more low-quality cohorts.
- *Limited evidence:* findings of one high-quality study or consistent findings in one or more low-quality studies.
- *Conflicting evidence:* inconsistent findings irrespective of study quality.
- *No evidence:* no studies found.

A risk factor association was considered positive only if it was statistically significant and was derived from multivariate results. A risk factor association was considered negative only if it was statistically insignificant and was derived from multivariate results. Statistical significance was concluded if the reported p value was < 0.05, or if the 95% confidence intervals around a rate ratio (RR) or similar statistic (such as odds ratio (OR) or hazard ratio (HR)) did not cross 1.

Sensitivity analysis

Sensitivity analysis was conducted to assess how sensitive the results of the review were in relation to the way it was performed. First, the effect of the cut-off point used in the methodological quality assessment for qualification as a high quality study on the synthesized results was assessed by shifting the cut-off point from >50 to >60% or shifting the cut-off point from >50 to >70%. Second, the effect of the inclusion of low quality studies on the synthesized results was assessed by repeating the analysis using only high-quality studies.

RESULTS

Selection of studies

The initial search of the computerized databases yielded 7,982 citations (Figure 1). After the screening of abstracts and titles, 35 full text articles were read in full. Twenty-eight articles were excluded because they did not meet the selection criteria. A total of seven articles were judged to meet the selection criteria and were included in the methodological quality assessment (6, 7, 18, 27, 33-35).

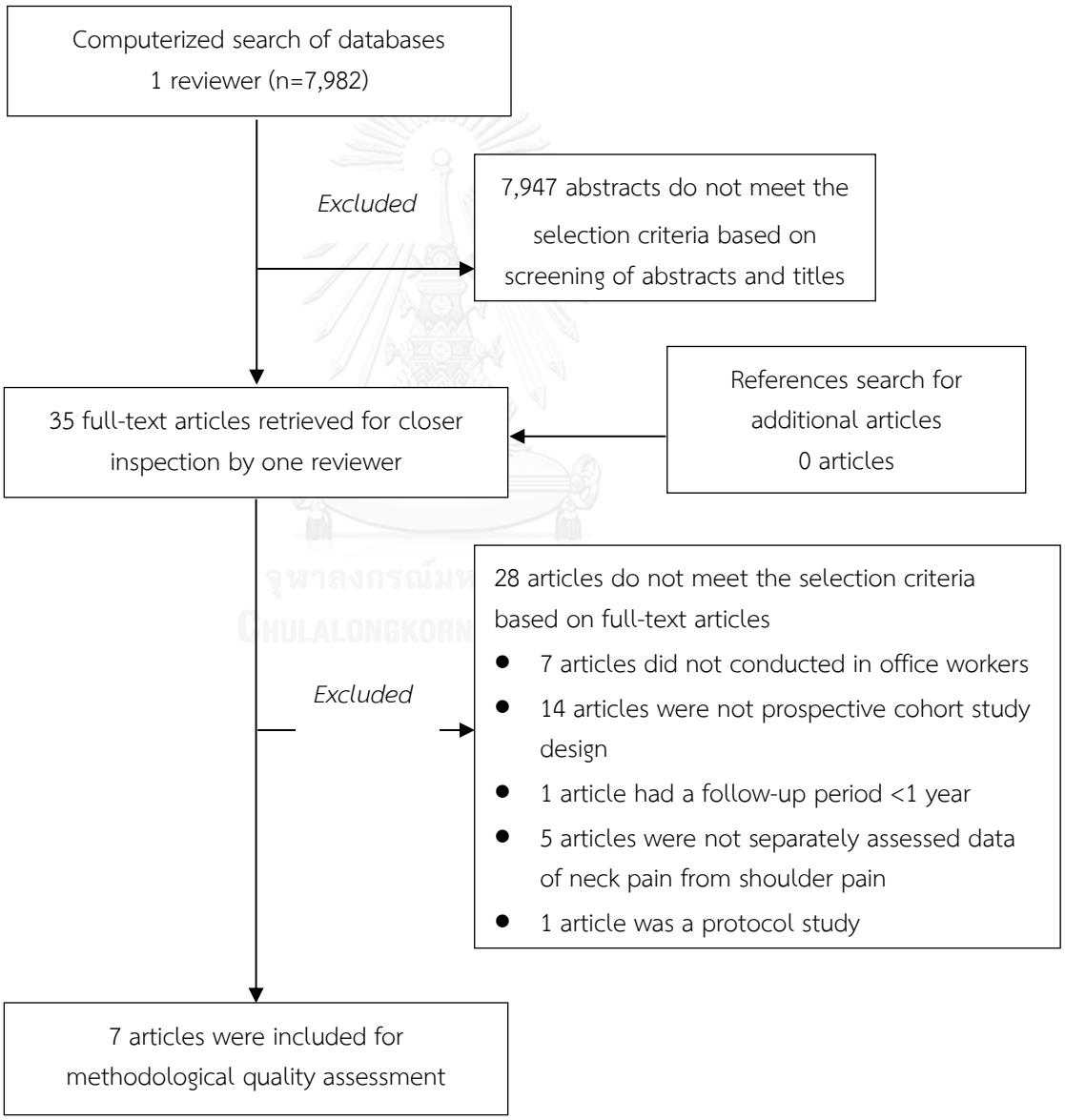

Figure 1 Flow diagram of the data screening process

Methodological quality assessment

The scoring of two reviewers of the included studies before discussion had an agreement rate of 85% (125/147). The overall inter-rater agreement was k = 0.66 with an SE of measurement of 0.07. After discussion, the two reviewers had an agreement rate of 99% (145/147). Then, the overall inter-rater agreement was k = 0.98 with an SE of measurement of 0.02. This represents very good agreement between the two reviewers (36). Disagreements were often related to reading errors or interpretation of the quality criteria list. These disagreements were resolved during a consensus meeting. However, disagreements persisted on two items (item 9 and 18) in the studies from Brandt et al (34) and Hush et al (7). A third reviewer (PJ) made the final decision in these cases.

The results of the methodological quality appraisal are presented in Table 2. The scores for the methodological quality of the studies ranged from 10 to 14 points (48%-67%). The median score was 14 points (67%). Five studies were scored as high-quality studies (18, 27, 33-35), while two studies were scored as low-quality studies (6, 7). The items in the criteria list rated as negative in most studies were participation rate (item 1: 29%), assessment of physical load at work (item 3: 14%), quality of assessment method for physical load at work (item 15: 14%), assessment of exposure during leisure time (item 18: 14%) and frequency of data collection during follow-up period (item 20: 29%).

Table 2 Methodological quality score of seven studies (studies are ranked according to their total scores and, in case of equal ranking, in alphabetical order of the first author's surname)

Study reference	Internal validity (IV) criteria												Descriptive quality (DQ) criteria											Total score (%)
	1	2	3	4	5	6	7	8	9	10	11	IV score	12	13	14	15	16	17	18	19	20	21	DQ score	
Andersen et al. (35)	-	+	+	+	+	+	-	+	+	+	+	9/11	+	+	+	-	+	-	-	+	-	-	5/10	14/21 (67)
Eltayeb et al. (27)	-	+	-	+	+	+	-	+	+	+	+	8/11	+	-	+	+	+	+	-	+	-	-	6/10	14/21 (67)
Jensen (33)	-	-	-	+	+	+	+	+	+	+	+	8/11	+	+	+	-	+	-	-	+	-	+	6/10	14/21 (67)
Wahlström et al. (18)	+	-	-	+	?	?	+	+	+	+	+	7/11	+	+	+	-	+	+	-	-	+	+	7/10	14/21 (67)
Brandt et al. (34)	-	+	-	-	+	+	+	+	+	+	-	7/11	+	-	+	-	+	+	+	+	-	-	6/10	13/21 (61)
Hush et al. (7)	-	-	-	-	+	+	+	+	+	-	-	5/11	+	+	+	-	+	+	?	-	+	+	7/10	12/21 (57)
Korhonen et al. (6).	+	-	-	+	-	+	-	+	+	+	-	6/11	+	+	+	-	+	-	?	-	-	-	4/10	10/21 (48)
Positive (%)	**29**	**43**	**14**	**71**	**71**	**86**	**57**	**100**	**100**	**86**	**57**		**100**	**71**	**100**	**14**	**100**	**57**	**14**	**57**	**29**	**43**		

"+" = positive, "-" = negative and "?" = unclear

Study characteristics

All included studies were conducted on office workers or computer users (Table 3). The sample sizes varied greatly: from 53 to 6,943. The drop-out rate during follow-up ranged from 0% to 23%. Five studies defined incident cases as those experiencing neck pain or discomfort for the duration of at least 1-8 days during the study period, whereas one study defined incident cases as those experiencing neck pain in the past 7 days and pain in the past year with at least moderate disability. The remaining one study did not specify the duration of experiencing neck pain. Four studies followed up for 12 months and the remaining three followed up for 17-24 months.

Table 3 Summary of study characteristics

Study	Study population, sample size and drop-out at follow-up	Outcome measurement (follow-up period)	Risk factors	Strength of association (95% CI)
Andersen et al. (35)	Computer users in Denmark n = 2,146 Drop-out 16%	Acute neck pain in the previous week (12 months)	Female Age (10-year increments) Mouse usage time (interquartile range)	Multivariate analysis OR=1.21 (1.16-1.27) OR=1.04 (1.02-1.07) OR=1.04 (1.00-1.09)
Eltayeb et al. (27)	Computer office workers at the National Social Security Institution GAK in Netherlands n = 268 Drop-out 2%	Neck pain for a duration of at least one week during the previous 12 months (24 months)	Computer working hours/day Previous history of complaints Irregular head and body posture Task difficulty	Multivariate analysis adjusted for age and gender OR=1.2 (1.0-1.41) OR=7.2 (3.8-13.6) OR=1.1 (1.0-1.21) OR=1.2 (1.0-1.51)

Jensen (33)	Computer users in companies and institutions in Denmark n = 3,475 Drop-out 23%	Neck symptoms (trouble, ache or pain) for more than 7 days within the last year (17-23 months, mean = 21 months)	Previous neck pain 1-7 days Duration of employment in same job <1 year Less than good computer skill	Multivariate analysis for men OR=3.8 (2.3-6.5) OR=2.1 (1.1-3.9) OR=0.4 (0.1-0.9)
			Previous neck pain 1-7 days Influence at work (low) Screen height above eye level	Multivariate analysis for women OR=2.8 (1.9-4.1) OR=2.2 (1.3-3.7) OR=1.5 (1.0-2.2)
Wahlström et al. (18)	Computer users in Sweden n = 671 Drop-out 0%	Pain in the neck and/or scapular areas for 3 days or more during the preceding month (17 months)	High muscular tension High job strain	Multivariate analysis stratified for gender IRR=1.9 (1.25-2.93) IRR=1.6 (1.03-2.61)

Brandt et al. (34)	Computer users in Denmark n = 6,943 Drop-out 18%	Neck pain during the past 7 days of at least moderate degree and the pain during the previous 12 month had bothered them quite a lot, much or very much (12 months)	High demand Female Pain started after accident	Multivariate analysis OR=1.7 (1.0-2.7) OR=1.9 (1.1-3.3) OR=3.4 (1.3-9.5)
Korhonen et al. (6)	Office workers in Municipal administrative units in Finland n = 416 Drop-out 22%	Neck pain or radiating neck pain for at least 8 days during the preceding 12 months (12 months)	Poor placement of keyboard (keyboard-the edge of the table <15 cm) Female	Multivariate analysis adjusted for age and time used VDU OR=2.1 (1.0-4.5) OR=2.9 (1.3-6.7)
Hush et al. (7)	Office workers in an university in Australia n = 53 Drop-out 0%	Neck pain lasting more than 24 h during the past fortnight (12 months)	Female	Multivariate analysis HR=3.07 (1.18-7.99)

Summary of risk factors

Risk factors were divided into three groups: individual, work-related physical, and work-related psychosocial risk factors (Table 4). A majority of factors (74%) were investigated by only one study. There was strong evidence that female gender and previous history of neck complaints are predictors of the onset of neck pain. Strong evidence was also found that high keyboard usage time, poor perception of computer placement, and low social support have no predictive value for the onset of neck pain. Moderate evidence was found that high physical leisure activity and high psychosocial stress have no predictive value for the onset neck pain. There was limited evidence that pain started after an accident, irregular head and body posture, duration of employment in same job <1 year (for males only), poor computer skills (for males only), distance of the keyboard from the edge of the table <15 cm, high task difficulty, low influence at work (for females subjects only), and high muscular tension are associated with the onset of neck pain. There was also limited evidence that high/low body mass index, chronic diseases, smoking, cervical flexion-extension or lateral flexion mobility, arm support during mouse and keyboard use, poor perception of office equipment position, poor physical work environment, awkward body posture, high average mouse activity per 10 min, high average keyboard activity per 2 min, high mouse or keyboard speed, low micro-pauses per min (for mouse or keyboard use), high work flow, high physical exposure, sitting duration before break >1 hr, poor social network, non-adjustable chair and desk, low decision authority, low skills discretion, low control, and Type A behavior have no predictive value for the onset of neck pain. Conflicting evidence was found for factors, such as older age, daily computer use, high mouse usage time, screen height above eye level, high job strain, and high demand.

Table 4 Overall level of evidence for risk factors and their association for the onset of neck pain in office workers

Group	Risk factor	Cohorts assessed	+ Findings	+ High quality (References)	+ Low quality (References)	- Findings	- High quality (References)	- Low quality (References)	Level of evidence
Individual	Female gender	4	4/4 (100%)	2 (34, 35)	2 (6, 7)	-	-	-	Strong
	Pain started after accident	1	1/1 (100%)	1 (34)	-	-	-	-	Limited
	Previous history of neck complaints	2	2/2 (100%)	2 (27, 33)	-	-	-	-	Strong
	Irregular head and body posture	1	1/1 (100%)	1 (27)	-	-	-	-	Limited
	Duration of employment in same job <1 year (for males only)	1	1/1 (100%)	1 (33)	-	-	-	-	Limited
	Poor computer skills (for males only)	1	1/1 (100%)	1 (33)	-	-	-	-	Limited
	Older age	3	1/3 (33%)	1 (35)	-	2/3 (67%)	2 (18,34)	-	Conflicting
	High/low body mass index	1	-	-	-	1/1 (100%)	1 (34)	-	Limited no
	Chronic diseases	1	-	-	-	1/1 (100%)	1 (34)	-	Limited no
	Smoking	1	-	-	-	1/1 (100%)	-	1 (6)	Limited no
	High physical leisure activity	2	-	-	-	2/2 (100%)	1 (31)	1 (7)	Moderate no
	Cervical flexion–extension mobility	1	-	-	-	1/1 (100%)	-	1 (7)	Limited no
	Cervical lateral flexion mobility	1	-	-	-	1/1 (100%)	-	1 (7)	Limited no

Work-related physical	Daily computer use	2	1/2 (50%)	1 (27)	-	1/2 (50%)	1 (33)	-	Conflicting
	High mouse usage time	3	1/3 (33%)	1 (35)	-	2/3 (67%)	2 (33, 34)	-	Conflicting
	High keyboard usage time	2	-	-	-	2/2 (100%)	2 (34, 35)	-	Strong no
	Distance of the keyboard from the edge of the table <15 cm	1	1/1 (100%)	-	- 1 (6)	-	-	-	Limited
	Screen height above eye level (one study investigated in females only)	2	1/2 (50%)	1 (33)	-	1/2 (50%)	1 (34)	-	Conflicting
	Arm support during mouse use	1	-	-		1/1 (100%)	1 (34)	-	Limited no
	Arm support during keyboard use	1	-	-	-	1/1 (100%)	1 (34)	-	Limited no
	Poor perception of office equipment position	1	-	-	-	1/1 (100%)	1 (27)	-	Limited no
	Poor perception of computer placement	2	-	-	-	2/2 (100%)	2 (27, 34)	-	Strong no
	Poor physical work environment	1	-	-	-	1/1 (100%)	-	1 (6)	Limited no
	Awkward body posture	1	-	-	-	1/1 (100%)	1 (27)	-	Limited no
	High average mouse activity per 10 min	1	-	-	-	1/1 (100%)	1 (35)	-	Limited no
	High mouse speed	1	-	-	-	1/1 (100%)	1 (35)	-	Limited no
	Low micro-pauses per min (for mouse use)	1	-	-	-	1/1 (100%)	1 (35)	-	Limited no
	High average keyboard activity per 2 min	1	-	-	-	1/1 (100%)	1 (35)	-	Limited no
	High keyboard speed	1	-	-	-	1/1 (100%)	1 (35)	-	Limited no
	Low micro-pauses per min (for keyboard use)	1	-	-	-	1/1 (100%)	1 (35)	-	Limited no
	High work flow	1	-	-	-	1/1 (100%)	1 (27)	-	Limited no
	High physical exposure	1	-	-	-	1/1 (100%)	1 (18)	-	Limited no
	Sitting duration before break >1 hr	1	-	-	-	1/1 (100%)	-	1 (7)	Limited no
	Poor social network	1	-	-	-	1/1 (100%)	1 (34)	-	Limited no
	High task difficulty	1	1/1 (100%)	1 (27)	-	-	-	-	Limited
	Non-adjustable chair	1	-	-	-	1/1 (100%)	1 (34)	-	Limited no
	Non-adjustable desk	1	-	-	-	1/1 (100%)	1 (34)	-	Limited no

Work-related	Low influence at work (for females only)	1	1/1 (100%)	1 (33)	-	-	-	-	Limited
Psychosocial	High muscular tension	1	1/1 (100%)	1 (18)	-	-	-	-	Limited
	High job strain	3	1/3 (33%)	1 (18)	-	2/3 (67%)	1 (27, 34)	-	Conflicting
	High job demand	2	1/2 (50%)	1 (34)	-	1/2 (50%)	1 (27)	-	Conflicting
	Low decision authority	1	-	-	-	1/1 (100%)	1 (27)	-	Limited no
	Low skills discretion	1	-	-	-	1/1 (100%)	1 (27)	-	Limited no
	Low social support	2	-	-	-	2/2 (100%)	2 (27, 34)	-	Strong no
	Low control	1	-	-	-	1/1 (100%)	1 (34)	-	Limited no
	High psychological stress	2	-	-	-	2/2 (100%)	1 (34)	1 (7)	Moderate no
	Type A behavior	1	-	-	-	1/1 (100%)	1 (34)	-	Limited no

Positive findings (+ Findings) were considered significant associations ($P < 0.05$ or the 95% confidence intervals around RRs, ORs or HRs did not cross 1) from the multivariate results. Negative findings (- Findings) were considered not significant associations. ROM, range of motion

Sensitivity analysis

Changing the cut-off point from >50 to >60% would not have altered our conclusions at all. With a cut-off point of >70%, there would have been no study in high quality status. By excluding low-quality studies (with a cut-off point of >50%), several conclusions would be altered including:

- the level of evidence for high physical leisure time activity and high psychological stress would change from moderate 'No' to limited 'No'.
- the level of evidence for smoking, cervical flexion–extension mobility, cervical lateral flexion mobility, poor physical work environment, and sitting duration before break >1 hr would change from limited 'No' to no evidence.
- the level of evidence for distance of the keyboard from the edge of the table <15 cm would change from limited to no evidence.

DISCUSSION

This review summarized the results of five high-quality and two low-quality prospective cohort studies investigating the predictive value of 47 individual, work-related physical and work-related psychosocial factors for the onset of non-specific neck pain in office workers. Because of heterogeneity among studies mainly regarding case definition, risk factors, outcome measure, and follow-up duration, the analysis of the results was limited to a qualitative summary. Strong evidence was found for female gender and previous history of neck complaints and limited evidence for pain started after an accident, irregular head and body posture, duration of employment in same job <1 year, poor computer skills, distance of the keyboard from the edge of the table <15 cm, high task difficulty, low influence at work, and high muscular tension as predictors for new-onset neck pain in office workers. Interestingly, for a large number of factors that have been mentioned in the literature as risk factors for neck pain we found no predictive value for future neck pain in office workers, such as high physical leisure activity, low social support, and high psychosocial stress.
In this review, studies solely investigating neck pain were included. The area of neck is usually defined according to the standardized Nordic questionnaire (37) or a region

bounded superiorly by the superior nuchal line, laterally by the lateral margins of the neck and inferiorly by an imaginary transverse line through the T1 spinous process (38). Clinically, symptoms in the shoulder region may be the result of injuries in the neck and/or shoulder regions. Evidence suggests that risk factors for neck and shoulder pain in the general population are not identical (23, 29). Thus, an exclusion of those studies investigating neck and shoulder symptoms as a single region from this review would increase homogeneity among included studies, increasing internal validity of the findings.

Methodological considerations

Of the seven included studies, the items in the criteria checklist rated as negative in most studies were participation rate, assessment method of physical load at work and its quality, assessment of exposure during leisure time and frequency of data collection during follow-up period.

Of the seven included studies, only two studies had a participation rate of ≥80% (6, 18). The participation rates of the remaining five studies varied considerably, ranging from 1% to 73% (7, 27, 33-35). In general, studies with low levels of participation may be more vulnerable to self-selection bias than those with high participation (39). Therefore, a low participation rate in a population survey may threaten the internal validity of studies (40).

Common methods for the assessment of physical exposures at work include subjective judgment, systematic observation and direct measurement (41, 42). Most studies employed a self-reported questionnaire to assess physical load at work (7, 18, 27, 33, 34). Only one of the seven included studies using a software program to assess physical load at work (35). Many of the subjective methods, particularly those non-standardized methods of acceptable quality, had problems with test-retest reliability, which may have led to a poor validity of exposures(43, 44). All included studies using self-reported questionnaires did not report the test-retest reliability of their measurement tools. Future research should attempt to use a reliable systematic observation or objective measurement, instead of subjective judgment, to evaluate physical load at work.

Of the seven included studies, only one study measured physical exposures during leisure time (13). The remaining six studies did not measure exposures during leisure time (18, 27, 33, 35) or did not clearly state when exposures were measured (6, 7). Apart from work time, exposures during leisure time should be assessed and included as part of the cumulative dose that an individual is exposed to. Hildebrandt et al (45) demonstrated the association between physical activity during leisure time and neck pain in the working population, especially in office workers. Future research should consider measuring exposure during work and leisure time in order to be more representative of an individual's exposure.

The frequency of data collection of neck pain incidence during the follow-up period for the included studies varied considerably, ranging from 2 weeks to 24 months. Of the seven studies, one collected data every fortnight (7) and one collected data every month (18). The rest of the studies collected data at the beginning and the end of study only (6, 27, 33-35). A longer recall period regarding the incidence of neck pain during follow-up period may increase recall bias (46). This bias may be pronounced in studies in which detailed information, such as the duration of experiencing pain and/or pain intensity, was required. Future studies should pay more attention to the frequency of data collection during their follow-up period, and it is recommended that data are collected at least every three months or are obtained from a continuous registration system.

Outcome measurement

To date, there is a lack of consensus over the definition of a new episode of neck pain (23). In this review, the onset of neck pain was considered to be the onset of any reported neck symptoms, regardless of severity of symptoms, duration of symptoms and level of disability. This pragmatic choice was made because of the fact that this review focused on a specific group of population and only a small number of studies were qualified to be included in the review.

Of the seven studies, four followed up for 12 months (6, 7, 34, 35) and the remaining three were followed up between 17-24 months (18, 27, 33). The predictive value of any exposures depends on the duration of follow-up as well as the disease

of interest. A long duration of follow-up is generally considered a strength in prospective cohort studies, as it usually results in a larger number of cases and thereby increases the power of the statistical analysis (47). Thus, a long duration of follow-up is likely to enhance the internal validity of the study.

Evidence of risk factors for the onset of neck pain in office workers

In the general population, McLean et al (23) systematically reviewed prospective cohort studies and found strong evidence that female gender, older age (for men only), high job demands, low social/work support, being an ex-smoker, a history of low back problems, and a history of neck problems were risk factors for new-onset neck pain in the general population. In the working population, Côté et al (2) in their systematic review of prospective cohort and randomized controlled studies found strong evidence for older age, previous musculoskeletal pain, high quantitative job demands, low social support at work, job insecurity, low physical capacity, poor computer workstation design and work posture, sedentary work position, repetitive work, and precision work. The predictive value of several factors identified in previous reviews could not be confirmed in the present review, which only showed strong evidence for female gender and history of neck complaints as predictors of the onset of neck pain among office workers. The observed variation in the results among studies may be due to the limited number of studies in a population of office workers. However, the findings shed some light on the notion that risk factors for the onset of neck pain in a subpopulation may be a subset of risk factors identified in a general population or occupation-specific (2). To gain further insight into risk factors for the development of neck pain, future studies should consider the investigation of risk factors in a more specific group of population. Although both gender and history of neck complaints are non-modifiable risk factors, this information is useful for clinicians to identify office workers at risk, which would mean the enhancement of resource allocation to those most in need and most likely to benefit from it. Otherwise, a large number of people would receive intervention, which is likely to compromise its effectiveness (14, 15). Most of the variables included in the review have been supported by evidence from one high-

quality study only. Thus, this review was limited in its ability to draw conclusions about the predictive nature of these variables and the conclusions may change or modifiable risk factors will be identified when new studies become available in the future. In addition, there are still several other variables that have not been investigated at all. Therefore, further prospective studies to investigate biopsychosocial risk factors for the development of neck pain in office workers are still required.

Sensitivity analysis

Since all high-quality studies had total scores of greater than 60%, changing the cut-off point from >50 to >60% would not have altered our conclusions at all. However, shifting the cut-off point from >50 to >70% would have led to no study qualifying as a high quality study.

By excluding low-quality studies, several conclusions about risk factors with moderate and limited evidence, namely high physical leisure time activity, high psychological stress, smoking, cervical flexion–extension mobility, cervical lateral flexion mobility, poor physical work environment, sitting duration before break >1 hr, and distance of the keyboard from the edge of the table <15 cm, would alter. This variation in the level of evidence reflects the fact that there have been a small number of very good quality studies investigating risk factors for the development of neck pain in office workers. Thus, further study is required before firm conclusions can be drawn.

Strengths and limitations of the study

The major strength of this review is that the studies were systematically searched, evaluated for their methodological quality by two independent reviewers, extracted and synthesized based on the number of studies and the quality score of studies. However, two main methodological limitations are noteworthy. First, the search strategy was limited to full reported publications in English. The possibility of publication and selection bias cannot be ruled out. This may have affected the results of this review. Second, the researchers summarized the results from studies

with substantial heterogeneity in study characteristics. This may explain the observed variation in the results among studies. Future research is required to indicate whether differences in these aspects affect the effectiveness of exercise intervention before direct comparisons among different programs can be conducted.

CONCLUSION

Five high-quality and two low-quality prospective studies on the association between risk factors and the onset of non-specific neck pain in office workers were reviewed and analyzed. The findings showed strong evidence for female gender and previous history of neck complaints as risk factors of the onset of neck pain. Furthermore, we found strong evidence for the following factors not having predictive value: high keyboard usage time, poor perception of computer placement, and low social support. The results of this review need to be interpreted with caution because most variables have been investigated by only one study. More high-quality studies in this area are needed.

FUNDING SOURCES AND POTENTIAL CONFLICTS OF INTEREST

This work was funded by Chulalongkorn University Centenary Academic Development Project #12 and Faculty of Allied Health Scineces, Chulalongkorn University. No conflicts of interest were reported for this study.

CHAPTER III

Development of a neck pain risk score for predicting nonspecific neck pain with disability in office workers: A 1-year prospective cohort study

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Published as: Arpalak Paksaichol, Prawit Janwantanakul, Chaipat Lawsirirat. Development of a neck pain risk score for predicting nonspecific neck pain with disability in office workers: A 1-year prospective cohort study. Journal of Occupational Health, 2014 (2013 ISI impact factor = 1.248).

Abstract

Objectives: The purpose of this study was to develop a neck pain risk score for office workers (NROW) to identify office workers at risk of developing nonspecific neck pain with disability.

Methods: A 1-year prospective cohort study of 559 healthy office workers was conducted. At baseline, risk factors were assessed using questionnaires and standardized physical examination. The incidence of neck pain was collected every month thereafter. Disability level was evaluated using the neck disability index (NDI). Logistic regression was used to select significant factors to build a risk score. The coefficients from the logistic regression model were transformed into the components of a risk score.

Results: Among 535 (96%) participants who were followed for 1 year, 23% reported incident neck pain with disability (NDI ≥ 5). After adjusting for confounders, the onset of neck pain with disability was significantly associated with history of neck pain, chair adjustability, and perceived muscular tension. Thus, the NROW comprises three questions about history of neck pain, chair adjustability, and perceived muscular tension. The NROW had scores ranging from 0 to 4. A cut-off score of at least 2 had a sensitivity of 82% and specificity of 48%. The positive and negative predictive values were 29% and 91%, respectively. The area under the receiver-operating characteristic curve was 0.75.

Conclusions: The risk score for nonspecific neck pain with disability in office workers was developed and it contained 3 items with scores ranging from 0 to 4. This study shows that the score appears to have reasonable sensitivity, specificity, positive predictive value and negative predictive values for the cut-off point of at least 2.

Key indexing sensitivity and specificity; Musculoskeletal Diseases; Prevention; Risk Factors; Computers

INTRODUCTION

Nonspecific neck pain is neck pain (with or without radiation) without any specific systematic disease being detected as the underlying cause of the complaint (1). Neck pain is a major health problem in office workers with a one-year prevalence of 69% in Belgium (4) and 42% in Thailand (5). The one-year incidence of neck pain has also been previously reported to be 34% in Finland (6), 36% in Sweden (18), and 49% in Australia (7). Neck pain is viewed as an episodic occurrence over a lifetime with variable recovery between episodes (8). Neck pain causes considerable personal suffering due to pain, disability, and impaired quality of work and life in general, which can be a great socio-economic burden on patients and society (2, 10).

Evidence suggests that neck pain in workers is assumed to be of multi-factorial origin. Different occupations are exposed to different working conditions and the nature of work influences the health of workers (2). Predisposing factors for neck pain are likely to be population-specific. A recent systematic review of prospective cohort studies has identified several risk factors for neck pain in office workers, including female gender, history of neck complaints, pain started after an accident, irregular head and body posture, duration of employment in same job <1 year (for males only), poor computer skills (for males only), distance of the keyboard from the edge of the table <15 cm, high task difficulty, low influence at work (for female subjects only), and high muscular tension (48).

Having a screening tool for neck pain is necessary for several reasons. First, a screening tool provides information about individuals' risk of developing neck pain, which will guide health professionals and individuals in joint decisions on further intervention. Identification of persons at risk would also mean the enhancement of resource allocation to those most in need and most likely to benefit from it. Without a screening tool, a large number of people would receive intervention, which is likely to compromise its effectiveness (14, 15). Second, a screening tool allows an examination to be conducted in primary health care and workplace settings where full clinical examinations are impractical due to limited personnel and time (16). Lastly, a screening tool is beneficial for selecting the relevant individuals for therapeutic research. Researchers may use a validated screening tool to select healthy subjects with an increased risk of developing a disease for a randomized controlled trial of a specific intervention to prevent a disease (15).

To our knowledge, no screening tool to identify office workers at risk of developing non-specific neck pain has been established. Thus, the purposes of this

study were to develop risk scores to assist health care providers in identifying office workers who are at risk of developing non-specific neck pain with disability. The aims were achieved by identifying important biopsychosocial predictors, assigning relative weights to each predictor, and then estimating the model's predictive performance.

METHOD

Study design

A prospective cohort study with a one-year follow up was conducted to determine risk factors for predicting neck pain and disability in office workers. Office workers without neck pain were evaluated at baseline and prospectively followed every month for a 12-month period.

Recruitment procedure

A convenience sample of office workers in four large-scale enterprises in Bangkok was recruited. The enterprises participating in this study were a public university (Chulalongkorn University and 3 ministry's head offices (the Royal Forest Department's head office, the Ministry of Education's head offices, and the Prime Minister's office). Office workers were defined as those working in an office environment with their main tasks involving use of a computer, participation in meetings, presentations, reading, and phoning (25). Office workers were included in the study if aged 18-55 years and working full-time. Subjects were excluded if they had reported neck pain in the previous 3 months with pain intensity greater than 30 millimeters (mm) on a visual analog scale (VAS), reported pregnancy or planned to become pregnant in the next 12 months, had a history of trauma or accidents or surgery in the neck region, had been diagnosed with fibromyalgia, carpal tunnel syndrome, cervical radiculopathy, systemic illness, connective tissue disorders, or planned a vacation for longer than 9 consecutive days.

Office workers were approached and invited to participate in this study. They were informed of the objectives and details of the research and asked to provide informed consent upon agreement to participate. At baseline, subjects completed a self-administered questionnaire and underwent physical examination conducted by trained physical therapists according to standardized protocol. Subjects then received a self-administered diary to record the incidence of neck pain and, if occurring, disability due to neck pain. The researcher returned to collect the diaries from participants every month over a 12-month period. The study was approved by the University Human Ethics Committee.

Outcome measures

The area of neck was defined according to the standardized Nordic questionnaire (Thai version) (37). The body pain diagram has been found to reliably and consistently evaluate pain distribution and pain location (49). Participants answered the question 'Have you experienced any neck pain lasting >24 hours in the previous four weeks?' If they answered 'Yes', follow-up questions about pain intensity measured by VAS were asked. Information was also sought regarding the cause of neck pain and the presence of weakness or numbness in the upper limbs. Those who reported incidence of neck pain were also asked about their disability level as measured by the neck disability index (NDI, Thai version) (50). The NDI contains 10 items on a 5-point Likert scale and the total score of the NDI ranges from 0-50, with higher scores indicating more severe disability.

In this study, participants were identified as cases if they answered 'Yes' to the question 'Have you experienced any neck pain lasting >24 hours in the previous four weeks?', reported pain intensity greater than 30 mm on a 100-mm VAS, had no weakness or numbness in the upper limbs, and had an NDI score at least 5. Participants were followed until they became symptomatic, withdrew from the study, or completed the 12-month follow-up.

Biopsychosocial risk factors

The self-administered questionnaire and physical examination were employed to assess potential biopsychosocial risk factors. The self-administered questionnaire comprised three sections designed to gather data on individual, work-related physical and work-related psychosocial factors. Individual factors included gender, age, hand dominance, marital status, education level, chronic diseases, frequency of weekly exercise sessions, smoking habits, and history of neck and low back pain.

Work-related physical factors included job position, years of working experience, average number of working hours a day, and frequency of computer use and sitting >4 h a day as well as rest breaks. Information about typing style and habitual neck posture while using a computer was also requested. The questionnaire asked participants, based on their own perceptions, to rate the ergonomics of their workstations (i.e. height of desk and chair, adjustability of chair, position of the computer screen, keyboard, and mouse) and work environment conditions (i.e. ambient temperature, light intensity, noise level, and air circulation).

Work related psychosocial factors were assessed by Job Content Questionnaire (Thai version), which consists of set questions, a total of 54-items in the following six areas: decision latitude (11 items), psychological demand (12 items), physical job demand (6 items), social support (8 items), job security (5 items) and work hazards (12 items). Each item had a response set of a four-point Likert scale ranging from 1, or strongly disagree, to 4, or strongly agree (51). Participants were also required to answer the question 'Have you, during the past month, experienced muscular tension during working?' (never, a few times, a few times per week, one time per day, or several times per day). The self-rated perceived muscular tension was scaled into three groups: high tension (a few times per week, one time per day, or several times per day), medium tension (a few times), or low tension (never) (18).

The physical examination included in the study was selected based on the theoretical effect of prolonged computer use on body parts, which may lead to forward head posture, rounded shoulders, and kyphotic upper thoracic spine (52). Previous cross-sectional studies indicated that neck pain was significantly associated with lower ranges of neck movement and neck muscle endurance (11, 53). A physical examination took a 30-minute single session to complete.

Body weight and height were measured by digital scale and a wall-mounted standiometer, respectively. Neck range of motion assessments looked at an active range of motion for neck flexion, extension, rotation, and lateral rotation using the cervical range of motion device (CROM) (54). Neck flexor endurance was assessed according to the procedures described by Harris et al (55). The participant assumed a crook-lying position with their chin maximally retracted and maintained isometrically. The subject then lifted the head and neck until the head was approximately 2.5 cm above the plinth. The length of time the subject was able to hold this position without deviation was recorded in seconds by the examiner (55). Pressure pain threshold (PPT), which is the minimal amount of pressure where the sensation of pressure first changes to pain, at the right upper trapezius was measured using an electronic algometer (Algomed®, MEDOC, Ramat Yishai, Israel) (56). The pressure was applied at a rate of 30 kPa/s. All participants were instructed to press a switch when the sensation changed from pressure to pain. The mean of three trials was calculated and used for the main analysis. A 30-second resting period was allowed between each measure.

Before data collection, the repeatability of data from the questionnaire and physical examination outcomes was assessed on 20 office workers. Each subject was

tested twice on 2 separate days with a week lapse between the measurements for the questionnaire and 1 day for the physical examination.

Statistical analysis

For the reliability study of the questionnaire outcomes, the intraclass correlation coefficient (ICC) was calculated for continuous data and Phi coefficient for nominal data. The ICC (3,1) was calculated for intra-rater reliability.

Characteristics of subjects were described using means or proportions. The percent missing data in the individual, work-related physical, and work-related psychosocial factor categories were 0.08%, 1.07%, and 0.45%, respectively. To retain the statistical power of the database, missing data were handled utilizing the 'hot-deck imputation' procedure. A respondent was selected at random from the total sample of the study and the value for that person was assigned to the case in which information was missing. This procedure was conducted repeatedly for each missing value until the dataset was complete (57).

The 1-year incidence rate of non-specific neck pain with disability was calculated as the proportion of new cases, defined as not having had neck pain at the baseline but reporting it during the follow-up in the cohort during the 12-month period.

To develop a risk score to predict incident non-specific neck pain with disability in office workers, a series of statistical analyses were conducted. The associations between each factor and neck pain were evaluated using the univariate logistic regression analysis. Any factors with a p-value ≤ 0.2 were eligible for addition into multivariate analysis. Multivariate logistic regression analysis with backward stepwise selection was then performed to determine the optimal combination of biopsychosocial factors needed to predict incident neck pain. Statistical significance was set at the 5% level.

Before univariate logistic regression analysis was conducted, collinearity between the different predictor variables was checked using the Variance Inflation Factors (VIF) and the Tolerance. Collinearity was assumed to be present if VIF was higher than 10 and Tolerance was lower than 0.1 (58). If collinearity was present, the risk factor with the highest correlation with the outcome was used for the multivariable analysis. The 'explained variance' of each of the multivariable logistic regression models was calculated by means of Nagelkerke's R^2 and the goodness of fit by means of the Hosmer and Lemeshow goodness-of fit test (59).

A simplified scoring system was devised on the basis of coefficient results. A score was assigned to each variable based on the magnitude of the β coefficient. A total score for the risk of developing neck pain was calculated as the sum of each variable. A receiver-operating characteristic curve (ROC) and the area under the ROC (AUC) were produced to evaluate the discriminatory ability of the risk score. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for several cut-off scores were calculated. The cut-off score that gave the maximum sum of sensitivity and specificity was taken as an optimum. All statistical analyses were performed using SPSS for Windows Version 17.0 (SPSS Inc., Chicago, IL).

RESULTS

Test-retest reliability

The test-retest reliability results demonstrated moderate (0.71) to good (0.91) reliability for questionnaire outcomes. Intra-rater reliability for physical examination outcomes were moderate (0.72) to good (0.91).

Demographic characteristics of study population

Among the total of 3,809 workers who received the invitation, 1,967 responded (response rate, 51.6%). Of these, 1,285 were excluded because they did not meet the inclusion criteria, giving an eligible population of 682. In total, 559 workers agreed to participate in the physical examination. Five hundred thirty-five workers were followed for one year and 24 (4.5%) subjects were lost during the follow-up period due to pregnancy (n=3), job transfer (n=15), early retirement (n=3) and withdrawal (n=3) (figure 1). Table 1 presents the demographic characteristics of the study population.

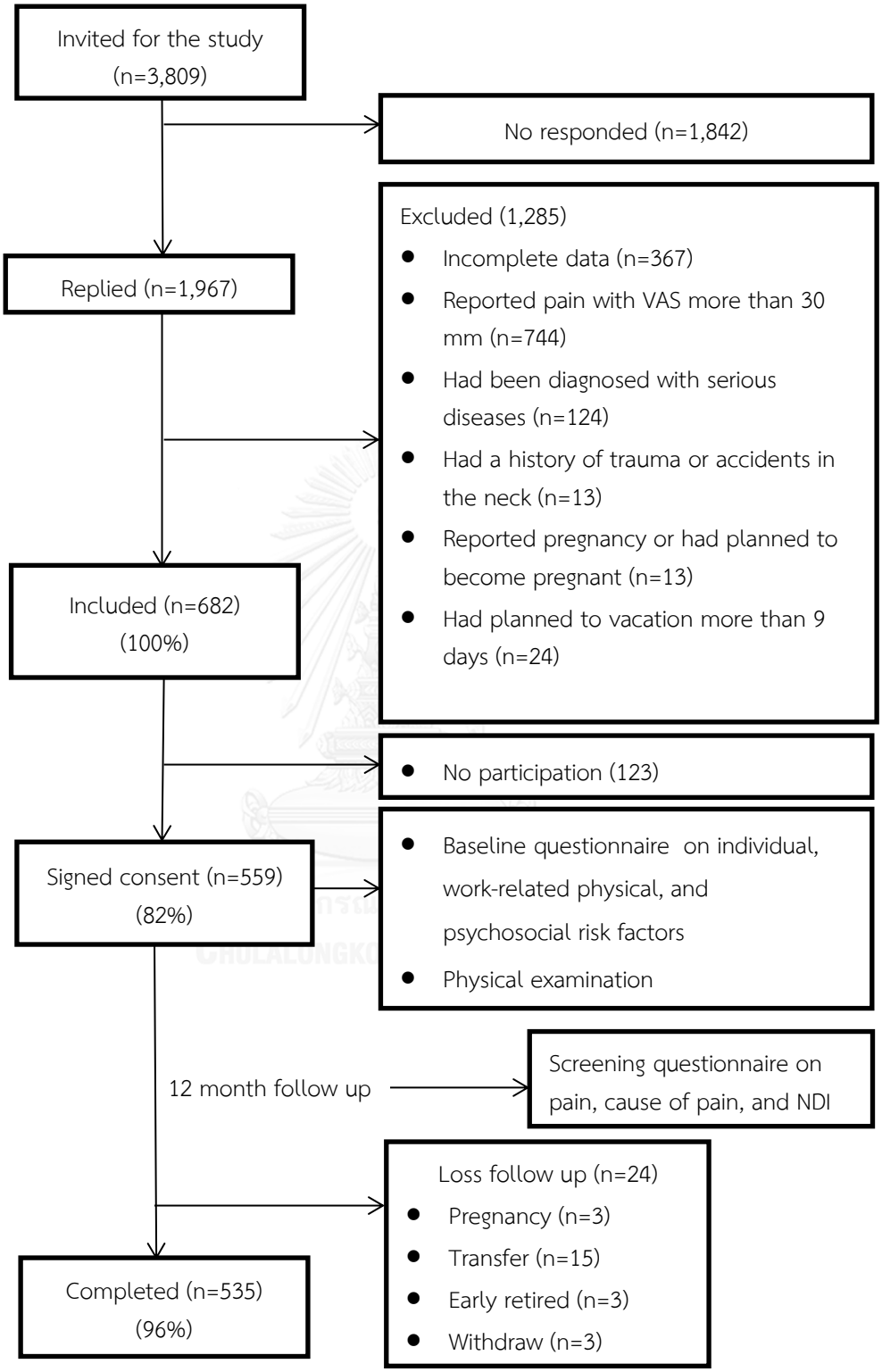

Figure 1 Flow chart of participants for the study. NDI, neck disability index; VAS, visual analog scale

Table 1 Descriptive summary of subject characteristics (n = 535)

Characteristics	N (%)	Mean (SD)
General characteristics		
Gender		
Male	106 (19.8)	
Female	429 (80.2)	
Age (years)		39.2 (9.0)
20-29	97 (18.1)	26.6 (1.8)
30-39	186 (34.8)	34.8 (1.85)
40-49	157 (29.3)	44.2 (2.9)
50-59	95 (17.8)	52.7 (1.9)
Body mass index (kg/m2)		24.07 (4.9)
< 18.5 kg/m2	31 (5.8)	17.7 1(0.6)
18.5-24.9 kg/m2	331 (61.9)	21.7 (1.7)
25-29.9 kg/m2	110 (20.6)	27.3 (1.4)
> 30 kg/m2	63 (11.8)	34.3 (3.8)
Occupation-related characteristics		
Duration of employment (years)		13.8 (9.3)
Working days per week (days per week)		(0.3) 5.0
Working hours per day (hours per day)		8.0 (1.0)
Psychosocial characteristics		
Job control		35.2 (5.0)
Psychosocial job demands		32.7 (4.5)
Physical job demands		13.5 (2.8)
Job security		16.5 (1.5)
Social support		29.7 (6.0)
Hazards at work		16.7 (3.6)
Perceived muscular tension		
High	85 (15.9)	
Medium	284 (53.1)	
Low	166 (31)	
Physical characteristics		
Cervical flexion (degree)		61 (9)
Cervical extension (degree)		65 (11)
Cervical lateral flexion (degree)		

Right	42 (7)
Left	44 (7)
Cervical rotation (degree)	
Right	72 (7)
Left	72 (7)
Neck flexors endurance time (s)	30.2 (21.2)
Pressure pain threshold (kPa)	
Right	300.0 (184.5)
Left	258.0 (158.1)

Incidence of non-specific neck pain

The incidence of neck pain, regardless of disability level, during the follow-up was 0.28 (95% CI 0.20-0.37). There were 80.1% of workers who reported neck pain with disability. The incidence of neck pain with disability (NDI ≥ 5) during the follow-up was 0.23 (95% CI 0.15-0.31) with the mean (SD) VAS and NDI scores of 42 (14) mm and 8.4 (3.4), respectively.

Risk score for the onset of non-specific neck pain in office workers

When performing univariate logistic regression analysis, variables showing p-value < 0.2 were female gender, history of neck pain and back pain, monitor height, adjustable chair, perceived muscular tension, physical job demands, and psychological job demands. Multivariate logistic regression analysis revealed a significant association between onset neck pain with disability and history of neck pain, adjustability of chair, and perceived muscular tension (Table 2). Nagelkerke's R^2 was 0.444 and the Hosmer-Lemeshow goodness-of-fit test was not significant (χ^2 = 2.054, P = 0.915). To develop a risk score for neck pain with disability in office workers, scores were assigned to each variable, which resulted in a range from 0 to 4 (Table 3). The optimal cut-off score was $\geq$ 2 (sensitivity = 82.0%; specificity = 47.6%; PPV = 29.1%; NPV = 91.0%) (Table 4). The area under the curve (AUC) was 0.75 (95%CI 0.69-0.81).

Table 2 Incidence and adjusted odds ratio (ORadj) with 95% confidence interval (95%CI) of non-specific neck pain with respect to factors in the final modeling (n = 535)

Factors	n	Incidence (%)	ORadj	95%CI	P value
History of neck pain					
Yes	262	77 (29.4)	2.24	1.39-3.06	0.001
No	273	34 (12.4)	1.00		
Adjustable chair					
Yes	340	59 (17.4)	1.00		
No	195	52 (26.7)	1.80	1.16-2.81	0.009
Perceived muscular tension					
High	85	34 (40.0)	4.04	1.99-8.17	<0.001
Medium	284	60 (21.1)	1.79	1.03-3.27	0.05
Low	166	17 (10.2)	1.00		

Table 3 **Risk scores for non-specific neck pain**

Factors	β coefficient	Risk score*
History of neck pain		
Yes	**0.80**	**1**
No		**0**
Adjustable chair		
Yes		
No	**0.59**	**1**
Perceived muscular tension		
High	**1.40**	**2**
Medium	**0.58**	**1**
Low		**0**

*** Reference groups were assigned a score of 0. β Coefficient of perceived muscular tension (medium) was assigned a score of 1 and then the other β Coefficient was divided by 0.58 and rounded off to the nearest integer.**

Table 4 Sensitivity and specificity of each cut-off value for the risk score for non-specific neck pain

Cut-off value	Sensitivity	Specificity	PPV	NPV
≥ 1	93.7	18.6	23.2	91.1
≥ 2	82.0	47.6	29.1	91.0
≥ 3	45.1	82.6	40.3	85.2
= 4	10.8	96.9	48.0	80.6

DISCUSSION

The one-year incidence of neck pain, regardless of disability level, in office workers was 28%. Previous epidemiological studies reported the annual incidence of neck pain in office workers to be in the range of 34-49% (6, 7, 18). The discrepancy between our and previous studies may be due to the difference in the definition of a symptomatic case. Korhonen et al (6) defined incident cases as those who reported local neck pain or radiating neck pain at least eight days during the preceding 12 months, whereas Hush et al (7) defined an episode of neck pain as a period of neck pain lasting longer than 24 hours. In this study, apart from having pain lasting more than one day, participants were required to report pain greater than 30 mm on a 100-mm VAS and no weakness or numbness in the upper limbs in order to be identified as cases. Consequently, it is likely that a lower number of subjects were identified as symptomatic cases in this study.

For the one-year incidence of neck pain with disability, the results showed that the annual incidence of neck pain with disability in office workers was 23%. Those reporting neck pain with disability in the present study had moderate pain intensity level and low disability level. One explanation for these findings is that these office workers still continued their work. Workers who continue working will have low disability because it would be difficult for them to remain productive with high disability levels (12).

The principle aim of the present study was to develop a screening tool based on the model to identify office workers at risk of developing non-specific neck pain and disability. A number of biopsychosocial risk factors as well as the outcome from the physical examination were included in the analysis. The results showed that a risk score for neck pain with disability in office workers or the “neck pain risk score for office workers (NROW)” comprised only three items to calculate the total score: history of neck pain, adjustability of chair, and perceived muscular tension. Each item

is unequal in weight. The scores range from 0 to 4 and the higher the score indicates a higher risk of neck pain with disability.

The strongest predictor in the NROW was perceived muscular tension. This finding is in line with previous studies (18, 60). Wahlström et al (18) reported that perceived muscular tension was significantly associated with an increased risk of developing neck pain among computer users. Huysmans et al (60) found that perceived muscular tension was a strong predictor of future neck-shoulder symptoms in symptom-free office workers. A model of musculoskeletal disorders and computer work by Wahlström (61) proposed that both physical demands from work and mental stress may increase the physical load, which in turn has a direct path to perceived muscular tension. Perceived muscular tension, along with perceptions of comfort and exertion, is hypothesized to be an early sign of musculoskeletal disorders.

The NROW is easy-to-use and can be carried out within a short space of time because it requires an individual to answer three simple questions. The NROW is a promising tool for the early identification of office workers at risk of developing non-specific neck pain with disability, who will receive the greatest benefit from preventive intervention. The NROW is suitable for utilization in primary health care and workplace settings where full clinical examinations are impractical due to limited personnel and time.

Selection of an optimal cut-off point largely depends on the purpose of utilizing the risk score and requires knowledge of the sensitivity, specificity, PPV and NPV. However, in the present study, a cut-off score of ≥ 2 provided the maximum sum of sensitivity and specificity. The purpose of utilizing the NROW is to identify high-risk office workers who are likely to benefit from any preventive intervention given to them. The sensitivity, which indicates the ability of the risk score to recognize high-risk office workers when present, is 82%. Subsequently, the false negative rate was 18%, meaning that only 18% of high-risk office workers will be identified as negative. With a cut-off score of ≥ 2, the specificity, which represents the ability of the risk score to recognize low-risk office workers when present, is 48%. Subsequently, the false positive rate was 52%, indicating that 52% of low-risk office workers will be identified as positive. Because these low-risk office workers may not have had any benefit from any preventive intervention given to them, a high false positive rate would cost money and lead to time loss. One needs to consider the expected consequences of missing a person at risk as opposed to including a person in an intervention even though they are not at risk. Since neck pain is prevalent

among office workers and leads to a great socio-economic burden on patients and society, one may prefer a risk score with high sensitivity to high specificity.

In practice, predictive values may be more useful for applying the risk score in clinical decision making than sensitivity and specificity rates because predictive values indicate the probability that the result is correct (62). The results show that the predictive value of the cut-off point of $\geq$ 2 was low for the PPV and high for the NPV. The PPV was 29%, indicating that 29% of office workers with a score of $\geq$ 2 are actually at risk of developing disabling neck pain. The NPV was 91%, meaning that 91% of office workers with a score of 1 were not at risk of developing disabling neck pain. Although the PPV and NPV provide useful information for interpreting the risk score, they are highly dependent on the prevalence of the condition of interest in the sample, in which the PPV will be lower and the NPV will be higher in samples with a low prevalence of the condition (62).

Strengths and limitations of this study

A major strength of this study is its prospective design, allowing for the identification of the cause-effect relationships, and the evaluation of a broad range of psychosocial factors for their contribution to neck pain. In addition, a large sample was successfully followed for one year (96%), allowing for robust results for determining the model's goodness-of-fit. However, there are a number of methodological limitations in this study. First, this study was a development study of a prognostic model. The predictive performance of the NROW was tested on the same population in which the risk score was developed. The model is likely to perform better in the development sample than in an independent sample. In other words, the predictive power is likely to be inflated (14, 15). In addition, the risk score may be very specific to the population study. Thus, extrapolation of these results to other populations should be made with caution. Further research to validate or testing the NROW's predictive performance in a new population of office workers using slightly different definitions and measurements of predictors and outcomes is suggested. Also, impact studies to quantify whether use of the NROW in daily practice improves decision making and patient outcome is recommended (15). Second, in this study, subjects were identified as cases if they reported pain lasting more than one day, pain greater than 30 mm on a 100-mm VAS, no weakness or numbness in the upper limbs, and an NDI score ≥ 5. Different results may emerge with different definitions of symptomatic cases. Third, the nature of several biopsychosocial factors and the diagnosis of neck pain were subjective, which may

have led to data inaccuracy. The important drawback of self-reported data is the risk of overestimation of exposure (63). Also, some workers may be more sensitive to any somatic disturbance than others. As a result, there is a risk of under- or over-reporting of the incidence. Future studies should consider inclusion of objective information from a physical examination to increase data accuracy. Fourth, this study only investigated the predictive ability of participants' neck flexor endurance on incident neck pain. Theoretically, prolonged computer use may lead to forward head posture, round shoulders, and kyphotic upper thoracic spine (52). Further study should include evaluation of other relevant physical characteristics, such as neck extensor, shoulder retractor, and back extensor endurance as well as cervical and thoracic curves. These factors may alter the predictive performance of the NROW.

CONCLUSION

The risk score for non-specific neck pain with disability in office workers was developed. It contained 3 items with scores ranging from 0 to 4. Using a cut-off score of at least 2, the sensitivity was found to be 82% and the specificity 48%. The positive and negative predictive values were 29% and 91%, respectively. The risk score is easy and quick for primary health care providers to complete. However, further research is required to validate the NROW in a new population of office workers.

CHAPTER IV

Contribution of biopsychosocial risk factors to non-specific neck pain in office workers: A path analysis model

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Published as: Arpalak Paksaichol, Chaipat Lawsirirat, Prawit Janwantanakul, Contribution of biopsychosocial risk factors to non-specific neck pain in office workers: A path analysis model**.** Journal of Occupational *and Health*, 2014 Dec 4 (2013 ISI impact factor = 1.096).

Abstract:

Objective: The etiology of non-specific neck pain is widely accepted to be multifactorial. Each risk factor does not only have direct effects on neck pain but they may also exert their effects indirectly through other risk factors. This study aimed to test this hypothesized model in office workers.

Methods: A one-year prospective cohort study of 559 healthy office workers was conducted. At baseline, a self-administered questionnaire and standardized physical examination were employed to gather biopsychosocial data. Follow-up data were collected every month for the incidence of neck pain. A regression model was built to analyze factors predicting the onset of neck pain. Path analysis was performed to examine direct and indirect associations between identified risk factors and neck pain.

Results: The onset of neck pain was predicted by female gender, having history of neck pain, monitor position not being level with the eyes, and frequently perceived muscular tension, in which perceived muscular tension was the strongest effector on the onset of neck pain. Gender, history of neck pain, and monitor height have indirect effects on neck pain that were mediated through perceived muscular tension. History of neck pain was the most influential effector on perceived muscular tension.

Conclusions: The results of this study support the hypothesis that each risk factors may contribute to the development of neck pain both directly and indirectly. The combination of risk factors necessary to cause neck pain is likely occupation specific. Perceived muscular tension is hypothesized to be an early sign of musculoskeletal symptoms.

Key indexing Neck pain; Office worker; Biopsychosocial; Predictors; Path analysis

INTRODUCTION

Neck pain is common among workers, affecting 13-48% of workers annually (64, 65). Office workers, defined as those working in an office environment with their main tasks involving computer use, participation in meetings, presentations, reading, and telephoning (25), are among those with the highest frequency of neck pain (3). Between 42% and 69% of office workers experienced neck pain in the preceding 12 months (4, 5, 11, 17) and about 34% to 49% of office workers reported a new onset of neck pain during a one-year follow-up (6, 7, 18). Neck pain is viewed as an episodic occurrence over a lifetime with variable recovery between episodes (8). Neck pain has been found to increase the risk for future long-term sickness absence among white-collar workers (66). Consequently, neck pain in effect constitutes a great socio-economic burden on patients and society (2, 20).

Non-specific neck pain is neck pain (with or without radiation) without any specific systematic disease being detected as the underlying cause of the complaint (1). The etiology of musculoskeletal disorders is widely accepted to be multifactorial, including individual, physical, and psychosocial factors (2, 24, 48, 67). Different occupations are exposed to different working conditions and the nature of the work influences the health of workers (2, 68-70). Predisposing factors for neck pain are likely to be population-specific. A recent systematic review of prospective cohort studies has identified several risk factors for neck pain in office workers, including female gender, history of neck complaints, pain started after an accident, irregular head and body posture, duration of employment in same job <1 year (for males only), poor computer skills (for males only), distance of the keyboard from the edge of the table <15 cm, high task difficulty, low influence at work (for female subjects only) and high muscular tension (48).

To understand the etiology of neck pain, a model to conceptualize the process involved in the development of neck pain among workers is required. Côté et al. (2) proposed that, rather than each risk factor only having direct effects on neck pain and the risk factors not themselves being outcomes of antecedent risk factors, neck pain is likely caused by multiple serial exposures (figure 1). For example, several risk factors relating to demographic, ethnic, and cultural characteristics may have direct effects on neck pain. However, they may also exert their effects indirectly through health behaviors, occupation, workplace physical and psychological exposures and how a worker copes with stress at work. On the other hand, risk factors related to the workplace can modify the direct effects of other workplace-related risk factors on the onset of neck pain and the effects of risk factors related to

the workplace on neck pain are mediated by workers' ability to cope with stress at work.

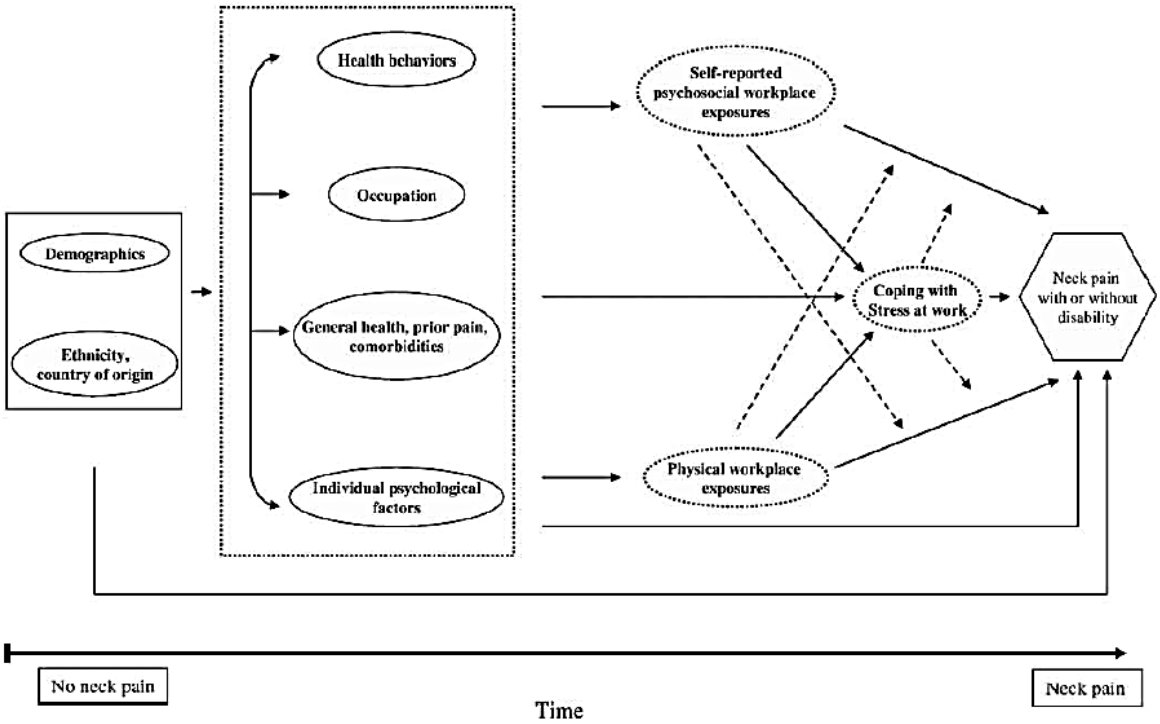

Figure 1. Hypothesized model of associations between biopsychosocial and neck pain with or without disability (Côté et al. (2)).

The analytical approach, such as path analysis, is a useful tool to test a causal pathway for the development of disease. Path analysis, which is an extension of multiple regression, can predict more than one dependent variable and assess the relationships among independent variables as well as dependent variables within that model (71, 72). It shows a theoretical, directional relationship (both direct and indirect) between variables, and offers a causal model of relationships (73). The purpose of this study was to test a hypothesized model of the direct and indirect effects of various risk factors involved in the development of non-specific neck pain in a sample of office workers using path analysis.

MATERIALS AND METHODS

Participants and procedure

A prospective cohort study with a one-year follow up was conducted in a convenience sample of 3,809 office workers recruited from four large-scale

workplaces in Bangkok, Thailand. The enterprises participating in this study were a public university and three ministry's head offices. The study was approved by the University Human Ethics Committee. An individual was included in the study if aged 18-55 years and working full-time. Subjects were excluded if they had reported neck pain in the previous three months, reported pregnancy or had planned to become pregnant in the next 12 months, had a history of trauma or accidents or surgery in the neck region, had been diagnosed with fibromyalgia, carpal tunnel syndrome, cervical radiculopathy, systemic illness, connective tissue disorders, or had planned for vacation more than 9 consecutive days in the next 12 months. Neck pain was defined as any neck pain lasting >24 hours with pain intensity greater than 30 mm on a 100 mm visual analog scale (VAS).

Office workers were approached and invited to participate in this study. They were informed of the objectives and details of the research and asked to provide informed consent upon agreement to participate. At baseline, subjects completed a self-administered questionnaire and underwent physical examination conducted by trained physical therapists according to standardized protocol (figure 2). Subjects then received a self-administrated diary to record the incidence of neck pain monthly and the researcher returned to collect the diaries from participants every month over a 12-month period.

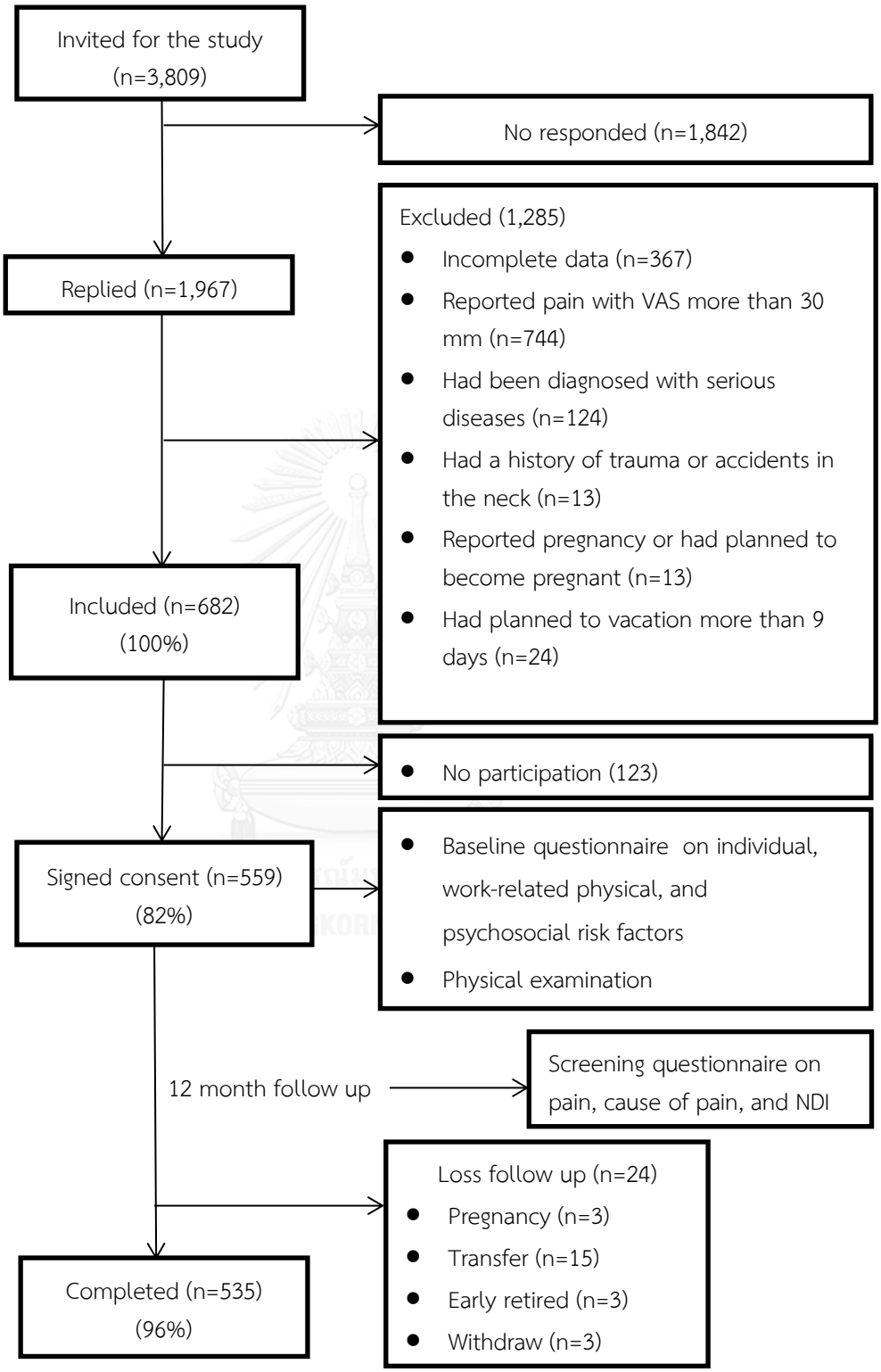

Figure 2 Flow chart of participants

Outcome measures

To assess onset neck pain during the previous month, a picture of the body from the standardized Nordic questionnaire (37) and the question 'Have you experienced any neck pain lasting >24 hours in the previous four weeks?' were included in a diary given to participants. If they answered 'Yes', follow-up questions were asked regarding pain intensity measured by a VAS and the presence of weakness or numbness in the upper limbs. In this study, participants were identified as cases if they answered 'Yes' to the question 'Have you experienced any neck pain lasting >24 hours in the previous four weeks?', reported pain intensity greater than 30 millimeters (mm) on a 100-mm VAS, and had no weakness or numbness in the upper limbs. Participants were followed until they become symptomatic, withdrew from the study, or completed the 12-month follow-up.

Biopsychosocial risk factors

The self-administered questionnaire and physical examination were employed to collect potential biopsychosocial risk factors. The self-administered questionnaire consisted of three sections in order to gather data on individual, work-related physical, and work-related psychosocial factors.

Individual factors included gender, age, hand dominance, marital status, education level, chronic diseases, frequency of weekly exercise sessions, smoking habits, and history of neck and low back pain.

Work-related physical factors included job position, years of working experience, average number of working hours a day, and frequency of computer use and sitting >4 h a day as well as rest breaks. Information about typing style and habitual neck posture while using a computer was also requested. The questionnaire asked participants, based on their own perceptions, to rate the ergonomics of their workstations (i.e. height of desk and chair, adjustability of chair, position of computer screen, keyboard and mouse) and work environment conditions (i.e. ambient temperature, light intensity, noise level, air circulation).

Work related psychosocial factors were assessed by Job Content Questionnaire, which consists of set questions, a total of 54-items in the following six areas: decision latitude (11 items), psychological demand (12 items), physical job demand (6 items), social support (8 items), job security (5 items) and work hazards (12 items). Each item had a response set of a four-point Likert scale ranging from 1, or strongly disagree, to 4, or strongly agree (51). Participants were also required to answer the question 'Have you, during the past month, experienced muscular

tension during work?' (never, a few times, a few times per week, one time per day, or several times per day). The self-rated perceived muscular tension was scaled into three groups: high tension (a few times per week, one time per day, or several times per day), medium tension (a few times), or low tension (never) (18).

The physical examination included in the study was selected based on the theoretical effect of prolonged computer use on body parts, which may lead to forward head posture, rounded shoulders and kyphotic upper thoracic spine (52). Previous studies showed that patients with neck pain had significantly lower ranges of neck movement and neck muscle endurance than those without neck pain (11, 53). A physical examination took a 30-minute single session to complete.

- Body weight and height were measured by digital scale and a wall-mounted standiometer, respectively.
- Neck range of motion assessments looked at an active range of motion for neck flexion, extension, rotation, and lateral rotation using the cervical range of motion device (CROM) (54). Subjects sat on the chair with feet on the floor. Each subject looked directly forward with the neck in a neutral position. The subject was then asked to move the head towards each direction as far as possible and the degree of neck motion in each direction was recorded.
- Neck extensor and flexor endurance were assessed according to the procedures described by Ljungquist et al. (74) and Harris et al. (55), respectively. For the neck extensor muscles endurance, the subject lay prone on a plinth with their head and neck supported by the examiner's hands. A Velcro band was strapped around the subject's head with an inclinometer attached to the band immediately above the tip of the right ear. A 2-kg weight for female and a 4-kg weight for male were suspended from the headband. The subject was instructed to hold the head steady in a horizontal position, monitored by an inclinometer. The test was discontinued if the subject was not able to hold the position because of fatigue or pain, or if the subject lost > 5 degrees of the position. The examiner recorded the muscle performance in seconds (31). For neck flexor muscles endurance, the participant assumed a crook-lying position with their chin maximally retracted and maintained isometrically. The subject then lifted the head and neck until the head was approximately 2.5 cm above the plinth. The length of time the subject was able to hold this position without deviation was recorded in seconds by the examiner (55).
- Pressure pain threshold (PPT), which is the minimal amount of pressure where the sensation of pressure first changes to pain, at the right upper trapezius was

measured using an electronic algometer (56). The pressure was applied at a rate of 30 kPa/s. All participants were instructed to press a switch when the sensation changed from pressure to pain. The mean of three trials was calculated and used for the main analysis. A 30-second resting period was allowed between each measure.

Before data collection, the repeatability of data from the self-administered questionnaire and physical examination outcomes was assessed on 20 office workers. Each subject was tested twice on two separate days with a week lapse between the measurements for the questionnaire and one day for the physical examination.

Statistical analyses

For the reliability study, the intraclass correlation coefficient (ICC [3,1]) was calculated for continuous data and Phi coefficient for nominal data. ICC (3,1) was calculated for intra-rater reliability.

Characteristics of subjects were described using means or proportions. Percent missing data in individual, work-related physical, and work-related psychosocial factor categories was 0.1%, 1.1%, and 0.5%, respectively. To retain the statistical power of the database, missing data were handled by the 'hot-deck imputation' procedure. A respondent was selected at random from the total sample of the study and the value for that person was assigned to the case in which information was missing. This procedure was conducted repeatedly for each missing value until the dataset was complete (57). The baseline and completed 12-month follow up characteristics of the study population were compared using Chi-square analysis and independent t-test.

Descriptive analysis and multiple regression were performed using SPSS for Windows Version 17.0, and path analysis was performed using LISREL Version 8.5. To test the hypothesized model, a three-step process analysis was undertaken. First, univariate logistic regression analysis was carried out to determine significant differences in the onset of neck pain with various biopsychosocial characteristics. Any factors with a p-value ≤ 0.2 in the univariate logistic regression analysis were eligible for addition into multivariate analysis. Second, multivariate logistic regression was conducted to determine whether baseline measures of biopsychosocial risk factors were associated with incident neck pain. Third, path analysis was used to examine the relationships among various factors on incident neck pain based on the model proposed by Côté et al. (2). The overall model fit was assessed by establishing fit indexes: the chi-square significance test (χ^2), the root mean square error of

approximation (RMSEA), the comparative fit index (CFI) and the goodness-of-fit index (GFI). The χ^2 statistic was used where a non-significant test indicates that the model and data were consistent. The RMSEA is an index of the amount of mis-specification of the model per degree of freedom, where values less than 0.05 indicate a good fit, values between of 0.05 and 0.08 indicate a marginal fit, and values greater than 0.1 indicate an unacceptable fit. Fit index values more than 0.95 are considered to indicate the acceptable fit of a model to data (75).

RESULTS

Test-retest reliability

The test-retest reliability results demonstrated moderate (0.71) to good (0.91) reliability for self-administered questionnaire outcomes. Intra-rater reliability for physical examination outcomes were moderate (0.72) to good (0.91).

Demographic characteristics of study population

Of the total 3,809 office workers who received a letter inviting them to participate in the study, 1,967 responded (52%). Of these, 682 were eligible and 559 agreed to participate at baseline measurement. A total of 535 office workers were followed for 1 year and 24 (5%) subjects were lost during the follow-up period due to pregnancy (n=3), job transfer (n=15), early retirement (n=3) and withdrawal (n=3). Table 1 shows the baseline and completed 12-month followed up characteristics of the study population. No significant difference in subject characteristics between baseline and completed 12-month followed up was detected ($p>0.05$). Over the 12-month follow up, 28% (151/535) of participants reported incidence of neck pain with the mean (SD) VAS score of 42 (14) mm.

Table 1 Descriptive summary of subject characteristics

Characteristics	Baseline (n = 559)		Completed 12-month follow up (n =535)		*p*
	N (%)	Mean (SD)	N (%)	Mean (SD)	
General characteristics					
Gender					0.711*
Male	113 (20.2)		106 (19.8)		
Female	446 (79.8)		429 (80.2)		
Age (years)		39.1 (9.1)		39.2 (9.0)	0.848**
20-29	105 (18.8)	26.6 (1.8)	97 (18.1)	26.6 (1.8)	0.945**
30-39	195 (34.9)	34.8 (2.8)	186 (34.8)	34.8 (1.9)	0.889**
40-49	161 (28.8)	44.2 (2.9)	157 (29.3)	44.2 (2.9)	0.959**
50-59	98 (17.5)	53 (2.5)	95 (17.8)	52.7 (1.9)	0.821**
Height		1.6 (0.1)		1.6 (0.1)	0.809**
Body weight		61.1 (14.3)		61.3 (14.4)	0.932**
Body mass index (kg/m2)					0.747*
< 18.5 kg/m2	34 (6.1)	17.7 (0.6)	31 (5.8)	17.7 (0.6)	0.917**
18.5-24.9 kg/m2	347 (62.1)	21.7 (1.7)	331 (61.9)	21.7 (1.7)	0.984**
25-29.9 kg/m2	112 (20.0)	27.2 (1.3)	110 (20.6)	27.3 (1.4)	0.890**
> 30 kg/m2	66 (11.8)	34.7 (5.4)	63 (11.8)	34.3 (3.8)	0.853**
Marital status					0.971*
Single	316 (56.5)		300 (56.1)		
Married	219 (39.2)		212 (39.6)		
divorced/widowed/separated	24 (4.3)		23 (4.3)		
Level of education					0.928*
Primary school	8 (1.4)		8 (1.5)		
Secondary school	13 (2.3)		13 (2.4)		
College	70 (12.5)		69 (12.9)		
Bachelor's degree	372 (66.5)		354 (66.2)		
Higher than Bachelor's degree	96 (17.2)		91 (17)		
Frequency of weekly exercise sessions					0.985*
No	155 (27.7)		147 (27.5)		
sometimes	341 (61.0)		326 (60.9)		
always	59 (10.6)		58 (10.8)		
Not sure	4 (0.7)		4 (0.8)		

History of neck pain				0.814*
Yes	284 (50.8)		262 (49)	
No	275 (49.2)		273 (51)	
History of back pain				0.792*
Yes	352 (63)		335 (62.6)	
No	207 (37)		200 (37.4)	
History of illness				0.996*
Yes	99 (17.7)		97 (18.2)	
No	460 (82.3)		438 (81.8)	
Work-related physical characteristics				
Duration of employment (years)		13.5 (9.2)		13.8 (9.3) 0.816**
Working days per week (days per week)		5.0 (0.2)		5.0 (0.3) 0.872**
Working hours per day (hours per day)		8.0 (1.0)		8.0 (1.0) 0.989**
Adjustable chair				0.963*
Yes	456 (81.6)		340 (63.6)	
No	103 (18.4)		195 (36.4)	
Monitor height at a level horizontal with the eyes				0.999*
Yes	322 (57.6)		306 (57.2)	
No	237 (42.4)		229 (42.8)	
Suitable desk height				0.958*
Yes	495 (88.6)		475 (88.8)	
No	64 (11.4)		60 (11.2)	
Typing				0.787*
Touch typing	294 (52.6)		278 (52)	
Non-touch typing	265 (47.4)		257 (48)	
Forward head posture while using a computer				0.998*
Often	210 (37.6)		195 (36.4)	
Sometimes	219 (39.2)		214 (40)	
Seldom	130 (23.3)		126 (23.6)	
Work-related psychosocial characteristics				
Job control		35.2 (5.0)		35.2 (5.0) 0.968**
Psychosocial job demand		32.6 (4.5)		32.7 (4.5) 0.973**
Physical job demand		13.5 (2.8)		13.5 (2.8) 0.987**
Job security		16.5 (1.5)		16.5 (1.5) 0.984**

Social support		30.1 (4.8)	29.7 (6.0)	0.895**
Hazard at work		16.7 (3.6)	16.7 (3.6)	0.874**
Perceived muscular tension				0.897*
Low	173 (30.9)	166 (31)		
Medium	297 (53.1)	284 (53.1)		
High	89 (15.9)	85 (15.9)		
Physical characteristics				
Cervical flexion (degrees)		61 (9)	61 (9)	0.911**
Cervical extension (degrees)		65 (11)	65 (11)	0.764**
Cervical rotation (degrees)				
Right		72 (7)	72 (7)	0.979**
Left		72 (7)	72 (7)	0.947**
Cervical lateral flexion (degrees)				
Right		42 (7)	42 (7)	0.758**
Left		44 (7)	44 (7)	0.950**
Neck flexor endurance (seconds)		30.7 (21.9)	30.2 (21.2)	0.830**
Neck extensor endurance (seconds)		177.0 (106.9)	176.6 (106.3)	0.779**
Pressure pain threshold (kPa)				
Right		299.8 (184.6)	300.0 (184.5)	0.890**
Left		258.4 (158.3)	258.0 (158.1)	0.641**

*using Chi-square test for a comparison between baseline and completed 12-month follow up data.

**using independent t-test for a comparison between baseline and completed 12-month follow up data.

A conceptual model for the onset of non-specific neck pain in office workers

Because there were significantly different numbers of female (n = 429) and male office workers (n = 106) participated in the study, multiple regression and path analysis was separately conducted for each gender. However, a model of the direct and indirect effects of various risk factors involved in the development of neck pain in female office workers was not significantly different from their male counterparts. Thus, data from females and males were combined for further multiple regression and path analysis.

When performing univariate logistic regression analyses, variables showing p-value < 0.2 were gender, history of neck pain and back pain, neck flexor endurance, desk and monitor height, typing style, perceived muscular tension, and physical job

demand. Thus, these factors were selected for further analysis. Multivariate logistic regression analyses revealed that gender, history of neck pain, monitor height, and perceived muscular tension were associated with onset neck pain (Table 2).

The causal relationship among gender, history of neck pain, monitor height, perceived muscular tension, and onset neck pain was examined by path analysis (figure 3). All factors had a direct effect on the onset of non-specific neck pain in office workers. The most influential factor causing neck pain was perceived muscular tension (β = 0.19), followed by history of neck pain (β = 0.12), gender (β = 0.11), and monitor height (β = 0.10), respectively. Factors mostly influencing perceived muscular tension were history of neck pain (β = 0.35), followed by gender (β = 0.07) and monitor height (β = 0.05), respectively. Based on the fit indices of path analysis, this model provided a good fit for the data (Chi-square = 0.00, p-value = 1.00, RMSEA < 0.001, GFI = 0.985, CFI = 0.993).

Table 2 Incidence, β coefficient and adjusted odds ratio (ORadj) with 95% confidence interval (95%CI) of non-specific neck pain with respect to factors in the final modeling[a] (n = 535)

Factors	N	Incidence (%)	β coefficient	ORadj	95%CI	p value
Gender						
Female	429	131 (30.5)	0.536	1.71	101-2.95	0.05
Male	106	20 (18.9)		1.00		
History of neck pain						
Yes	262	95 (36.3)	0.493	1.64	1.08-2.49	0.02
No	273	56 (20.5)		1.00		
Perceived muscular tension						
High	85	41 (48.2)	1.317	3.73	1.98-7.03	<0.001
Medium	284	84 (29.6)	0.629	1.88	1.13-3.13	0.016
Low	166	26 (15.7)		1.00		
Monitor height at a level horizontal with the eyes						
Yes	306	74 (24.2)		1.00		
No	229	77 (33.6)	0.41	1.51	1.02-2.23	0.041

[a]Factors included in the statistical modelling were gender, history of neck pain and back pain, neck flexor endurance, desk and monitor height, typing style, perceived muscular tension, and physical job demand.

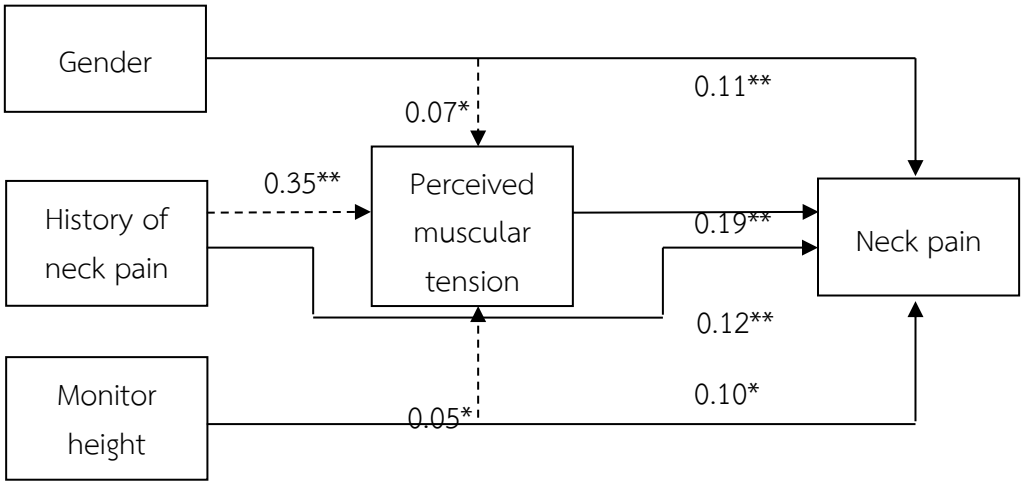

Figure 3 Path analysis of factors predicting onset neck pain in office workers with standardized regression coefficients (*P <0.05, **P<0.01).

DISCUSSION

The one-year incidence of neck pain in our sample of office workers was 28%. Previous epidemiological studies reported the annual incidence of neck pain in office workers to be in the range of 34-49% (6, 7, 18). In this study, apart from having pain lasting more than one day, participants were required to report pain greater than 30 mm on a 100-mm visual analogue scale and no weakness or numbness in the upper limbs in order to be identified as cases. Korhonen et al. (6) defined incident cases as those who reported local neck pain or radiating neck pain at least eight days during the preceding 12 months whereas Hush et al.(7) defined an episode of neck pain as a period of neck pain lasting longer than 24 hours. Consequently, the discrepancy between our and previous studies may be due to the difference in the definition of a symptomatic case.

Côté et al. (2) suggested that most neck pain in workers is non-traumatic and that its etiology is multifaceted, meaning that neck pain is not caused by a single risk factor but rather is the combination of risk factors. The specific combinations of risk factors necessary to cause an episode of neck pain likely vary between workers. The authors further elaborated about the complex relationships between individual, work-related physical, psychosocial factors for the development of neck pain by stating that each risk factor has both direct and indirect effects on the development

of neck pain. Some risk factors may exert their effects indirectly through other risk factors as a mediator.

The results of the present study indicate that the onset of neck pain in office workers was predicted by gender, history of neck pain, monitor height, and perceived muscular tension. As proposed by Côté et al.(2), each risk factor had the direct and indirect effects on the development of non-specific neck pain in a sample of office workers. The model showed that female gender, having history of neck pain, monitor position not being level with the eyes, and frequently perceived muscular tension directly caused neck pain and perceived muscular tension was the strongest effector on the onset of neck pain. A recent systematic review of prospective cohort studies has showed strong evidence for the history of neck complaints and female gender as risk factors of the onset of neck pain in office workers (48). Computer screen position not being level with the eyes was also previously reported to be a predictor for the onset of neck pain in undergraduate students (76). Several studies reported an association between perceived muscular tension and the onset of neck pain (18, 77, 78). Wahlström et al. (18) demonstrated that perceived muscular tension was significantly associated with an increased risk of developing neck pain among computer users. Huysmans et al. (78) found that perceived muscular tension was a strong predictor of future neck-shoulder symptoms in symptom-free office workers.

Apart from having a direct effect on the development of neck pain, gender, history of neck pain, and monitor height have indirect effects on neck pain that were mediated through perceived muscular tension. Female gender, having history of neck pain, and monitor position not being level with the eyes were related to frequently perceived muscular tension. The results also pointed out that history of neck pain was the most influential effector on perceived muscular tension.

The conceptual model for the onset of non-specific neck pain in office workers proposed in this study is in line with an existing model of musculoskeletal disorders and computer work proposed by Wahlström (61). The author hypothesized that work technology and organization have a direct path to physical demands. Both physical demands from work and mental stress may increase the physical load, which in turn has a direct path to perceived muscular tension. Individual factors are hypothesized to be an effect modifier for the association between physical demands and physical load as well as the association between work organization and mental stress. Perceived muscular tension, along with perceptions of comfort and exertion, is hypothesized to be an early sign of musculoskeletal symptoms, which arises as a result of work organizational and psychosocial factors as well as physical load and

individual factors. Interventions to prevent musculoskeletal disorders due to computer work should be directed at more than one factor, i.e. physical, work organizational, and psychosocial factors.

From the findings of the current study, the prevention of non-specific neck pain among office workers should at least focus on developing strategies or interventions to rectify monitor height and to alleviate perceived muscular tension. For the other two non-modifiable risk factors (i.e. gender and history of neck complaints), this information is useful for clinicians to identify office workers at risk, which would mean the enhancement of resource allocation to those most in need and most likely to benefit from it. Otherwise, a large number of people would receive intervention, which is likely to compromise its effectiveness (48).

Strengths and limitations of the study

A major strength of this study is its prospective design and the evaluation of a broad range of biopsychosocial factors for their contribution to neck pain. In addition, homogenous participants, in terms of working characteristics, were selected for the present study because different occupations are exposed to different working conditions and the nature of work influences the health of workers (2). Consequently, predisposing factors for neck pain are likely to be population-specific. However, the current study has three methodological limitations. First, in this study, subjects were identified as cases if they reported pain lasting more than 1 day, pain greater than 30 millimeters (mm) on a 100-mm visual analog scale, no weakness or numbness in the upper limbs. Different results may emerge with different definitions of symptomatic cases. Second, the nature of several biopsychosocial factors and the diagnosis of neck pain were subjective, which may have led to data inaccuracy. The important drawback of self-reported data is the risk of overestimation of exposure (63). Also, some workers may be more sensitive to any somatic disturbance than others. As a result, there is a risk of under- or over-reporting of incidence. Future studies should consider the inclusion of objective information from a physical examination to increase data accuracy. Third, monitor height, which was one of risk factors identified in this study, was categorized into only two groups, i.e. monitor height was or was not positioned at a level horizontal with the eyes. Thus, the effect of above- and below-the-eye-level monitor height on the onset of neck pain cannot be examined in this study. Further study should investigate this issue to enhance understanding regarding the relationship between monitor height and non-specific neck pain in office workers.

CONCLUSION

We found that gender, history of neck pain, monitor height, and perceived muscular tension were predictors for non-specific neck pain in office workers. A conceptual model for the development of neck pain was developed using path analysis. Female gender, having history of neck pain, monitor position not being level with the eyes, and frequently perceived muscular tension directly caused neck pain with perceived muscular tension being the strongest effector on neck pain. Also, gender, history of neck pain, and monitor height had indirect effects on neck pain that were mediated through perceived muscular tension with history of neck pain being the most influential effector on perceived muscular tension. Interventions aimed at preventing the occurrence of non-specific neck pain in the office environment should address these factors.

Acknowledgement This work was funded by the Thai Health Foundation and Chulalongkorn University Centenary Academic Development Project (#12).

CHAPTER V

General conclusion

5.1 Summary of the results

The objectives of the study was three folds: (1) to systematically review prospective cohort studies to gain insights into risk factors for the development of non-specific neck pain in office workers as well as to assess the strength of evidence; (2) to develop a screening tool based on the model to assist health care providers in identifying office workers who are at risk of developing non-specific neck pain with disability; and (3) To test a hypothesized model of the direct and indirect effects of various risk factors involved in the development of non-specific neck pain in a sample of office workers using path analysis.

In the first study (Chapter 2), five high-quality and two low-quality prospective studies on the association between 47 individual, work-related physical, and work-related psychosocial risk factors and the onset of non-specific neck pain in office workers were reviewed and analyzed. The results showed strong evidence for female gender and previous history of neck complaints as risk factors of the onset of non-specific neck pain. Furthermore, we found strong evidence for the following factors not having predictive value: high keyboard usage time, poor perception of computer placement and low social support. The results of this review need to be interpreted with caution because most variables have been investigated by only one study.

In the second study (Chapter 3), a screening tool was developed to assist health care providers in identifying office workers who are at risk of developing non-specific neck pain with disability. A 1-year prospective cohort study of 559 healthy office workers was conducted. At baseline, risk factors were assessed using questionnaires and standardized physical examination. The incidence of neck pain was collected every month thereafter. Disability level was evaluated using the neck disability index (NDI). Logistic regression was used to select significant factors to build a risk score. The coefficients from the logistic regression model were transformed into the components of a risk score. Among 535 (96%) participants who were followed for

1 year, 23% reported incident neck pain with disability (NDI ≥ 5). After adjusting for confounders, the onset of neck pain with disability was significantly associated with history of neck pain, chair adjustability, and perceived muscular tension. Thus, the risk score for non-specific neck pain with disability in office workers contained 3 questions about history of neck pain, chair adjustability, and perceived muscular tension with scores ranging from 0 to 4. Using a cut-off score of at least 2, the sensitivity was found to be 82% and the specificity 48%. The positive and negative predictive values were 29% and 91%, respectively. The area under the receiver-operating characteristic curve was 0.75. The risk score is easy and quick for primary health care providers to complete. The score appears to have reasonable sensitivity, specificity, positive predictive value and negative predictive values for the cut-off point of at least 2. However, further research is required to validate the score in a new population of office workers.

In the third study (Chapter 4), a hypothesized model of the direct and indirect effects of various risk factors involved in the development of non-specific neck pain was tested in a sample of office workers using path analysis. A one-year prospective cohort study of 559 healthy office workers was conducted. At baseline, a self-administered questionnaire and standardized physical examination were employed to gather biopsychosocial data. Follow-up data were collected every month for the incidence of neck pain. A regression model was built to analyze factors predicting the onset of neck pain. Path analysis was performed to examine direct and indirect associations between identified risk factors and neck pain. The result showed that the onset of non-specific neck pain was predicted by female gender, having history of neck pain, monitor position not being level with the eyes, and frequently perceived muscular tension, in which perceived muscular tension was the strongest effector on the onset of neck pain. Gender, history of neck pain, and monitor height have indirect effects on non-specific neck pain that were mediated through perceived muscular tension. History of neck pain was the most influential effector on perceived muscular tension. The findings of this study support the hypothesis that each risk factors may contribute to the development of non-specific neck pain both directly and indirectly. The combination of risk factors necessary to cause non-specific neck pain is likely occupation specific. Perceived muscular tension is hypothesized to be an early sign of musculoskeletal symptoms.

5.2 Limitations of the study and suggestions for further study

In the systematic review study, two main methodological limitations are noteworthy. First, the search strategy was limited to full reported publications in English. The possibility of publication and selection bias cannot be ruled out. This may have affected the results of this review. Second, the researchers summarized the results from studies with substantial heterogeneity in study characteristics. This may explain the observed variation in the results among studies. Future research is required to indicate whether differences in these aspects affect the effectiveness of exercise intervention before direct comparisons among different programs can be conducted.

In the study for developing a neck pain risk score for predicting nonspecific neck pain with disability in office workers, there are a number of methodological limitations. First, this study was a development study of a prognostic model. The predictive performance of the NROW was tested on the same population in which the risk score was developed. The model is likely to perform better in the development sample than in an independent sample. In other words, the predictive power is likely to be inflated (14, 15). In addition, the risk score may be very specific to the population study. Thus, extrapolation of these results to other populations should be made with caution. Further research to validate or testing the NROW's predictive performance in a new population of office workers using slightly different definitions and measurements of predictors and outcomes is suggested. Also, impact studies to quantify whether use of the NROW in daily practice improves decision making and patient outcome is recommended (15). Second, in this study, subjects were identified as cases if they reported pain lasting more than one day, pain greater than 30 mm on a 100-mm VAS, no weakness or numbness in the upper limbs, and an NDI score ≥ 5. Different results may emerge with different definitions of symptomatic cases. Third, the nature of several biopsychosocial factors and the diagnosis of neck pain were subjective, which may have led to data inaccuracy. The important drawback of self-reported data is the risk of overestimation of exposure (63). Also, some workers may be more sensitive to any somatic disturbance than others. As a result, there is a risk of under- or over-reporting of the incidence. Future studies should consider inclusion of objective information from a physical examination to increase data accuracy. Fourth, this study only investigated the predictive ability of participants' neck flexor endurance on incident neck pain. Theoretically, prolonged computer use may lead to forward head posture, round shoulders, and kyphotic upper thoracic spine (52). Further study should include

evaluation of other relevant physical characteristics, such as neck extensor, shoulder retractor, and back extensor endurance as well as cervical and thoracic curves. These factors may alter the predictive performance of the NROW.

In the study for testing a hypothesized model of the direct and indirect effects of various risk factors involved in the development of non-specific neck pain in a sample of office workers, there are three methodological limitations. First, in this study, subjects were identified as cases if they reported pain lasting more than 1 day, pain greater than 30 millimeters (mm) on a 100-mm visual analog scale, no weakness or numbness in the upper limbs. Different results may emerge with different definitions of symptomatic cases. Second, the nature of several biopsychosocial factors and the diagnosis of neck pain were subjective, which may have led to data inaccuracy. The important drawback of self-reported data is the risk of overestimation of exposure (63). Also, some workers may be more sensitive to any somatic disturbance than others. As a result, there is a risk of under- or over-reporting of incidence. Future studies should consider the inclusion of objective information from a physical examination to increase data accuracy. Third, monitor height, which was one of risk factors identified in this study, was categorized into only two groups, i.e. monitor height was or was not positioned at a level horizontal with the eyes. Thus, the effect of above- and below-the-eye-level monitor height on the onset of neck pain cannot be examined in this study. Further study should investigate this issue to enhance understanding regarding the relationship between monitor height and non-specific neck pain in office workers.

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APPENDIX

APPENDIX A

SCREENING TEST

แบบสอบถามชุดที่ 1 (ใช้สำหรับการตรวจคัดกรอง)

เลขที่แบบสอบถาม.....

วัน เดือน ปี ที่เก็บข้อมูล.....

- กรุณาตอบคำถามทุกข้อตามความเป็นจริง โดยเลือกเพียงคำตอบเดียว หรือใส่ข้อความสั้นๆที่ตรงกับตัวท่านมากที่สุด
- ในบางคำถามสามารถเลือกตอบได้มากกว่า 1 คำตอบ ซึ่งจะระบุไว้ในท้ายของคำถามข้อนั้น

ขอขอบคุณเป็นอย่างสูงในการให้ความร่วมมือ

ID ...../.....

แบบคัดกรอง

ชื่อ-นามสกุล..... เบอร์โทรศัพท์มือถือ.....

แผนก.....เบอร์โทรศัพท์ที่ทำงาน..... .....

อายุ.....ปี ศาสนา..... E-mail.....

คำชี้แจง กรุณาทำเครื่องหมาย ✓ ลงใน [....] หน้าคำตอบที่ท่านเลือก และตอบคำถามทุกข้อตามความเป็นจริง

1. ท่านใช้เวลาส่วนใหญ่ทำงานอยู่ในสำนักงาน และงานที่ทำเกี่ยวข้องกับการใช้เครื่องคอมพิวเตอร์ การเข้าร่วมประชุม การอ่านเอกสาร และการคุยโทรศัพท์ และมีการเดิน หรือ ยืน หรือ ยกของบ้างเล็กน้อย ใช่หรือไม่

[....] ใช่ [....] ไม่ใช่

2. ท่านเป็นพนักงานแบบใด

[....] แบบเต็มเวลา (Full time) [....] แบบชั่วคราว (Part time)

3. ท่านทำงานที่มีลักษณะงานดังข้อ 1 มาอย่างต่อเนื่องนานเท่าใด

[....] น้อยกว่า 1 ปี [....] เท่ากับ 1 ปี หรือมากกว่า

4. ท่านเคยเข้ารับการผ่าตัดบริเวณแนวกระดูกสันหลัง ใช่หรือไม่

[....] ใช่ [....] ไม่ใช่

5. ท่านเคยเข้ารับการผ่าตัดบริเวณช่องท้อง ในช่วง **12 เดือนที่ผ่านมา** ใช่หรือไม่

[....] ใช่ [....] ไม่ใช่

6. ท่านเคยได้รับอุบัติเหตุรุนแรงบริเวณกระดูกสันหลัง ใช่หรือไม่

[....] ใช่ [....] ไม่ใช่

7. ท่านเคยได้รับการวินิจฉัยจากแพทย์ ว่าเป็นโรคใดต่อไปนี้บ้างหรือไม่ **(เลือกได้มากกว่า 1 ข้อ)**

[....] ภาวะความผิดปกติของกระดูกสันหลังแต่กำเนิด [....]โรคข้ออักเสบรูมาตอยด์

[....] โรคติดเชื้อของกระดูกสันหลัง [....] โรคเกาต์

[....] โรคกระดูกสันหลังอักเสบ ชนิดยึดติด (ankylosing spondylitis)

[....] โรคกระดูกสันหลังเคลื่อน [....] โรคกระดูกพรุน

[....] โรคกระดูกสันหลังเสื่อม [....] ภาวะเนื้องอกหรือมะเร็ง

[....] โรคในกลุ่มแพ้ภูมิตนเอง (Systemic Lupus Erythematosus)

[....] โรคอื่นๆ ที่เกี่ยวข้องกับกระดูกสันหลัง (โปรดระบุ).....

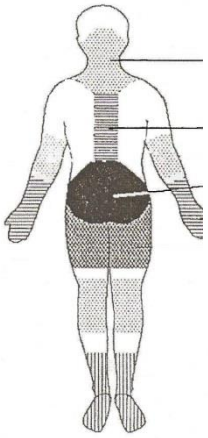
[....] ไม่มี

8. กำลังตั้งครรภ์ หรือมีแผนจะตั้งครรภ์ ในช่วง **12 เดือนข้างหน้า** หรือไม่

[....] ใช่ [....] ไม่ใช่

9. ท่านมีแผนจะหยุดงานต่อเนื่องมากกว่า 9 วัน ในช่วง **12 เดือนข้างหน้า** หรือไม่

[....] มีแผน [....] ไม่มีแผน



รูปแสดงอาณาเขตส่วนของคอ/บ่า และหลังส่วนล่าง

10. ในช่วง 3 เดือนที่ผ่านมา ท่านเคยมีอาการปวด บริเวณ **คอ/บ่า** ติดต่อกันนานกว่า 1 วัน หรือไม่

[....] เคย [....] ไม่เคย (ถ้าตอบว่าไม่เคย ข้ามไปตอบคำถามข้อ **12**)

11. อาการปวด**คอ/บ่า** ในรอบ 3 เดือนที่ผ่านมา **โดยเฉลี่ย**มีระดับความรุนแรงเท่ากับเท่าใด ขอให้ทำเครื่องหมาย **|** ลงบนเส้นตรงด้านล่าง ที่คิดว่ามีระดับความปวดตรงกับตัวท่าน โดยด้านซ้ายมือ คือ ไม่ปวด จนไปถึงด้านขวามือ คือ ปวดมากที่สุด

ไม่ปวด ปวดมากที่สุด

12. ในช่วง 3 เดือนที่ผ่านมา ท่านเคยมีอาการปวด บริเวณ **หลังส่วนล่าง** ติดต่อกันนานกว่า 1 วัน หรือไม่

[....] เคย [....] ไม่เคย (ถ้าตอบว่าไม่เคย **สิ้นสุด**การตอบแบบคัดกรอง)

13. อาการปวด**หลังส่วนล่าง**ของท่าน มีอาการต่อเนื่องหรือมีอาการปวดเป็นๆ หายๆ เป็นเวลา $\geq$ 3 เดือน โดยมีอาการปวดอย่างน้อย 1 ครั้งต่อสัปดาห์ หรือไม่

[....] ใช่ [....] ไม่ใช่

14. อาการปวด**<u>หลังส่วนล่าง</u>** ในรอบ 3 เดือนที่ผ่านมา **โดยเฉลี่ย**มีระดับความรุนแรงเท่ากับเท่าใด ขอให้ทำเครื่องหมาย | ลงบนเส้นตรงด้านล่าง ที่คิดว่ามีระดับความปวดตรงกับตัวท่าน โดยด้านซ้ายมือ คือ ไม่ปวด จนไปถึงด้านขวามือ คือ ปวดมากที่สุด

ไม่ปวด ปวดมากที่สุด

$$$ ขอขอบพระคุณเป็นอย่างสูงในความร่วมมือ $$$

APPENDIX B

SELF-ADMINISTERED QUESTIONNAIRE

แบบสอบถาม

ID.....
วัน เดือน ปี ที่เก็บข้อมูล.....

คำชี้แจง

- แบบสอบถามนี้แบ่งออกเป็น 3 ส่วน ได้แก่
  ส่วนที่ 1 ข้อมูลส่วนบุคคล
  ส่วนที่ 2 ข้อมูลเกี่ยวกับลักษณะงานประจำของคุณ
  ส่วนที่ 3 ข้อมูลด้านจิตใจและสังคมสิ่งแวดล้อม

- กรุณาตอบคำถามทุกข้อตามความเป็นจริง โดยเลือกเพียงคำตอบเดียว หรือใส่ข้อความสั้นๆ ที่ตรงกับตัวคุณมากที่สุด
- ในบางคำถามสามารถเลือกตอบได้มากกว่า 1 คำตอบ ซึ่งจะระบุไว้ในท้ายของคำถามข้อนั้น

ขอขอบพระคุณคุณเป็นอย่างสูงในการให้ความร่วมมือ

<u>ส่วนที่ 1</u> ข้อมูลส่วนบุคคล

คำชี้แจง กรุณาตอบคำถามทุกข้อตามความเป็นจริง โดยใส่ข้อความสั้นๆ หรือเลือกคำตอบที่สอดคล้องกับความคิดเห็นของคุณมากที่สุด โดยใส่เครื่องหมาย ✓ ใน [....] เพียง 1 คำตอบ

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1. เพศ [....] 1. ชาย [....] 2. หญิง
2. วัน/เดือน/ปีเกิด...../...../.....
3. สถานภาพสมรส
   [....] 1. โสด [....] 2. สมรส
   [....] 3. หม้าย/หย่า/แยกทาง [....] 4. อื่นๆ โปรดระบุ.....
4. วุฒิการศึกษาสูงสุด
   [....] 1. ม.3 [....] 2. ม.6
   [....] 3. ปวช./ปวท./ปวส. [....] 4. ปริญญาตรี
   [....] 5. ปริญญาโท-เอก [....] 6. อื่นๆ โปรดระบุ.....

5. <u>ในรอบ 12 เดือนที่ผ่านมา</u> คุณออกกำลังกายบ่อยแค่ไหน (การออกกำลังกาย หมายถึง การเคลื่อนไหวร่างกายอย่างต่อเนื่องอย่างน้อย 30 นาที หรือจนรู้สึกเหนื่อย เพื่อเสริมสร้างสุขภาพร่างกายให้แข็งแรงโดยกระทำในยามว่างหรือเป็นงานอดิเรก เช่น เดินเร็ว วิ่ง ว่ายน้ำ เล่นกีฬา เป็นต้น)
   [....] 1. ไม่ได้ทำ
   [....] 2. ทำบ้าง แต่ไม่สม่ำเสมอ
   [....] 3. ทำสม่ำเสมอ โดยเฉลี่ย.....ครั้งต่อสัปดาห์
   [....] 4. ไม่แน่ใจ

6. คุณสูบบุหรี่ หรือไม่
   [....] 1. ไม่สูบ
   [....] 2. ไม่สูบ แต่บุคคลใกล้ชิดสูบ เช่น สมาชิกในครอบครัว หรือ เพื่อนร่วมงาน เป็นต้น
   [....] 3. สูบ โปรดระบุจำนวนบุหรี่ที่สูบโดยประมาณ.....มวนต่อวัน
   [....] 4. เคยสูบ แต่ปัจจุบันไม่ได้สูบแล้ว โปรดระบุจำนวนปีที่<u>หยุดสูบบุหรี่</u> .....ปี

7. ท่านมีโรคประจำตัวหรือไม่
   [....] 1. ไม่มี [....] 2. มี โปรดระบุ.....

8. ในอดีต (มากกว่า 3 เดือนที่ผ่านมา) คุณเคยมีอาการปวดคอหรือไม่
   [....] 1. เคย [....] 2. ไม่เคย

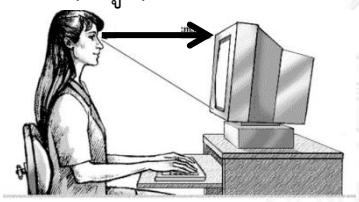
9. ในอดีต (มากกว่า 3 เดือนที่ผ่านมา) คุณเคยมีอาการปวดหลังหรือไม่
   [....] 1.เคย [....] 2. ไม่เคย

<u>ส่วนที่ 2</u> ข้อมูลเกี่ยวกับลักษณะงานประจำของคุณ

คำชี้แจง กรุณาตอบคำถามทุกข้อตามความเป็นจริง โดยใส่ข้อความสั้นๆ หรือเลือกคำตอบที่สอดคล้องกับความคิดเห็นของคุณมากที่สุดเพียงคำตอบเดียว โดยใส่เครื่องหมาย ✓ ใน [....] หรือช่องในตารางที่ตรงกับคำตอบของคุณ

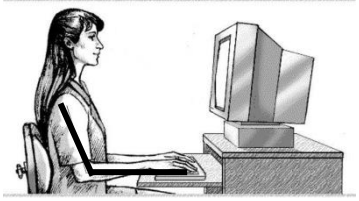
---

1. ตำแหน่งงานปัจจุบันของคุณคือ.....
   [....] 1. ผู้บริหาร/ผู้จัดการ/หัวหน้างาน
   [....] 2. เจ้าหน้าที่การเงิน/บัญชี
   [....] 3. เจ้าหน้าที่ธุรการ/สำนักงาน
2. ตั้งแต่อดีตจนถึงปัจจุบัน คุณเคยทำงานในสำนักงานมาแล้วเป็นเวลา.....ปี
3. <u>ในรอบ 12 เดือนที่ผ่านมา</u> คุณทำงานในตำแหน่งดังกล่าวโดยเฉลี่ยวันละ.....ชั่วโมง เป็นจำนวน.....วันต่อสัปดาห์
4. ในรอบ 12 เดือนที่ผ่านมา คุณทำงานล่วงเวลา เฉลี่ยวันละ.....ชั่วโมง
5. ลักษณะการพิมพ์งานของคุณ
   [....] 1. พิมพ์แบบสัมผัส (ขณะพิมพ์งาน ตามองจอมอนิเตอร์ โดยไม่ต้องมองแป้นพิมพ์)
   [....] 2. พิมพ์แบบไม่สัมผัส
6. เมื่อคุณใช้งานเครื่องคอมพิวเตอร์ ตำแหน่งจอคอมพิวเตอร์อยู่ตรงหน้า ในระดับที่เหมาะสมหรือไม่ (ดังรูป)



[....] 1. ใช่ [....] 2. ไม่ใช่

7. เมื่อคุณใช้งานเครื่องคอมพิวเตอร์ แป้นพิมพ์และเม้าส์วางไว้ที่ระดับเดียวกับข้อศอก หรือไม่ (ดังรูป)

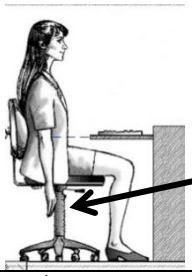


[....] 1. ใช่ [....] 2. ไม่ใช่

8. เมื่อคุณใช้งานเครื่องคอมพิวเตอร์ บ่อยครั้งแค่ไหน ที่คุณในท่าทางดังภาพ

[....] 1. บ่อยครั้ง
[....] 2. บางครั้ง
[....] 3. นานๆ ครั้ง

9. คุณเห็นว่า ที่ทำงานของคุณ โดยส่วนใหญ่มีลักษณะตรงกับข้อใดบ้าง

หัวข้อ	ใช่	ไม่ใช่
		
9.1 เก้าอี้ที่คุณนั่งเป็นประจำ คุณสามารถปรับระดับความสูงได้ (ดังรูป)		
9.2 โต๊ะทำงานที่คุณใช้เป็นประจำ มีความสูงพอเหมาะกับคุณ		
9.3 ห้องทำงานของคุณ มักจะมีเสียงดังรบกวน		
9.4 ห้องทำงานของคุณ มักจะมีอุณหภูมิพอเหมาะ ไม่ร้อนหรือเย็นจนเกินไป		
9.5 ห้องทำงานของคุณ มักจะมีแสงสว่างเพียงพอ ไม่มืดหรือสว่างจนเกินไป		
9.6 ห้องทำงานมีอากาศถ่ายเทดี		

10. ตำแหน่งที่ว่างของแป้นพิมพ์ที่ท่านใช้ อยู่ห่างจากขอบโต๊ะมากกว่า 15 ซม. ใช่หรือไม่ (โปรดดูตัวอย่างที่แสดงไว้)

    [....] 1. ใช่ [....] 2. ไม่ใช่

11. ใน 1 เดือนที่ผ่านมา ในระหว่างวันทำงาน ท่านมีความรู้สึกตึงบริเวณคอและบ่า บ่อยแค่ไหน

    [....] 1. บ่อยครั้ง (อย่างน้อย 2-3 ครั้ง/สัปดาห์ หรือ หลายๆ ครั้ง/วัน หรือ วันละครั้ง)

    [....] 2. บางครั้ง (2-3 ครั้ง/เดือน)

    [....] 3. ไม่เลย

<u>ส่วนที่ 3</u> ข้อมูลด้านจิตใจและสังคมสิ่งแวดล้อม

คำชี้แจง กรุณาอ่านประโยคต่อไปนี้ แล้วขีดเรื่องหมาย ✓ ในช่องที่ตรงกับความรู้สึกของคุณต่องาน ในกรณีที่ไม่มีคำตอบใดตรง กรุณาเลือกข้อที่ใกล้เคียงความรู้สึกที่สุดเพียงข้อเดียว **<u>กรุณาตอบทุกข้อ</u>**

	1. ไม่เห็นด้วยมาก	2. ไม่เห็นด้วย	3. เห็นด้วย	4. เห็นด้วยมาก
1. ในการทำงานคุณได้พัฒนาความสามารถของตนเอง	☐	☐	☐	☐
2. คุณแสดงความเห็นได้เต็มที่ในเรื่องที่เกิดขึ้นในงานของคุณ	☐	☐	☐	☐
3. งานของคุณทำให้คุณต้องค้นคิดสิ่งใหม่ๆหรือคิดสร้างสรรค์	☐	☐	☐	☐
4. คุณมีบทบาทสำคัญในการตัดสินใจในกลุ่มงานของคุณ	☐	☐	☐	☐
5. ในการทำงานคุณมีโอกาสตัดสินใจด้วยตัวเอง	☐	☐	☐	☐
6. งานที่คุณทำต้องการทักษะและความชำนาญระดับสูง	☐	☐	☐	☐
7. ในการทำงานคุณต้องเรียนรู้สิ่งใหม่ๆ	☐	☐	☐	☐
8. ที่ทำงานของคุณใช้การตัดสินแบบประชาธิปไตย	☐	☐	☐	☐
9. งานของคุณต้องใช้สมาธิมากและนาน	☐	☐	☐	☐
10. โอกาสก้าวหน้าในอาชีพหรืองานของคุณดี	☐	☐	☐	☐
11. ในเวลา 5 ปีข้างหน้า ทักษะความชำนาญของคุณยังมีคุณค่า	☐	☐	☐	☐

	1. ไม่เห็นด้วยมาก	2. ไม่เห็นด้วย	3. เห็นด้วย	4. เห็นด้วยมาก
12. คุณต้องทำสิ่งซ้ำๆหลายๆครั้งในงาน	☐	☐	☐	☐
13. คุณต้องทำงานที่มีลักษณะหลากหลายมาก	☐	☐	☐	☐
14. คุณมีอิสระในการตัดสินใจว่าจะทำงานยังไง	☐	☐	☐	☐
15. งานของคุณยุ่งวุ่นวาย	☐	☐	☐	☐
16. งานของคุณเป็นงานหนัก	☐	☐	☐	☐
17. คุณต้องทำงานมากจนเวลาพักผ่อนไม่พอ	☐	☐	☐	☐
18. คุณมักต้องรีบทำงานให้ทันกำหนด	☐	☐	☐	☐
19. งานของคุณมักถูกขัดจังหวะก่อนเสร็จ ทำให้ต้องทำต่อทีหลัง	☐	☐	☐	☐
20. งานของคุณเป็นงานที่ต้องทำอย่างรวดเร็ว	☐	☐	☐	☐
21. เงินตอบแทนหรือค่าจ้างของคุณน้อย	☐	☐	☐	☐
22. งานของคุณต้องล่าช้าเพราะต้องคอยงานจากผู้อื่น/หน่วยอื่น	☐	☐	☐	☐
23. คุณต้องเคลื่อนไหวร่างกายอย่างรวดเร็วและต่อเนื่องในงาน	☐	☐	☐	☐
24. ในงานคุณต้องพบปัญหาหรือข้อขัดแย้งที่เกิดจากผู้อื่น	☐	☐	☐	☐
25. งานของคุณมีความเสี่ยงทางการเงินเช่น ขาดทุน หมุนเงินไม่ทัน	☐	☐	☐	☐
26. คุณจำเป็นต้องยกหรือเคลื่อนย้ายของหนักบ่อยๆในงาน	☐	☐	☐	☐
27. คุณมักต้องทำงานนานๆ โดยหัวและแขนอยู่ในท่าไม่เหมาะสม	☐	☐	☐	☐
28. งานของคุณเป็นงานที่ใช้แรงกายมาก	☐	☐	☐	☐
29. คุณต้องทำงานนานๆ โดยร่างกายอยู่ในท่าไม่เหมาะสม	☐	☐	☐	☐
30. งานที่คุณทำต้องแข่งขันกับผู้อื่น	☐	☐	☐	☐
31. งานคุณทำมั่นคงดี	☐	☐	☐	☐

32. งานที่คุณทำมีสม่ำเสมอตลอดปีใช่หรือไม่ (เลือกข้อใดข้อหนึ่ง)

☐ 1. ไม่ใช่ มีงานเป็นช่วง และเลิกจ้างงานบ่อยๆ ☐ 2. ไม่ใช่ เลิกจ้างงานบ่อยๆ

☐ 3.ไม่ใช่ มีงานเป็นช่วงๆ ☐ 4. มีงานทำสม่ำเสมอตลอดปี

33. ในปีที่ผ่านมา คุณเผชิญกับสถานการณ์ที่ทำให้เกือบตกงาน /ไม่มีงานทำ /เลิกจ้างบ่อยแค่ไหน

☐ 1. ปีที่แล้วฉันตกงาน/ถูกเลิกจ้ ☐ 2. ตลอดเวลา ☐ 3. เคยบ้าง ☐ 4. ไม่มีเล

34. ใน 2 ปีข้างหน้า คุณมีโอกาสจะสูญเสียงานของคุณขณะนี้กับนายจ้างคนนี้มากน้อยแค่ไหน

☐ 1. มีโอกาสสูงมาก ☐ 2. มีโอกาส บ้าง ☐ 3. ไม่ค่อยมีโอกาส ☐ 4. ไม่มีโอ

การอยู่ร่วมกันเป็นสังคม ทุกคนต้องมี**ผู้ร่วมงาน**แม้จะทำงานคนเดียว

ผู้ร่วมงานหมายถึง คนที่ทำงานร่วมกับคุณไม่ว่าจะเป็นสามี ญาติ เพื่อนที่ทำงานด้วย ตลอดจนผู้ที่ต้องติดต่อเกี่ยวข้องในงานเช่น ร้านค้าหรือบุคคลที่คุณไปติดต่อ

	1. ไม่เห็นด้วยมาก	2. ไม่เห็นด้วย	3. เห็นด้วย	4. เห็นด้วยมาก
35. หัวหน้าคุณเอาใจใส่ทุกข์สุขของลูกน้อง	☐	☐	☐	☐
36. หัวหน้าคุณเก่งในการทำให้คนทำงานร่วมกันได้	☐	☐	☐	☐
37. หัวหน้าคุณช่วยเหลือให้งานสำเร็จลุล่วงไป	☐	☐	☐	☐
38. หัวหน้าคุณให้ความสนใจกับสิ่งที่คุณพูด	☐	☐	☐	☐
39. ผู้ร่วมงานของคุณช่วยเหลือกันเพื่อให้งานเสร็จ	☐	☐	☐	☐
40. ผู้ร่วมงานของคุณเป็นมิตรดี	☐	☐	☐	☐
41. ผู้ร่วมงานของคุณมีความสามารถในงานของเขา	☐	☐	☐	☐
42. ผู้ร่วมงานของคุณให้ความสนใจในตัวคุณ	☐	☐	☐	☐

ในการทำงานคุณมีปัญหาต้องเจอกับ**สิ่งอันตรายใดๆ** ต่อไปนี้หรือไม่

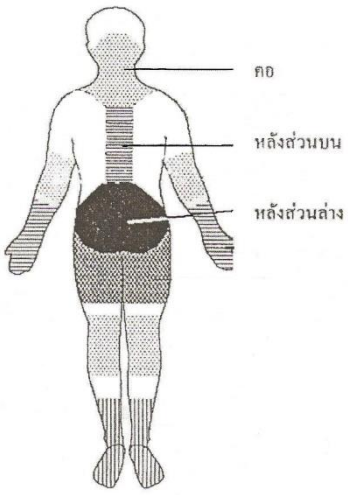
	1. ไม่มีปัญหา	2. มีบ้าง / เป็นปัญหาน้อย	3. มี /เป็นปัญหามาก
43. เครื่องมือ เครื่องจักร หรืออุปกรณ์ที่อันตราย	☐	☐	☐
44. กระบวนการทำงานที่อันตราย	☐	☐	☐
45. การถูกทำอันตรายจากความร้อน ไฟลวกหรือถูกไฟ	☐	☐	☐
46. สารเคมีอันตรายหรือสารพิษใดๆ	☐	☐	☐
47. การติดเชื้อโรคจากงาน	☐	☐	☐
48. มลพิษทางอากาศจากฝุ่น ควัน ก๊าซ ฟูม เส้นใย หรื	☐	☐	☐
49. การจัดวางสิ่งของหรือจัดเก็บสต็อกที่อาจก่อให้เกิดอุบัติเหตุ	☐	☐	☐
50. บริเวณงานสกปรก /รกรุงรัง /ไม่มีระเบียบ	☐	☐	☐
51.การถูกทำร้ายทางจิตใจเช่น ถูกดุด่า ถูกลวนลามทาง	☐	☐	☐
52. สภาพจราจรติดขัดเช่น รถติด คนขับไร้วินัย	☐	☐	☐
53. การถูกทำร้ายทางกายเช่น เสี่ยงต่อการถูกปล้น จี้ ว	☐	☐	☐
54. เสียงดัง	☐	☐	☐

**********ขอขอบพระคุณเป็นอย่างสูงในการให้ความร่วมมือ**********

APPENDIX C

SELF-ADMINISTERED DIARY

แบบสอบถามเพื่อติดตามผล



รูปแสดงขอบเขตของ คอ/บ่า หลังส่วนบน และหลังส่วนล่าง

ตอนที่ 1 ข้อมูลอาการปวดคอ/บ่า

ก) กรุณาตอบแบบสอบถามให้ครบทุกข้อ อ่านและตอบคำถามแต่ละข้อให้ถูกต้อง ตามความเป็นจริง โดยขีดเครื่องหมาย ✓ ลงในช่อง [....] ที่ท่านเห็นว่าตรงกับลักษณะของท่านมากที่สุด

1. ในรอบ 3 เดือนที่ผ่านมาท่านเคยมีอาการปวด ความรู้สึกไม่สบาย หรือความรู้สึกที่ไม่ปกติ (เช่น ผิวหนังชา หรือแขน/ขาอ่อนแรง เป็นต้น) เป็นเวลานานอย่างน้อย 1 วัน ณ บริเวณคอคอ/บ่า (ถ้าตอบว่า **ไม่ใช่** สิ้นสุดการตอบแบบสอบถาม)

   [....] 1. ใช่ [....] 2. ไม่ใช่

2. อาการปวดคอ/บ่า ในรอบ 3 เดือนที่ผ่านมา ครั้งที่รุนแรงที่สุดมีระดับความรุนแรงเท่ากับเท่าไหร่ ขอให้ทำเครื่องหมาย | ลงบนเส้นตรงด้านล่าง ที่คิดว่ามีระดับความปวดตรงกับตัวท่าน โดยด้านซ้ายมือ คือ ไม่ปวด จนไปถึงด้านขวามือ คือ ปวดมากที่สุด

ไม่ปวด ปวดมากที่สุด

ตอนที่ 2 ความบกพร่องความสามารถของคอ (Neck Disability Index)

แบบสอบถามนี้ใช้ในการประเมินผลกระทบของ**อาการปวดคอ**ที่มีต่อความสามารถในการจัดการชีวิตประจำวันของท่าน โปรดเลือกข้อที่ตรงกับอาการและความสามารถของท่าน**มากที่สุด**เพียงข้อเดียว และกรุณาให้ข้อมูลในทุกข้อ

ข้อที่ 1 ความรุนแรงของอาการปวด

☐ ในขณะนี้ไม่มีอาการปวด

☐ ในขณะนี้มีอาการปวดเพียงเล็กน้อย

☐ ในขณะนี้มีอาการปวดปานกลาง

☐ ในขณะนี้มีอาการปวดค่อนข้างมาก

☐ ในขณะนี้มีอาการปวดมาก

☐ ในขณะนี้มีอาการปวดมากที่สุดเท่าที่จะจินตนาการได้

ข้อที่ 2 การดูแลตนเอง (เช่น อาบน้ำ/ชำระล้างร่างกาย แต่งตัว เป็นต้น)

☐ สามารถทำเองได้ตามปกติ โดยไม่ทำให้อาการปวดเพิ่มขึ้น

☐ สามารถทำเองได้ตามปกติ แต่มีอาการปวดเพิ่มขึ้น

☐ การทำเองทำให้มีอาการปวด จึงทำให้ต้องทำอย่างช้า ๆ และระมัดระวัง

☐ ทำเองได้เป็นส่วนใหญ่ แต่จะต้องการความช่วยเหลืออยู่บ้าง

☐ ต้องการการช่วยเหลือในการดูแลตนเองเกือบทั้งหมด ทุกวัน

☐ ไม่สามารถแต่งตัวได้เอง อาบน้ำ/ชำระล้างร่างกายเองได้ด้วยความยากลำบาก และต้องอยู่บนเตียง

ข้อที่ 3 การยกของ

☐ สามารถยกของหนักได้ โดยไม่มีอาการปวดเพิ่มขึ้น

☐ สามารถยกของหนักได้ แต่มีอาการปวดเพิ่มขึ้น

☐ อาการปวดทำให้ไม่สามารถยกของหนักขึ้น จากพื้น ได้ แต่สามารถยกได้หากของนั้น อยู่ในที่ที่ เหมาะสม เช่น บนโต๊ะ

☐ อาการปวดทำให้ไม่สามารถยกของหนักขึ้น จากพื้น ได้ แต่สามารถยกได้หากของนั้น มีน้ำหนักเบาถึงปานกลาง และจัดวางอยู่ในที่ที่เหมาะสม

☐ สามารถยกของที่มีน้ำหนักเบามากๆ ได้

☐ ไม่สามารถยก/ถือ/หิ้ว/แบก/อุ้ม หรือสะพายสิ่งของใด ๆ ได้เลย

ข้อที่ 4 การอ่าน

- ☐ สามารถอ่านได้มากตามที่ต้องการ โดยไม่มีอาการปวดคอ
- ☐ สามารถอ่านได้มากตามที่ต้องการ โดยมีอาการปวดคอเพียงเล็กน้อย
- ☐ สามารถอ่านได้มากตามที่ต้องการ โดยมีอาการปวดคอปานกลาง
- ☐ ไม่สามารถอ่านได้มากตามที่ต้องการ เพราะมีอาการปวดคอปานกลาง
- ☐ แทบจะไม่สามารถอ่านได้เลยเพราะมีอาการปวดคอมาก
- ☐ ไม่สามารถอ่านได้เลย

ข้อที่ 5 อาการปวดศีรษะ

- ☐ ไม่มีอาการปวดศีรษะเลย
- ☐ มีอาการปวดศีรษะเพียงเล็กน้อย และนาน ๆ ครั้ง
- ☐ มีอาการปวดศีรษะปานกลาง และนาน ๆ ครั้ง
- ☐ มีอาการปวดศีรษะปานกลาง และบ่อยครั้ง
- ☐ มีอาการปวดศีรษะมาก และบ่อยครั้ง
- ☐ มีอาการปวดศีรษะเกือบตลอดเวลา

ข้อที่ 6 การตั้งสมาธิ

- ☐ สามารถตั้งสมาธิได้อย่างที่ต้องการ โดยไม่มีความยากลำบาก
- ☐ สามารถตั้งสมาธิได้อย่างที่ต้องการ โดยมีความยากลำบากเพียงเล็กน้อย
- ☐ มีความยากลำบากปานกลางในการตั้งสมาธิเมื่อต้องการ
- ☐ มีความยากลำบากอย่างมากในการตั้งสมาธิเมื่อต้องการ
- ☐ มีความยากลำบากมากที่สุดในการตั้งสมาธิเมื่อต้องการ
- ☐ ไม่สามารถตั้งสมาธิได้เลย

ข้อที่ 7 การทำงาน

- ☐ สามารถทำงานได้มากตามที่ต้องการ
- ☐ สามารถทำงานประจำได้เท่านั้น ไม่มากไปกว่านั้น
- ☐ สามารถทำงานประจำได้เกือบทั้งหมด แต่ไม่มากไปกว่านั้น
- ☐ ไม่สามารถทำงานประจำได้เลย
- ☐ แทบจะทำงานอะไรไม่ได้เลย
- ☐ ไม่สามารถทำงานอะไรได้เลย

ข้อที่ 8 การขับขี่รถ

- ☐ สามารถทำได้โดยไม่มีอาการปวดคอ
- ☐ สามารถทำได้นานตามที่ต้องการ โดยมีอาการปวดคอเพียงเล็กน้อย
- ☐ สามารถทำได้นานตามที่ต้องการ โดยมีอาการปวดคอปานกลาง
- ☐ ไม่สามารถทำได้นานตามที่ต้องการ เพราะมีอาการปวดคอปานกลาง
- ☐ แทบจะทำไม่ได้เลย เพราะมีอาการปวดคอมาก
- ☐ ไม่สามารถทำได้เลย

ข้อที่ 9 การนอนหลับ

- ☐ ไม่มีความยากลำบากในการนอนหลับ
- ☐ การนอนหลับถูกรบกวนเพียงเล็กน้อย (นอนไม่หลับน้อยกว่า 1 ชั่วโมง)
- ☐ การนอนหลับถูกรบกวนเล็กน้อย (นอนไม่หลับ 1-2 ชั่วโมง)
- ☐ การนอนหลับถูกรบกวนปานกลาง (นอนไม่หลับ 2-3 ชั่วโมง)
- ☐ การนอนหลับถูกรบกวนเป็นอย่างมาก (นอนไม่หลับ 3-5 ชั่วโมง)
- ☐ การนอนหลับถูกรบกวนอย่างสิ้นเชิง (นอนไม่หลับ 5-7 ชั่วโมง)

ข้อที่ 10 กิจกรรมนันทนาการ/การพักผ่อนหย่อนใจ

- ☐ สามารถทำกิจกรรมทุกอย่างได้ โดยไม่มีอาการปวดคอเลย
- ☐ สามารถทำกิจกรรมทุกอย่างได้ แต่มีอาการปวดคออยู่บ้าง
- ☐ สามารถทำกิจกรรมได้เป็นส่วนใหญ่ แต่ไม่ทั้งหมด เพราะมีอาการปวดคอ
- ☐ สามารถทำกิจกรรมได้เพียงบางอย่าง เพราะมีอาการปวดคอ
- ☐ แทบจะทำกิจกรรมต่าง ๆ ไม่ได้เลย เพราะมีอาการปวดคอ
- ☐ ไม่สามารถทำกิจกรรมใด ๆ ได้เลย

ขอขอบพระคุณเป็นอย่างสูงในการให้ความร่วมมือ

VITA

Miss. Arpalak paksaichol was born on October 15th, 1970 in Bangkok, Thailand. She graduated a Bachelor degree of Science (Physiotherapy) from Rangsit University in 1992 and a Master degree of Science (Exercise Physiology) from Mahidol University in 2000. She has worked as a physical therapist in Department of Physical Therapy, Mahachai hospital, Samutsakorn (April 1st 1992-March 31st 1997). She has worked as an instructor in Faculty of Physical Therapy, Rangsit University (April 16th 2001-March 31st 2010). She has studied for a Doctor of Philosophy Program in Physical Therapy at Faculty of Allied Health Sciences, Chulalongkorn University since 2010.