

**CUMULATIVE TRAUMA DISORDERS
AND INTERPRETERS FOR THE DEAF IN TEXAS**

**A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF SCIENCE
IN THE GRADUATE SCHOOL OF THE
TEXAS WOMAN'S UNIVERSITY**

COLLEGE OF HEALTH SCIENCES

**BY
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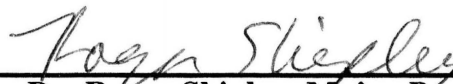
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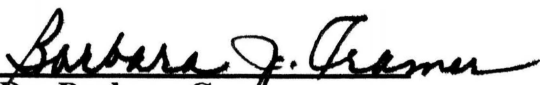
To the Associate Vice President for Research and Dean of the Graduate School:

I am submitting herewith a thesis written by Deborah Marie Adkins, entitled "Cumulative Trauma Disorders and Interpreters for the Deaf in Texas". I have examined this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree, of Master of Science with a major in Health Studies.



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We have read this thesis, and recommend its acceptance:



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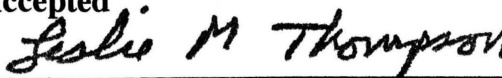


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DEDICATION

This paper is dedicated to my grandmother, Cora Zaide Morgan. Her strength and courage have guided me throughout my life. She taught me that while life is not always fair we can be strong and survive any situation. Even now, when she has more “bad days” than “good days” she continues to teach me more than just “you are going to be old one day and you will know how it feels.”

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ABSTRACT

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This study was conducted for several reasons. One reason was to develop an instrument to assess knowledge of Cumulative Trauma disorders (CTDs) and behaviors to prevent CTDs in interpreters for the deaf (the CTDQ). A second reason for completing this study was to determine the relationship between knowledge and preventive behaviors regarding CTDs in interpreters for the deaf. The final reason for this study was to determine the relationship between time spent signing, personal history of CTDs, and knowledge of CTDs and behaviors to prevent CTDs. The convenience sample for this study was comprised of 300 volunteer participants randomly selected from the list of Texas Certified Interpreters for the deaf.

After the final mailing to Texas certified interpreters for the deaf 171 interpreters participated in the study by fully or partially completing the CTDQ developed for this study. A panel of experts reviewed the instrument for content validity. A post hoc cronbach's alpha test indicated that the reliability was poor on both the knowledge and behavior scale. Based on the results from the two two-way analysis of variance studies and four correlation tests there were no statistically significant findings to support a

relationship between knowledge and preventive behaviors regarding CTDs in interpreters for the deaf or to support a relationship between time spent signing, history of CTDs, and knowledge of CTDs and behaviors to prevent CTDs.

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CHAPTER 1

INTRODUCTION

Cumulative trauma disorders (CTDs) is the term used to describe a large group of specific diagnoses of the musculoskeletal system where the cause of the injury is repetitive work. These disorders make up more than half of all occupational injuries reported in the United States (Monsivais, 1993).

Cumulative trauma disorders in sign language interpreters are caused by the repetitive hand and arm motions that require muscle strength, endurance, and flexibility. These repetitive hand and arm movements are necessary in sign language interpreting. At the Rochester Institute of Technology (RIT), during the 1988-1989 academic school year, interpreters provided over 49,700 hours of educational interpreting for deaf students. During that same time period, 45% of the full-time interpreters, at RIT, were either out of work, on worker's compensation, or working with a reduced interpreting load (Feurstein & Fitzgerald, 1992).

Sign language interpreting is often overlooked as a high risk group for CTDs. Due to the increased number of CTDs in interpreters for the deaf, identification of this population as a high risk group for CTDs is increasing. Interpreters and their employers are starting to recognize the need for education and research regarding CTDs and the use of manual sign language. This study assessed knowledge of CTDs and behaviors to prevent CTDs for interpreters of the deaf.

Statement of the Problem

An instrument for assessing knowledge of CTDs and behaviors to prevent CTDs in interpreters for the deaf was developed. The study explored the relationship between knowledge and behaviors regarding CTDs in interpreters for the deaf. The study also explored the relationship between time spent signing, personal history of CTDs, and knowledge of CTDs and behaviors used to prevent CTDs.

Hypotheses

The following null hypotheses were tested at the .05 level of significance:

- 1. There is no statistically significant difference in level of knowledge of CTDs between part-time and full-time Texas interpreters for the deaf.**
- 2. There is no statistically significant difference in frequency of behaviors used to prevent CTDs between part-time and full-time Texas interpreters for the deaf.**
- 3. There is no statistically significant difference in level of knowledge of CTDs between Texas interpreters for the deaf with a history of CTDs and those without a history of CTDs.**
- 4. There is no statistically significant difference in frequency of behaviors used to prevent CTDs between Texas interpreters for the deaf with a history of CTDs and those without a history of CTDs.**
- 5. There is no statistically significant relationship between level of knowledge of CTDs and frequency of behaviors used to prevent CTDs in full-time Texas interpreters for the deaf.**

6. There is no statistically significant relationship between level of knowledge of CTDs and frequency of behaviors used to prevent CTDs in part-time Texas interpreters for the deaf.
7. There is no statistically significant relationship between level of knowledge of CTDs and frequency of behaviors used to prevent CTDs in Texas interpreters for the deaf with a history of CTDs.
8. There is no statistically significant relationship between level of knowledge of CTDs and frequency of behaviors used to prevent CTDs in Texas interpreters for the deaf without a history of CTDs.

Definition of Terms

The following terms were defined for the purpose of this study:

1. **Behaviors.** Lifestyle changes that interpreters for the deaf use to prevent CTDs.
2. **Certified Interpreter for the Deaf.** Interpreter that has received a level one or above certification from the TCD.
3. **Cumulative Trauma Disorders (CTDs).** Disorders of the musculoskeletal system diagnosed by a physician (medical, osteopathic, or chiropractic), where the cause is repetitive work.
4. **Cumulative Trauma Disorders Questionnaire (CTDQ).** The instrument developed for this study to assess knowledge of CTDs and use of behaviors to prevent CTDs in Interpreters for the deaf.
5. **Full-time Interpreters for the Deaf.** Texas certified interpreters for the deaf that sign 20 or more hours a week.
6. **Interpreter for the Deaf with CTDs.** Interpreters for the deaf that have been diagnosed with CTDs.

7. **Interpreter for the Deaf without CTDs.** Interpreters for the deaf that have not been diagnosed with CTDs
8. **Knowledge.** Measure of accurate information that Texas interpreters for the deaf have about CTDs.
9. **Part-time Interpreter for the Deaf.** Texas certified interpreters for the deaf that sign fewer than twenty hours a week.
10. **Sign.** The use of manual communication, sign language, to interpret for the deaf.
11. **Texas Commission for Deaf (TCD).** State agency that is responsible for certifying interpreters for the deaf.
12. **Texas Interpreters for the Deaf.** Individuals who are certified by the Texas Commission for the Deaf to translate information to a deaf or hearing impaired person.
13. **Texas Society of Interpreters for the Deaf (TSID).** The professional organization for individuals that are interested in quality translating services for the deaf or hearing impaired people.

Limitation

The following limitation of this study was acknowledged:

1. A convenience sample of subjects from the Texas Commission for the Deaf and not a national wide sample was used. This impacts the generalization of the studies results.

Assumptions

For the purpose of this study the following assumptions were made:

1. Knowledge and behaviors are complex and can be measured.
2. Interpreters answered the questionnaires truthfully and accurately.

3. Full-time interpreters for the deaf are at an increased risk for CTDs than are part-time interpreters for the deaf.

Background and Significance

Sign language is one of the four most commonly used languages in the United States. Despite the unique functional demands of manual sign language little research or knowledge regarding the demands, consequences, or relationship to CTDs of prolonged signing is available at this time (Meals, Payne & Gaines, 1988). Workers compensation claims due to CTDs are increasing among interpreters for the deaf, while research in the areas of CTDs and interpreters for this population is lacking. This study was completed to help provide a baseline on knowledge of CTDs and behaviors to prevent CTDs among interpreters for the deaf.

CHAPTER 2

REVIEW OF THE LITERATURE

Relevant literature regarding cumulative trauma disorders and interpreters for the deaf will be discussed. This review is divided into the following sections: (a) history of cumulative trauma disorders, (b) symptoms of cumulative trauma disorders, (c) incidence of cumulative trauma disorders, (d) costs of cumulative trauma disorders, (e) treatment of cumulative trauma disorders, (f) prevention of cumulative trauma disorders, and (g) previous research. Information regarding CTDs and sign language interpreters for the deaf was incorporated into each section when it was applicable. A summary will conclude this review of the literature.

History of Cumulative Trauma Disorders

Cumulative trauma disorders (CTDs) were first observed in monastic scribes in 1717 by Bernardino Ramazzini (Heilbroner, 1993). Ramazzini was the Italian physician that is considered the founder of occupational medicine (Goldoftas, 1991). Dr. Ramazzini identified three principal causes of what are now known as CTDs: fixed working posture, repetitive motions, and psychological stress (Pheasant, 1991). The term cumulative trauma disorders (CTDs) is used in North America (Pheasant, 1991). CTDs is the umbrella term used to describe specific diagnosis of the musculoskeletal system with a common etiology (Hales & Bertshe, 1992). The common etiology is cumulative conditions that are also referred to as repetitive trauma illness, repetitive motion disorders, and overuse

syndrome (Siebenaler & McGovern, 1992). The term repetitive strain injuries (RSI) is the term used in Australia and the United Kingdom to describe work related musculoskeletal disorders of the neck, shoulder, and upper limb. The term Occupational Cervicobrachial Disorders (OCD) is the term used in Japan and Scandinavia to describe a similar range of conditions (Pheasant, 1991). Despite the difference in terms all imply that repetitive work is the sole etiology of the condition (Hales & Bertsche, 1992). The difference in names reflects the medical uncertainty regarding a large group of disorders affecting the tendons, nerves, and blood vessels in the upper body (Goldaftas, 1991).

Symptoms of Cumulative Trauma Disorders

Cumulative trauma disorders are characterized by symptoms that are transient based on the type and duration of work. The symptoms may include local pain and tenderness to touch, decreased range of motion, discomfort with particular activities, pain, tingling, and numbness in areas supplied by a particular nerve, weakness, clumsiness, and in advanced stages muscle atrophy (Fredrick, 1992). These symptoms occur when individuals jobs exceed their capacity for performing the usual work functions (King & Crosby, 1994). As the symptoms progress, individuals may no longer be able to perform daily activities (Ross, 1994). There are several categories of work that may be a source of potential symptoms to workers including: manual handling and lifting, repetitive activities, with or without precision, and sedentary work, with or without stress (Isernhagen, 1988). King and Crosby (1994) have identified the following common risks found in industry: repetitiveness, forceful exertions,

mechanical stress, posture, vibration, and temperature. The work of sign language interpreting includes many of the etiologies included above. Sign language interpreting is associated with a set of repetitive, forceful movements in conjunction with awkward positions of the fingers, hand/wrist, forearm, and shoulder (Feurestein & Fitzgerald, 1992).

CTDs have been associated in sign language interpreting more than in deaf people who communicate in sign language. This occurs due to the distinct difference between interpreting and signing. Deaf people and other sign language users can regulate the speed at which they sign. Interpreters must keep pace with a speaker, and cannot regulate their pace, and therefore CTDs are the result (Stedt, 1989).

Incidence of Cumulative Trauma Disorders

According to the US bureau of Statistics, CTDs are the leading cause of occupational illness in the nation. CTDs accounted for more than 60% of the occupational illnesses in 1991 (Schachner, 1993). In 1992, CTDs accounted for 56% of the 331,600 gradual-onset work-related illnesses reported by the Labor Department's Occupational Safety and Health Administration (OSHA) (Heilbroner, 1993). OSHA has called CTDs the "occupational disease of the 1990's" and the agency has targeted CTDs as a major concern (Goldoftas, 1991). During the 1988-1989 academic year 45% of the full-time interpreters at the Rochester Institute of Technology (RIT) were either out of work, on workers compensation, or working with a reduced interpreting load because of pain (Feuerstein & Fitzgerald, 1992).

Costs

CTDs result in a number of costs including: the direct effects on production, sickness absence costs, labor turnover costs, litigation, and insurance costs (Pheasant, 1991). A case of carpal tunnel syndrome, the most common CTD, can require surgery, months of rehabilitation and three to four weeks of rest per flare up before it comes under control and the costs can exceed twenty thousand dollars per effected employee (Davidsen, 1991). The direct costs (medical and workers' compensation) and indirect costs (lost productivity and expense incurred in training new workers) can be staggering to employees (Hales & Bertsche, 1992). The costs to employers in pain and low morale are also high (Storti, 1990). In contrast to non-work related injuries, CTDs have three costs that must be addressed: the physical problem, the psychosocial aspects, and the legal aspect of getting workers' compensation benefits (Millender, 1992).

In addition to employer cost, is the emotional and medical cost to the employees who suffers from a CTD. Victims of full blown CTDs often cannot wash their hair, open a door or even hold a single sheet of paper without agonizing pain. Some of the most severely affected never fully recover (Heilbroner, 1993).

Interpreters with CTDs often face additional emotional costs. According to DeCaro (in Cergol, 1991) "interpreting is much more than an occupation--it is a lifestyle and a culture, people become interpreters because they care about working in the deaf community, and when they become injured, they are deprived of an opportunity to interact with people whom they have grown to know and respect."

Treatment

The early detection and treatment of CTDs is important for the rapid and complete recovery before a severe or disabling condition occurs (Hayes & Bertsche, 1992). Standard conservative treatments have been useful in sign language interpreters (Meals, Payne & Gains, 1988). Conservative management of CTDs include: identifying the causal agent or risk factors and reducing exposure, resting from stress, and increasing nutrition to the tissue through restoration of synovial and vascular pumping, and increasing strength and reinforcing postural adjustments once the symptoms have subsided (King & Crosby, 1994).

Treatment should also address the chronic pain that is associated with CTDs. Management of chronic pain includes: increasing flexibility, improving posture, eliminating use of pain medications, decreasing pain behaviors, increasing strength, educating worker on pain management techniques, teaching risk factors to avoid, increasing endurance, and integrating into society (King & Crosby, 1994).

Employees should be encouraged to report any physical signs of injury as soon as possible, since early detection of a CTD can reduce the severity of the injury (Carson, 1994). Early detection and proper treatment can save thousands of dollars in surgery costs (Eby & Mahone, 1991).

Prevention

The prevention of cumulative trauma disorders requires early diagnosis and job and lifestyle changes (Schenck, 1989). Employees should be encouraged to report any signs of injury as soon as possible, because early detection of a CTD can reduce the severity of the injury (Carson, 1994).

Both employees and employers need to realize the severity of CTDs and readjust their views. Employers must discourage worker's obsessive ambition as well their own workaholic cultures, qualities that are frequently at the root of CTD injuries (Heilbroner, 1993).

Exercise programs have been helpful in preventing CTDs. The exercise programs should increase flexibility, strength, and endurance. The exercises must be properly designed and employees must be precisely trained (Hebert, 1993). Warm up and cool down exercises are believed to be most beneficial in preventing CTDs and other work related injuries.

There are several ways to reduce the repetition that is often considered an etiology of CTDs. Limiting overtime can decrease repetition. In industry, regulating production rates and rotating employees to work stations that require different arm movements and position can be an effective way to decrease repetition. Encouraging employees to take frequent mini-breaks can be useful (Carson, 1994).

Frequent position and posture changes are important in preventing CTDs. In general, a varied working posture is better than a fixed working posture, but a working posture which is static and relaxed is better than one which is static and tense (Pheasant, 1991). The ideal work area allows the employee to alternate between sitting and standing with the spine in a neutral position (Carson, 1994).

There are some specific ways that interpreters can prevent CTDs. One way is to limit workload of interpreting to 20 hours a week (Cergol, 1991). The length of interpreting sessions and the number of rests periods can be altered. The degree of difficulty of interpreting assignments can be

varied (De Caro, Feurestein, & Hurwitzx, 1992). It is interesting to note that a study indicated that interpreters without pain introduced a greater number of rest cycles into their work (Feurstein & Fitzgerald, 1992).

Finally, interpreters must become aware of the potential cumulative effects of interpreting on their health and the factors that contribute to these effects (DeCaro, Feuerstein, & Hurwitz, 1992).

A study of sixteen volunteers in the Southwest found that in general the employees had not been taught about cumulative trauma at the worksite. That investigator, Monsivais (1993) indicated that the volunteers stated they wanted more information about the cause of their problem, different treatment methods, and various resources available to them during treatment. The questionnaire that was part of the interview was not specific enough for an interpreter type work setting.

CHAPTER 3

METHODOLOGY

The methodology of this study is discussed in relation to the population, procedures used to sample the population, instrument used to measure the variables, and procedures used to collect the data. A descriptive and statistical techniques that will be used to treat the data are discussed.

Population and Sample

The population for this study consisted of 171 certified interpreters from the Texas Commission for the Deaf and Hard of Hearing Certified Interpreters List 1996. The list included 1,187 certified interpreters. The list was numbered excluding interpreters that held an oral, morphemic sign system, or intermediary certifications. These certifications were excluded as the systems they use were not consistent with the use of manual sign language that the instrument was designed to assess. Certified interpreters that had an out-of-state address were also excluded as this study was approved by the Human Subjects Committee to assess interpreters in the state.

A random number table was used to obtain 300 possible subjects. That number was chosen in an attempt to get a significant number of subjects while controlling the costs.

Human Subjects Review

The prospectus was approved by the Human Subjects Review Committee of Texas Woman's University in Denton, Texas (refer to Appendix A).

Included in the application to the Human Subjects Review Committee was a copy of the letter of consent, in a cover letter form (refer to Appendix B).

The letter discussed the confidentiality of the study, the right to refuse, and the methods by which information would be gathered and shared.

Instrumentation

An investigator-designed data collection questionnaire was developed to collect and organize the data for this study. The questionnaire was titled the Cumulative Trauma Disorder Questionnaire (CTDQ). The CTDQ was divided into three parts. Part I included demographic information including the study code number, part-time or full-time interpreting status, and personal history of CTDs. Part II was the knowledge scale which consisted of seven true or false statements about CTDs. Part III was the behavior scale which included a frequency chart and seven preventive behavior statements.

Content validity was completed on the instrument by a board of experts in the area of CTDs. The board included: Jim King, M.S., O.T.R., a certified hand therapist who has lectured, published articles, and treated patients with CTDs, Colleen McCormick, a certified interpreter for the Deaf, who has been treated for CTDs and attended several lectures on the subject, Beth Moser, R.N., a former health care administrator who had employees that obtained workers compensation for CTDs and has been treated herself, for CTDs.

Each of the experts was sent a cover letter, CTDQ (refer to Appendix C), CTDQ scoring information (refer to Appendix D), and a content evaluation questionnaire (refer to Appendix E). All of the experts reviewed the instrument and returned the content evaluation (refer to Appendix F). Two of the experts recommended some changes in the wording of several of the questions. The changes were made and reviewed with the board by phone.

The final CTDQ consisted of 16 questions. In Part I there were two choices for each question. Part II was made up of 7 statements with true or false answers to determine interpreters knowledge of CTDs. Part I was scored by assigning interpreters to groups 1 or 2 based on hours spent interpreting every week, and groups 3 or 4 based on history of CTDs or no history of CTDs. Part III utilized a Likert scale format to determine how often interpreters practiced behaviors to prevent CTDs. Part II was assigned a possible range of scores from 0 to 7. Part III was assigned a possible range of scores from 7 to 35. As the sum total increases on Part II the knowledge of CTDs increases. On Part III as the sum total increases so does the behaviors the interpreter uses to prevent CTDs. When a question was not answered no number was given to that question and it was interpreted as missing data.

Data Collection

The questionnaire was mailed to the 300 randomly selected interpreters. Each interpreter received a packet that included a cover letter (refer to Appendix B), the CTDQ (refer to Appendix C), and a pre-addressed return envelope with postage. The interpreters were asked to

return the questionnaire within two weeks. After two weeks a follow-up letter (Refer to Appendix B) and a new questionnaire was sent to the subjects who did not return the initial questionnaire. The code number on Part I of the CTDQ was used for tracking those who had already returned the CTDQ. Three more weeks were given for participants to complete and return their questionnaires. At that time 171 responses were obtained which was 57% rate of return. That was above the the 40% return rate that statistician, Dr. Lease, and investigator had predetermined was needed for statistical significance.

Treatment of Data

Data on the knowledge of cumulative trauma disorders and behaviors to prevent CTDs in Interpreters for the Deaf were collected utilizing an interval scale to score the instrument (refer to Appendix D). The descriptive statistics included data to determine the time spent signing each week and if interpreters had a history of CTDs.

Reliability of the instrument was tested through factor analysis and Cronbach's alpha coefficient, ex post facto. These procedures were used to obtain information on internal consistency reliability and construct validity of the instrument.

The inferential statistics used were the Pearson product-moment correlation and two two-way Analysis of Variance (ANOVA). The Pearson product-moment correlation was used to measure the relationship between knowledge and behaviors. The first ANOVA was used to measure the differences between knowledge of CTDs in part-time and full-time interpreters and interpreters with and without a history of CTDs. The

second ANOVA was used to measure the differences between behaviors used to prevent CTDs in part time and full-time interpreters and interpreters with and without a history of CTDs.

An alpha level of .05 was utilized to determine statistical significance. Additional ex post facto measures were completed as statistically needed. The appropriate tables and graphs were used to present the data.

Summary

The methodology was reviewed in this chapter. This review included detailed information regarding the population and sample, human subjects review, instrumentation, data collection, and treatment of the data. This information formed the foundation for the basis of this study.

CHAPTER 4

ANALYSIS OF DATA

This chapter will review a description of the sample, participants responses, reliability of the findings, and will include a summary of the findings by hypothesis.

Description of the Sample

The instrument was mailed to 300 Texas Certified interpreters for the deaf. One hundred and seventy one interpreters returned their questionnaires. This results in a 57% return rate for hypothesis testing. This sample of convenience was broken down into the following categories: part-time or full-time interpreters and interpreters with a history of CTDs and without a history of CTDs. Of the 171 participants, 66 were part-time interpreters, 105 were full-time interpreters, 62 had a history of CTDs and 109 did not have a history of CTDs.

Findings by Hypotheses

There were eight null hypotheses tested in this study. Below the findings for each hypothesis will be reviewed.

- 1. There is no statistically significant difference in level of knowledge of CTDs between part-time and full-time Texas interpreters for the deaf. A two-way analysis of variance was used to test this hypothesis (refer to table 1). Based on the F ratio there was no significant difference in the level of knowledge of CTDs between part-time and full time interpreters for the deaf.**

Table 1
Analysis of Variance on Knowledge of CTDs by time spent interpreting and history of CTDs.

Source of variation	Sum of Squares	df	Mean Square	F ratio	Significance of F
PTFT	.228	2	.132	.110	.740
CTD	.137	1	.137	.115	.735
PTFT x CTD	1.76	1	1.176	.987	.322
Residual	197.708	166	1.191		
Total	199.112	169	1.178		

Note. PTFT = part time or full time interpreter; CTD = personal history of cumulative trauma disorder status.

* $p < .05$.

A second two-way analysis of variance was completed to test hypothesis 2 (refer to table 2).

Table 2
Analysis of Variance on behaviors to Prevent CTDs by time spent interpreting and history of CTDs.

Source of variation	Sum of Squares	df	Mean Square	F ratio	Significance of F
CTD	30.782	1	30.782	2.474	.118
PTFT	19.703	1	19.703	1.594	.210
PTFT x CTD	2.937	1	2.937	.236	.628
Residual	2064.996	166	12.440		
Total	2111.347	169	12.493		

Note. PTFT = part time or full time interpreter; CTD = personal history of cumulative trauma disorder status.

* $p < .05$.

2. There is no statistically significant difference in frequency of behaviors used to prevent CTDs between part-time and full-time Texas interpreters for the deaf. Based on this F ratio no statistically significant

difference in the frequency of behaviors used to prevent CTDs between part-time and full-time interpreters for the deaf was established.

The two-way analysis of variance used to test hypothesis number one was also used for hypothesis 3 (refer to table 1).

3. There is no statistically significant difference in level of knowledge of CTDs between Texas interpreters for the deaf with a history of CTDs and those without a history of CTDs. Based on these results with a .05 level of significance, there was no significant difference in the level of knowledge of CTDs between part-time and full-time interpreters for the deaf.

The second two-way analysis of variance used to test hypothesis number 2 was also completed to test hypothesis 4 (refer to table 2).

4. There is no statistically significant difference in frequency of behaviors used to prevent CTDs between Texas interpreters for the deaf with a history of CTDs and those without a history of CTDs. This F ratio indicates no statistically significant difference in frequency of behaviors used to prevent CTDs between part-time and full-time interpreters for the deaf.

A Pearson product-moment correlation was completed to test hypothesis 5 (refer to table 3).

5. There is no statistically significant relationship between level of knowledge of CTDs and frequency of behaviors used to prevent CTDs in full-time Texas interpreters for the deaf. The correlation indicates that there is not a statistically significant correlation between level of knowledge of CTDs and behaviors used to prevent CTDs in full-time interpreters for the deaf based on a .05 level of significance.

Table 3

Correlation coefficients between behaviors to prevent CTDs and knowledge of CTDs in full-time interpreters for the deaf.

	Knowledge
Behavior	.0515
	(104)
	$p = .604$

Note. Values enclosed in parentheses represent number of subjects.

* $p < .05$.

A Pearson product-moment correlation was also completed to test hypothesis 6 (refer to table 4).

6. There is no statistically significant relationship between level of knowledge of CTDs and frequency of behaviors used to prevent CTDs in part-time Texas interpreters for the deaf. This correlation indicates that there is not a statistically significant correlation between level of knowledge of CTDs and behaviors used to prevent CTDs in part-time interpreters for the deaf.

Table 4

Correlation coefficients between behaviors to prevent CTDs and knowledge of CTDs in part-time interpreters for the deaf.

	Knowledge
Behavior	-.0816
	(65)
	$p = .518$

Note. Values enclosed in parentheses represent number of subjects.

* $p < .05$.

A third Pearson product-moment correlation was completed to test hypothesis 7 (refer to table 5).

7. There is no statistically significant relationship between level of knowledge of CTDs and frequency of behaviors used to prevent CTDs in Texas interpreters for the deaf with a history of CTDs.

Table 5
Correlation coefficients between behaviors
to prevent CTDs and knowledge of CTDs
in interpreters for the deaf with a history
of CTDs.

	Knowledge
Behavior	-.0717
	(62)
	p= .580

Note. Values enclosed in parentheses represent number of subjects.

*p < .05.

This correlation indicates that there is not a statistically significant correlation between level of knowledge of CTDs and behaviors used to prevent CTDs in interpreters for the deaf with a history of CTDs.

A final Pearson product-moment correlation was completed to test hypothesis 8. (refer to table 6).

8. There is no statistically significant relationship between level of knowledge of CTDs and frequency of behaviors used to prevent CTDs in Texas interpreters for the deaf without a history of CTDs.

This correlation indicates that there is not a statistically significant correlation between level of knowledge of CTDs and behaviors used to prevent CTDs in interpreters for the deaf without a history of CTDs.

Table 6

Correlation coefficients between behaviors to prevent CTDs and knowledge of CTDs in interpreters for the deaf without a history of CTDs.

	Knowledge
Behavior	-.0448
	(107)
	p= .647

Note. Values enclosed in parentheses represent number of subjects.

*p < .05.

Additional Findings

To determine the reliability of the instrument a factor analysis and the completion of a Cronbach's alpha coefficient, ex post facto was planned. The small number of questions on each scale prevented completion of the factor analysis as a statistical measure. Reliability analysis in the forms of reliability coefficients were obtained for both the knowledge and behavior scales. The following reliability coefficients were obtained on the knowledge scale using Cronback's alpha (refer to table 7).

Table 7
Reliability Analysis on the Knowledge Scale

Reliability Coefficients

N of cases = 119.0 N of items = 7
Alpha = .0611

Note. *p < .05.

Based on the alpha score the reliability of the knowledge score was poor.

The reliability analysis of the behavior scale is located in table 8.

Table 8
Reliability Analysis for the Behavior Scale

Reliability Coefficients

N of Cases = 159.0 N of Items = 7
Alpha = .4189

Note. * $p < .05$.

Based on the above alpha result the reliability of the behavior scale is also poor.

Descriptive statistics to describe item by item responses to every question on the knowledge and behavior scale are included in Appendix G . These statistics include frequencies and percentages of responses.

Summary of Findings

In summary, 171 Texas certified interpreters for the deaf participated in the study by fully or partially completing the CTDQ developed for this study. The instrument received content validity. However, the above findings indicate that the reliability is poor on both the knowledge and behavior scale. There was no statistically significant results to support the rejection of any of the eight null hypothesis of this study.

CHAPTER 5

SUMMARY OF THE STUDY

This chapter provides a summary, discussion of the findings, conclusions and implications. Recommendations for further study are also discussed.

Summary

Cumulative trauma disorders are becoming an increasing concern for interpreters for the deaf. This study sought to develop an instrument for addressing knowledge of CTDs and behaviors used to prevent CTDs. A second purpose of this study was to determine the relationship between knowledge and preventive behaviors regarding CTDs in interpreters for the deaf. The final purpose of this study looked at time spent interpreting, history of CTDs, knowledge of CTDs, and behaviors used to prevent CTDs to determine if there was a relationship between them.

The CTDQ was developed for this study. Content validity was established by a panel of experts. At the end of the data collection, reliability analysis were completed ex post facto on the 171 returned questionnaires. The reliability coefficients showed poor reliability. The instrument did not consist of enough questions for completing factor analysis.

The second purpose of the study was to explore the relationship between knowledge and behaviors regarding CTDs in interpreters for the deaf. Correlation coefficients were obtained to

determine if there was a relationship between knowledge of CTDs and behaviors used to prevent CTDs. Four different correlations were completed to address the relationship between knowledge of CTDs and behaviors used to prevent CTDs in part-time interpreters, full-time interpreters, interpreters with a history of CTDs and interpreters without a history of CTDs. All four correlations resulted in an alpha that was not significant and therefore a relationship between knowledge of CTDs and behaviors used to prevent CTDs was not established.

The final reason for this study was to determine the relationship between time spent interpreting, history of CTDs and knowledge of CTDs, and behaviors used to prevent CTDs. Two separate two-way analysis of variances (ANOVA) were completed to address the final purpose of this study. One ANOVA was completed on the knowledge scale and the other ANOVA was completed on the behavior scale. Neither ANOVA established a statistically significant relationship between time spent interpreting or a history of CTDs and knowledge of CTDs and knowledge of CTDs or behaviors used to prevent CTDs.

Discussion of Findings

The collective responses of the 171 participants who completed the CTDQ did not demonstrate a relationship between knowledge of CTDs and behaviors used to prevent CTDs. This was consistent with other health research where knowledge of a health risk or problem did not correlate with using behaviors to prevent that health problem or reduce that health risk.

The frequency of responses on the questions might help in developing a more reliable instrument than the CTDQ. The development of the CTDQ was also a purpose of this study. However, statistically significant reliability was not established.

Conclusions and Implications

From the findings of this study, the following conclusions were drawn.

1. The 57% return rate of the CTDQ seemed to demonstrate an interest in CTDs and a willingness to participate in studies by interpreters for the deaf.
2. The fact that 36% of the interpreters in this study reported a history of CTDs. This statistic seems to support the belief that sign language interpreters are at high risk for CTDs.
3. Full-time interpreters made up 61% of the participants of this study. Full-time interpreting was defined as using sign language for 20 or more hours a week. This percentage would indicate that less than 40% of interpreters use decreased use of sign language as a behavior to prevent CTDs.
4. Knowledge of CTDs did not correlate with the use of behaviors to prevent CTDs. It did not appear that increased knowledge of CTDs resulted in an increase in the use of preventive behaviors.
5. The CTDQ needs more items to be a reliable instrument. The fact that the instrument was short and did not take long to complete may have been a factor in the good return rate but limited the reliability of the instrument.

6. There was not a statistically significant difference in part-time interpreters, full-time interpreters, interpreters with a history of CTDs, and interpreters without a history of CTDs and knowledge of CTDs or behaviors used to prevent CTDs. Since there was not a statistically significant difference between those with a history of CTDs and those without a history of CTDs further research in this area seems needed.
7. The fact that 62 of the 171 interpreters participating in this study reported a history of CTDs would make one question assumption 3 of this study. The study demographics may support the assumption that all interpreters are at risk for CTDs.

Recommendations For Further Research

This study seemed to support the belief that sign language interpreters are a high risk group for CTDs. The CTDQ did not demonstrate reliability. A relationship between knowledge of CTDs and use of behaviors to prevent CTDs could not be established. Based on the above statements the following recommendations for further research are included:

1. The CTDQ or another instrument needs to be revised developed to assess knowledge of CTDs and behaviors used to prevent CTDs in interpreters for the deaf. An instrument with more questions would allow for factor analysis to be completed. The instrument would require further research and statistical tests to assure reliability.
2. Research in ways to promote the use of preventive behaviors to

decrease CTDs in interpreters for the deaf also seems needed.

3. A study on practical ways to adapt a sign language interpreters job might also be helpful.
4. A comparison study of incidence of CTDs in interpreters for the deaf and other nontraditional populations might also be beneficial in determining how at risk interpreters are compared to other populations. A study of this type might also help employers, insurance claim adjusters, interpreters, and health care professionals understand more about CTDs and sign language interpreting.
5. Inter item correlation statistics could also be completed on the CTDQ knowledge and behavior scales. These statistics may show a relationship between knowledge and preventive behaviors that comparing the entire scales did not demonstrate. Any type of future research that includes interpreters for the deaf and cumulative trauma disorders would be beneficial.

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APPENDICES

APPENDIX A
Human Subjects Review Approval Letter

TEXAS WOMAN'S
UNIVERSITY
DENTON DALLAS HOUSTON

34

HUMAN SUBJECTS
REVIEW COMMITTEE
P.O. BOX 22939
Denton, TX 76204-0939
Phone: 817/898-3377

February 9, 1996

Deborah Adkins

Dear Deborah Adkins:

Social Security #:

Your study entitled "Knowledge of Cumulative Trauma Disorders and Behavior Modifications to Prevent Cumulative Trauma Disorders in Interpreters for the Deaf" has been reviewed by a committee of the Human Subjects Review Committee and appears to meet our requirements in regard to protection of individuals' rights.

Be reminded that both the University and the Department of Health and Human Services (HHS) regulations typically require that agency approval letters and signatures indicating informed consent be obtained from all human subjects in your study. These are to be filed with the Human Subjects Review Committee. Any exception to this requirement is noted below. This approval is valid one year from the date of this letter. Furthermore, according to HHS regulations, another review by the Committee is required if your project changes.

Special provisions pertaining to your study are noted below:

- _____ The filing of signatures of subjects with the Human Subjects Review Committee is not required.
- _____ Other:
- X No special provisions apply.

Sincerely,



Chair

Human Subjects Review Committee - Denton

cc: Graduate School
Dr. Roger Shipley, Health Studies
Dr. William Cissell, Health Studies

APPENDIX B
Initial Cover Letter
&
Follow Up Letter

Return Address

**TCD Certified Interpreter
Address of TCD Certified Interpreter.**

Date

Dear Interpreter:

I am requesting your assistance to complete a questionnaire about knowledge and behaviors regarding Cumulative Trauma Disorders among Interpreters for the Deaf. Several continuing education courses have been provided to interpreters on preventing and treating work related injuries. The completion of the enclosed research study will provide interpreters with valuable information for future educational programs.

It is my hope that you will complete the enclosed questionnaire. You can be assured of complete confidentiality. The questionnaire has an identification number for mailing and follow-up purposes only. Please return the questionnaire in the enclosed stamped envelope within two weeks.

Participation in this study is completely voluntary. ** The return of the completed questionnaire constitutes as informed consent to act as a subject in this research study.

If you would like a copy of the results of this study please write the name and address you would like the results mailed to at the bottom of this letter and return it with your questionnaire. The study director will submit reports to TCD and TSID.

Please feel free to call or write Texas Woman's University's Office of Research and Grants Administration, if you have any questions, or if you wish to report a problem, at 817-898-3375. My thesis committee chair, Dr. Roger Shipley, can also be contacted at 817-898-2840.

Thank you for your assistance.

Sincerely,

**Deborah Adkins
Study Director**

Return Address

**TCD Certified Interpreter
Address of TCD Certified Interpreter:**

Date

Dear Interpreter:

Two weeks ago I mailed you a questionnaire on Cumulative Trauma Disorders. To date I have not received your response.

The large response to the initial mailing has been very encouraging. However, I would really like to have your input for my final results.

Enclosed is another questionnaire and self-addressed stamped envelope. It would be greatly appreciated if you would return this questionnaire back immediately. If your questionnaire is not returned your valued opinions will not be included in the study.

Participation in this study is completely voluntary. ** The return of the completed questionnaire constitutes as informed consent to act as a subject in this research study.

If you would like a copy of the results of this study please write the name and address you would like the results mailed to at the bottom of this letter and return it with your questionnaire.

Please feel free to call or write Texas Woman's University's Office of Research and Grants Administration, if you have any questions, or if you wish to report a problem, at 817-898-3375. My thesis committee chair, Dr. Roger Shipley, can also be contacted at 817-898-2840.

Thank you for your time and assistance.

Most sincerely,

**Deborah Adkins
Study Director**

APPENDIX C
Cumulative Trauma Disorder Questionnaire

Study Code # :

Cumulative Trauma Disorder Questionnaire

PART I:

Please circle the response that best describes your answer.

Time spent signing each week:

0 to 20 hours

21 or more hours

Cumulative Trauma Disorder, for this study, is being defined as disorders of the musculoskeletal system diagnosed by a physician (medical, osteopathic, or chiropractic), where repetitive work is the cause of the injury.

Have you ever had Cumulative Trauma Disorder?

Yes

No

Part II:

Please circle the response that best describes your answer.

1. Numbness, tickling, "pin & needles" sensation, burning feeling, "sleeping" hand, waking numbness during sleep, pain in elbow, pain in wrist, loss of dexterity and a weak grip are all symptoms of Cumulative Trauma Disorders.

True

False

2. Cumulative Trauma Disorders are also called repetitive motion trauma injury, overuse syndrome, or repetitive stress syndrome.

True

False

3. Cumulative Trauma Disorders were diagnosed as early as 1900.

True

False

4. Carpal tunnel syndrome, DeQuervain's Syndrome, and epicondylitis, all fall under the category of Cumulative Trauma Disorders.

True

False

5. Cumulative Trauma Disorders can result in debilitating pain but will not lead to permanent nerve damage and disability.

True

False

6. The principal causes of Cumulative Trauma Disorders are a fixed working posture, repetitive motions, and psychological stress.

True

False

7. Sign language interpreting is associated with a set of repetitive, forceful movements with awkward postures of the fingers, hand, wrist, forearm, and shoulder that have been associated with Cumulative Trauma Disorders.

True

False

Part III:

Please circle the answer that best describes behaviors you use to prevent Cumulative Trauma Disorders. There are no right or wrong answers.

These definitions should be used for answering the following questions.

Always = 10 out of 10 times

Frequently = 7 out of 10 times

Sometimes = 5 out of ten times

Seldom = 3 out of 10 times.

Never = 0 out of 10 times

- 1. When my hands and shoulders are tired, I should participate in hobbies that use repetitive hand and arm movements.**

Always Frequently Sometimes Seldom Never

- 2. When I have symptoms of Cumulative Trauma Disorders I rest from interpreting.**

Always Frequently Sometimes Seldom Never

- 3. When I have symptoms of CTDs, I see a physician.**

Always Frequently Sometimes Seldom Never

- 4. Prior to interpreting, I complete warm-up exercises.**

Always Frequently Sometimes Seldom Never

- 5. I use sign language for more than an one hour at a time, without a rest.**

Always Frequently Sometimes Seldom Never

- 6. At the end of an interpreting assignment, I complete cool-down exercises.**

Always Frequently Sometimes Seldom Never

- 7. I change my position (standing & sitting) throughout the day.**

Always Frequently Sometimes Seldom Never

APPENDIX D
Cumulative Trauma Disorder Questionnaire Scoring

PART I:

Time spent signing each week:

0 to 20 hours **Coded as Group A**

21 or more hours **Coded as Group B**

Cumulative Trauma Disorder, for this study, is being defined as disorders of the musculoskeletal system diagnosed by a physician (medical, osteopathic, or chiropractic), where repetitive work is the cause of the injury.

Have you ever had Cumulative Trauma Disorder?

Yes **Coded as Group C**

No **Coded as Group D**

Part II:

Please circle the response that best describes your answer.

1. Numbness, tickling, "pin & needles" sensation, burning feeling, "sleeping" hand, waking numbness during sleep, pain in elbow, pain in wrist, loss of dexterity and a weak grip are all symptoms of Cumulative Trauma Disorders.

True 1
False 0

2. Cumulative Trauma Disorders are also called repetitive motion trauma injury, overuse syndrome, or repetitive stress syndrome.

True 1
False 0

3. Cumulative Trauma Disorders were diagnosed as early as 1900.

True 0
False 1

4. Carpal tunnel syndrome, DeQuervain's Syndrome, and epicondylitis, all fall under the category of Cumulative Trauma Disorders.

True 1
False 0

5. Cumulative Trauma Disorders can result in debilitating pain but will not lead to permanent nerve damage and disability.

True 0
False 1

6. The principal causes of Cumulative Trauma Disorders are a fixed working posture, repetitive motions, and psychological stress.

True 1
False 0

7. Sign language interpreting is associated with a set of repetitive, forceful movements with awkward postures of the fingers, hand, wrist, forearm, and shoulder that have been associated with Cumulative Trauma Disorders.

True 1
False 0

Part III:

Please circle the answer that best describes behaviors you use to prevent Cumulative Trauma Disorders. There are no right or wrong answers.

These definitions should be used for answering the following questions.

Always = 10 out of 10 times

Frequently = 7 out of 10 times

Sometimes = 5 out of ten times

Seldom = 3 out of 10 times.

Never = 0 out of 10 times

1. When my hands and shoulders are tired, I should participate in hobbies that use repetitive hand and arm movements.

Always	Frequently	Sometimes	Seldom	Never
1	2	3	4	5

2. When I have symptoms of Cumulative Trauma Disorders I rest from interpreting.

Always	Frequently	Sometimes	Seldom	Never
5	4	3	2	1

3. When I have symptoms of CTDs, I see a physician.

Always	Frequently	Sometimes	Seldom	Never
5	4	3	2	1

4. Prior to interpreting, I complete warm-up exercises.

Always	Frequently	Sometimes	Seldom	Never
5	4	3	2	1

5. I use sign language for more than an one hour at a time, without a rest

Always	Frequently	Sometimes	Seldom	Never
1	2	3	4	5

6. At the end of an interpreting assignment, I complete cool-down exercises.

Always	Frequently	Sometimes	Seldom	Never
5	4	3	2	1

7. I change my position (standing & sitting) throughout the day.

Always	frequently	Sometimes	Seldom	Never
5	4	3	2	1

APPENDIX E
Content Validity Evaluation

Content Evaluation of Cumulative Trauma Disorders

After reviewing the entire questionnaire please grade the following. Feel free to make any comments that you feel would make the questionnaire better.

Grade each : Question:	A (excellent) Grade:	to Grade:	E (Very poor) Comments:
1. Clarity of instructions	_____		_____
2. Format of questionnaire	_____		_____
3. Definition of Cumulative Trauma Disorder in Part I.	_____		_____
4. Frequency definitions in Part III.	_____		_____
5. Face validity of questionnaire	_____		_____

While reviewing Part II and Part III please mark each question as either acceptable or needs improvement. In the comment section please indicate any changes you feel would make the questions better.

Question:	Acceptable	Needs improvement	Comments:
Part II			
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____

Part III

Question:	Acceptable	Needs improvement	Comments:
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____

Additional comments or changes that you feel can make the questionnaire better.

This image shows a single sheet of white paper with ten horizontal black lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice. There is no text or other markings on the paper.

APPENDIX F
Content Validity Evaluation Results

Combined Results of the Content Evaluation of Cumulative Trauma Disorders Questionnaire completed by the expert panel.

After reviewing the entire questionnaire please grade the following. Feel free to make any comments that you feel would make the questionnaire better.

Grade each : Question:	A (excellent) Grade:	to E (Very poor) Comments:
1. Clarity of instructions	<u>A</u>	<u>_____</u>
2. Format of questionnaire	<u>A</u>	<u>Simple & clear to the point.</u>
3. Definition of Cumulative Trauma Disorder in Part I.	<u>B</u>	<u>May want to give examples.</u>
4. Frequency definitions in Part III.	<u>B</u>	<u>It is a little difficult to determine by "ten out of ten times" Another panel member liked the use of "ten out of ten times"</u>
5. Face validity of questionnaire	<u>A</u>	<u>_____</u>

While reviewing Part II and Part III please mark each question as either acceptable or needs improvement. In the comment section please indicate any changes you feel would make the questions better.

Question:	Acceptable	Needs improvement	Comments:
Part II			
1.	<u>X</u>	<u>_____</u>	<u>Other possible listings: neck pain, and shoulder pain.</u>
2.	<u>X</u>	<u>_____</u>	<u>Overuse syndrome & repetitive motion trauma syndrome are what interpreters relate to.</u>
3.	<u>X</u>	<u>_____</u>	<u>_____</u>
4.	<u>X</u>	<u>_____</u>	<u>_____</u>
5.	<u>X</u>	<u>_____</u>	<u>Good Question!</u>
6.	<u>X</u>	<u>_____</u>	<u>_____</u>
7.	<u>X</u>	<u>_____</u>	<u>_____</u>

APPENDIX G
CTDQ Knowledge and Behavior Scale
Frequency and Percentage Responses

Knowledge and Behavior Scale Responses

Knowledge Scale				
Question	Value	Frequency	Percent	
1	0	8	4.7	
	1	158	92.4	
	Missing	5	2.9	
2	0	6	3.5	
	1	162	94.7	
	Missing	3	1.8	
3	0	58	33.9	
	1	73	42.7	
	Missing	40	23.4	
4	0	14	8.2	
	1	130	76.0	
	Missing	27	15.8	
5	0	9	5.3	
	1	156	91.2	
	Missing	6	3.5	
6	0	23	13.5	
	1	143	83.6	
	Missing	5	2.9	
7	0	10	5.8	
	1	157	91.8	
	Missing	4	2.3	

Behavior Scale Question	Value	Frequency	Percent
1	1	0	
	2	5	2.9
	3	11	6.4
	4	68	39.8
	5	84	49.1
	Missing	3	1.8
2	1	9	5.3
	2	35	20.5
	3	72	42.1
	4	32	18.7
	5	18	10.5
	Missing	5	2.9
3	1	74	43.3
	2	39	22.8
	3	32	18.7
	4	6	3.5
	5	10	5.8
	Missing	10	5.8
4	1	56	32.7
	2	37	21.6
	3	48	28.1
	4	20	11.7
	5	9	5.3
	Missing	1	.6
5	1	19	11.1
	2	44	25.7
	3	52	30.4
	4	47	27.5
	5	8	4.7
	Missing	1	.6
6	1	98	57.3
	2	44	25.7
	3	19	11.1
	4	6	3.5
	5	3	1.8
	Missing	1	.6
7	1	4	2.3
	2	14	8.2
	3	38	22.2
	4	84	49.1
	5	29	17.0
	Missing	2	1.2