Musculoskeletal Symptomatology and Repetitive Strain Injuries in Diagnostic Medical Sonographers

(A Pilot Study in Washington and Oregon)

Martin Necas,
Bellevue Community College, Spring 1996

ABSTRACT: Repetitive strain injuries (RSIs) are beginning to be widely recognized as a serious occupational risk for sonographers. The goal of this study was to establish the incidence of musculoskeletal symptomatology and RSIs in sonographers from the states of Washington and Oregon, and correlate certain physical attributes, work load, and work habits with the reporting rates of musculoskeletal symptomatology and RSIs. The data for this study was gathered through a comprehensive questionnaire. Eighteen percent of respondents suffered no symptoms, 66% suffered symptoms without RSI, and 15% have been diagnosed with RSI. The analysis revealed that a positive correlation exists between certain ergonomically unsound work-habits and increased symptomatology. The proportion of RSI-diagnosed sonographers tended to increase with more years in the profession. The reporting rate of musculoskeletal symptomatology and RSI also appeared to be influenced by other variables, such as gender, work-load, and stress in the workplace.

KEYWORDS: Repetitive Strain Injuries, Sonographer, Ultrasound

INTRODUCTION

Repetitive strain injuries (RSIs) is a group of musculoskeletal disorders that most commonly involve the upper extremities and the torso. In the field of ultrasound these disorders most commonly result in aggravating symptoms of tension and pain in the affected areas which may lead to debilitating disability. The purpose of this study was to identify the prevalence of musculoskeletal symptoms and RSIs in the sample population and attempt to correlate certain physical attributes, work load, and work habits with the reporting rates of musculoskeletal symptomatology and RSIs in the respondents.

Repetitive strain injuries have gained increasing media attention in the nineties. This is perhaps due to disturbing statistics from the US Bureau of Labor Statistics, which has recognized RSIs as the leading occupational disease in the United States, accounting for over 60% of all recordable work related illnesses.[1,2] Between 1980 and 1990, the incidence of RSIs has grown nine fold, and has been identified in a wide array of occupations from manufacturing (small parts assembler, sewing worker, grinding worker, butcher, packager, construction worker), through the service sector (cashier, typist, postal worker, musician, telephone operator, data entry clerk), to health care occupations (sonographer, operating room personnel, dentist).[1,3-8]

The term repetitive strain injury (RSI) is synonymous with terms such as cumulative trauma disorder (CTD), overuse syndromes, regional musculoskeletal disorders, cervical-brachial disorders, or repetitive motion disor-

ders.[1] These constitute a large group of musculoskeletal disorders which can arise from various factors associated with repetitive work. These factors not only include (1) high repetition, but also (2) high levels of force, (3) awkward joint position, (3) direct pressure, (4) prolonged twisted posture, (5) vibration, and others.[2,5,6,9-13] Clearly, at least some combination of the factors 1 through 4 can be present in the everyday practice of sonography.

It has been hypothesized that highly repetitive tasks do not allow for sufficient recovery time of muscles, which results in muscle fatigue.[2] Cumulative forces constitute biomechanical stresses that may cause soft tissue microtears and microtrauma in the involved muscles, tendons, joints and nerves. [1,4,7] Tissue swelling, and the development of fluid filled ganglia has also been associated with RSIs.[5,9] Depending on the affected areas, RSIs can be classified into several groups: muscle fatigue, tendon and tendon-sheath disorders, nerve entrapment syndromes, and neuro-vascular disorders.[1,14] Common disorders from each of these categories are presented in Figure 1. It is important to note that the majority, if not all, of these disorders have already been identified in practicing sonographers.[3,15-17]

Patients with tendon disorders often present with local pain, tenderness to touch, and decreased range of motion, while those with nerve disorders also complain of tingling, numbness, clumsiness and weakness in the area innervated by the affected nerve. [7,11] An array of different symptoms with varying intensities may be present in a single person.

The issue involving RSIs is complicated by the fact that no single group of factors appears to be causative. Instead, a number of occupational, and non-occupational factors seem to contribute to this multifactorial disorder. [1,12] Some of the plentiful non-occupational factors that may play a major part in RSI development include: female gender, rheumatoid arthritis, athletics, hypertension, diabetes, thyroid disorders, kidney disorders, gout, alcoholism, pregnancy, gynecological disorders, use of oral contraceptives, and others.[1,2,9,18-20]

The above paragraphs clearly point to the fact, that the risk of RSIs is quite real for sonographers. In fact, the topic of RSI in ultrasound is not new. It has been discussed by Craig[15] in 1985, studied in cardiac sonographers by Vanderpool et al[3] in 1993, and addressed in "The 1993 survey results of the Canadian Society of Diagnostic Medical Sonography" [17] (CSDMS). A serious concern about the risk of RSI development in sonographers has also been expressed by Joan Baker, the founder of the SDMS, now chair of the Diagnostic Ultrasound Program at Bellevue Community College, Bellevue, WA.[16]

Although RSIs have been recognized in the ultrasound community, only a single study has targeted the topic[3] and much is yet to be uncovered about the prevalence of specific RSIs, their causative factors, and prevention strategies. The goal of this study is to determine the prevalence of the problem in the sample population, and attempt to correlate certain physical attributes, work load, and work habits with the reported musculoskeletal symptoms and RSIs in the respondents.

FIGURE 1

COMMON REPETITIVE STRAIN INJURIES

Tendon Disorders:
- Chronic Tendinitis:
  - Bicipital Tendinitis
  - Rotator Cuff Tendinitis
- Chronic or Stenosing Tenosynovitis:
  - De Quervain's Syndrome
  - Trigger Finger
- Lateral and Medial Epicondylitis
- Ganglionic Cysts

Nerve Entrapment Syndromes:
- Carpal Tunnel Syndrome
- Cubital Tunnel Syndrome
- Radial Tunnel Syndrome

Muscular Disorders:
- Focal dystonia
- Fibromyositis
- Tension Neck Syndrome

Neuro-vascular Disorders:
- Thoracic Outlet Syndrome

source: references 1,6,14,20

METHODS

SURVEY DESIGN AND DISTRIBUTION

A comprehensive questionnaire was designed, based on musculoskeletal symptomatology recorded in the literature, as well as symptomatology reported from diagnostic medical sonographers in informal interviews.[7,8,16,21] The survey contained five question categories pertaining to: (1) personal attributes, (2) employment-related information, (3) personal work habits and work environment, (4) musculoskeletal symptomatology information, and (5) information about diagnosed RSIs.

The first category included questions about the respondent's dexterity, sex, height and weight. The second category focused on questions pertaining to the respondent's ultrasound specialty(-ies), years worked, daily work-load, type of equipment used, and others. The third category comprised of questions about the respondent's scanning technique, routine work habits, level of stress experienced in the workplace, and familiarity with correct work station design. The fourth question category was presented as a table where the columns represented ten anatomical areas, and the rows represented seven common types of musculoskeletal symptoms. The anatomical areas included: fingers, palm, dorsum of hand, wrist, elbow, shoulder, neck, upper back, lower back, and feet. The symptoms included swelling, pain, aching, tension, itching/burning, tingling, numbness. The respondent was asked to check the boxes that represented his or her anatomical areas affected by specific symptoms. The fifth and last question category was designed specifically for those respondents who have been diagnosed with repetitive strain injury. The key areas of interest were the specific types of RSI, their possible causes, treatments received, the degree of treatment success, and whether the respondent continues to practice sonography.

The survey was mailed to all of the 413 members of the Society of Diagnostic Medical Sonographers in the states of Washington and Oregon. After receiving the completed questionnaires, all data was entered into a spreadsheet format using Microsoft Excel 5.0 for Windows.

DATA ANALYSIS

Before proceeding to data analysis, certain data from the received questionnaire was synthesized to yield numerical values that could be statistically analyzed. One key value was the *work-habit score* which was defined as the number of times that the respondent answered "yes" to the following ten indications: gripping the transducer, applying sustained pressure, scanning with a flexed wrist, scanning with a hyperextended wrist, maintaining a twisted posture, strenuously lifting patients, frequent leaning over the patient, frequent over-stretching of the arms between the patient and the control panel, moving ultrasound equipment too heavy for the respondent at least once a day, and constantly feeling rushed during a regular work-day.

Based on the responses in the musculoskeletal symptomatology section, it was possible to determine the number of symptoms in any particular anatomical area, the number of affected anatomical areas in the respondent, and the total number of symptoms the respondent reported. The level of stress in the workplace that the respondent experienced was judged on a numerical scale, where 0=minimal stress, 1=mild, 2=average, 3=moderate, and 4=severe stress.

The data was subsequently analyzed using descriptive statistics (means, standard deviations, medians, percentages, ratios), distributions, and linear regression. Appropriate tables and graphs were developed to demonstrate pertinent relationships. For the purposes of further discussion, the author has considered a respondent "asymptomatic" if the respondent did not report any musculoskeletal symptoms, "symptomatic" if the respondent reported symptoms, but hasn't been diagnosed with RSI, and "RSI sufferer" if RSI has been diagnosed in the respondent.

RESULTS

The presentation of the results will concentrate first on comparing the asymptomatic respondents, symptomatic respondents and RSI sufferers. The subsequent sections will present the characteristic findings in the symptomatic subgroup, and RSI sufferers.

A total of 149 responses were received (out of 413 sent), which corresponds to a response rate of 36%. Females accounted for 85%, and males for 15% of the responding population with a female to male ratio of 5.67. This is in close agreement with the proportion of females (84%) and males (16%) nationwide, as reported in the ARDMS Registry Reports, summer 1995 (Volume XIII, Issue 2).

Table 1 provides a comparison of the asymptomatic, symptomatic, and RSI diagnosed respondents with respect to years worked, hours and scans per week performed, the combination of work habits, and the level of the respondent's perceived levels of occupational stress. This table illustrates several relationships. First, the female:male ratio in the asymptomatic category is relatively low, which may indicate that, proportionately, more males are asymptomatic than females. Furthermore, the female:male ratio in the RSI category is relatively high, indicating that more females may have RSI than males. There don't appear to be differences in height between the three subgroups, however the mean weight has a tendency to rise slightly from the asymptomatic through the symptomatic respondents to the RSI sufferers. Similar rising tendency can be observed with respect to the number of years the respondents have worked in ultrasound, hours per week worked, and number of scans/week performed. The *work-habit score* is the lowest in the asymptomatic respondents, higher in the symptomatic, and highest in the RSI sufferers. Both the asymptomatic and symptomatic respondents reported a median of stress in the workplace as "average", while the RSI sufferers reported a median of "moderate". Interestingly, the RSI sufferers and the symptomatic respondents reported a comparable number of symptoms and number of symptomatic anatomical areas. However, the RSI sufferers reported a higher rate of developing synovial ganglia than the symptomatic respondents.

A strong positive correlation (r=0.38) was found between the *work-habit score* and the number of symptoms reported (Graph 1). Similar correlation (r=0.40) also exists between the *work habit score* and the number of symptomatic anatomical areas in the respondent (Graph 2). These graphs demonstrate that the number of musculoskeletal symptoms, as well as the number of symptomatic anatomical areas tends to be progressively higher in those respondents who report a higher *work-habit score*. The data for both graphs was drawn from all respondents.

SYMPTOMATIC RESPONDENTS

The majority (66%) of our respondents were classified as symptomatic. The most common areas of complaint included the neck, shoulder, and wrist, followed by the upper back, lower back, fingers, elbow, feet, dorsum of the hand, and the palm (Table 2). Additionally, 13 % of the symptomatic respondents have developed at least one wrist ganglion while working in ultrasound.

Females in this survey appeared to have suffered slightly more than males. While 67 % of all females have experienced musculoskeletal symptoms, 61% of males have. Further analysis revealed that females actually account for 90% of reported symptoms (mean=10.5) and males account for only 10% reported symptoms (mean=6.9), where, on the basis of gender distribution, one would expect females to account for 86% and males for 14% of all reported symptoms. In addition, females reported symptoms in more anatomical areas (mean=4.7), than males (mean=3.3).

No association was found between the respondents' weight or height and the number of reported symptoms. An effective comparison of symptomatology distributions in various specialties was not possible due to the low number of respondents in echocardiography, and vascular sonography. There also did not appear to be significant difference in the percentage of symptomatic respondents with respect to the number of years they have worked in sonography. However those who have worked in ultrasound for less than 15 years tend to report fewer symptoms (mean=9.3) than those who have worked in ultrasound for more than 15 years (mean=11.4).

Although the number of symptoms is identical for those who work <40 hrs/week and those that work 40+ hrs/week (mean=9.9), those respondents who perform <40 scans/week reported fewer symptoms (mean=9.2) than those that perform 40+ scans/week (mean=10.4).

Most of our symptomatic respondents (86%) reported having less than three 10-minute breaks during the day. These respondents reported higher number of symptoms (mean=10.2) than those who had three or more breaks during the day (mean=6.8).

There did not appear to be any relationship between the percentage of time the respondent scanned sitting and his or her symptomatology. An effective comparison of symptomatology based on the level of stress in the workplace was not possible due to the small number of respondents in the categories of "minimal" and "mild" stress (6%). Forty five percent of symptomatic respondents felt the level of stress in their workplace was "average", 39% reported "moderate", and 9% "severe" level of stress.

RSI SUFFERERS

Repetitive strain injury was diagnosed in 23 respondents, which corresponds to 15% of all respondents. Females had an slightly increased reporting rate of diagnosed repetitive strain injuries than males. While 16% of all females reported an RSI, 13% of males had an RSI.

No association was found between the respondents' weight or height and the reporting rate of RSIs, however this analysis was compromised by the low number of respondents in these categories.

The incidence of RSI had a strong tendency to rise with the number of years the respondent has worked in ultrasound. While the rate of RSI is 0% in those that have worked in ultrasound for less than 5 years, the reporting rate steadily increases from 9%, through 15%, 22%, to 24%) in respondents who have worked 5-10 years, 10-15, 15-20, and 20+ years respectively (Graph 3). It should be noted, however that no significant differences in the number of symptoms or symptomatic areas were found in RSI sufferers with the respect to the number of years worked in ultrasound.

The incidence of RSI did not appear to be significantly related to workload in this study. RSI has been diagnosed in 17% of respondents who work 40+ hrs/week, and 10% of respondents who work <40 hrs/week. Similarly, sixteen percent of those who perform >40 scans/week have been diagnosed with RSI, as have 14% of those performing <40 scans/week.

No association was found between the percentage of time the respondent scanned sitting and the reported rate of RSI.

The frequency of RSI seems to increase with an increased level of stress in the workplace. While the sample of respondents was too small for the categories of "minimal" and "mild" stress, the frequency of RSI was 13%, 17%, and 21% in those respondents who answered their stress was "average", "moderate", and "severe", respectively.

The most common anatomical areas with RSI involvement included the shoulder, and the wrist, followed by the back, forearm, elbow, feet, hand and neck (Table 3). While 35% of RSI sufferers have received a treatment that they believe was successful, 22% reported their treatment as unsuccessful, and 43% are either still undergoing treatment or they have mixed feelings about their treatment. Fifteen RSI sufferers continue to practice sonography full time, while seven continue on a part-time basis, and only a single person reported leaving the profession.

DISCUSSION

It needs to be emphasized, that this study was a pilot study, not an epidemiologic study. Its purpose was to determine whether there are strong relationships between certain individual factors, increased musculoskeletal symptomatology, and repetitive strain injuries. Although this study produced a number of interesting results, there are several limitations that need to be discussed. First, the sample population used in this study is indeed a demographically selected population (Washington state and Oregon state) and it is conceivable that this population may have certain characteristics that would not be representative of the entire sonographers population in the US. Second, since the studied population was drawn from the members of the SDMS, the proportion of the various specialties is biased toward general sonography with an unfairly low

proportion of echocardiographers and vascular technologists. The respondent rate was good (36%), but it is possible that those who did not respond had certain characteristics that might have affected the results to some degree. Furthermore, the analysis of this study was based on the responses to a questionnaire without an empirical confirmation of the data. Finally, even though some interesting relationships have come to light in this study, it is not possible to prove causality between different factors or data series.

Despite the above limitations, this study has demonstrated that there is a strong correlation between work habit score and increased musculoskeletal symptomatology. The factors which comprised the work habit score are generally accepted as "potentially harmful" repetitive, static, or overload motions and postures, however no other study to date had demonstrated their relevance in sonography. The linear regression models, depicted by the dotted lines in Graph 1 and Graph 2, show that higher *work-habit scores* correlate with increased number of symptoms (roughly 1:1) as well as higher number of symptomatic anatomical areas reported (roughly 2:1).

This study also confirms that females tend to suffer from musculoskeletal symptoms and RSI more than males, although the differences appear to be rather subtle. Similar findings are well documented in the literature[18] and have also been confirmed in echocardiographers by Vanderpool et al[3] in 1993. The relative risk ratio of RSI for women to men in this study is 1.231, which is almost identical to the average female:male ratio in all occupations (1.343) as reported by Ashbury[18] in 1991. The minimal discrepancy between this study and Asbury's study may be due to the fact that the latter involved large numbers of subjects in many occupations, as well as the observation that the relative female:male risk ratio had been on a decline from 1988 to 1990.[13]

It is generally believed that RSIs are in some way linked to workload and the total time a person has been working in a profession.[3,4,15] The results of this study show that the proportion of RSI sufferers rises considerably with the number of years the respondents have worked in ultrasound. In fact, roughly 1 in every 4 sonographers who has been in the profession for more than 20 years have been diagnosed with one or more RSIs. In contrast, the percentage of symptomatic respondents does not rise with increasing years of work, although the average number of symptoms tend to be higher in those who have worked for more than 15 years. This would tend to suggest that perhaps no more sonographers are becoming symptomatic with increasing years in the profession, but those that are symptomatic may develop more symptoms. The effect of other work-load variables, such as the hours/week worked, or scans/week performed on the symptomatology of our subjects is somewhat ambiguous.

Several studies have focused on the effect of psychological stress on the development of RSI. These studies have demonstrated that stress can be a significant contributor to the development of RSIs.[9] Two trends regarding stress in the workplace seem to be apparent in this study. Firstly, the asymptomatic and symptomatic respondents have a mean value of stress "average", whereas the RSI sufferers report a higher mean of "moderate". The second trend arises from the increasing rate of RSI (13%, 17%, 21%) in the categories of average, moderate and severe stress respectively.

Interestingly, the RSI sufferers in this study appeared to report comparable levels of symptomatology with the symptomatic respondents. However, while 0% of asymptomatic, and 13% of symptomatic respondents have acquired a ganglion, nearly 22% of RSI sufferers have. A closer look at the RSI sufferers reveals that they report the highest average of years worked in ultrasound, they work the highest number of hours, perform the most scans, have the highest *work-habit score*, and tend to experience the highest level of stress. It should not be surprising, therefore, that 83% of RSI sufferers are seriously concerned about the impact of sonography on their health, as opposed to 63% of symptomatic and 22% of asymptomatic respondents.

CONCLUSION

The above discussion confirms that musculoskeletal symptomatology and RSIs pose a serious threat to the working sonographers. Since RSIs are virtually impossible to diagnose in the absence of musculoskeletal symptoms, the focus must be put on prevention in battling this painful and often debilitating group of disorders.[6,20] Yet, before preventive measures can be instituted in sonography, it is necessary to carry out further research and pinpoint the precise ergonomic hazards of sonography. This will probably turn out exceedingly difficult, since there is relatively little that sonographers nationwide have in common with regards to empirically measurable variables. In other words, the variability in individual performance of the job is very high. Sonographers tend to be registered in more than one specialty, perform these specialties in various combinations with a focus on one specialty more than the other, and there may also be pronounced differences in scanning technique, work-station configuration, duration of exams, etc. Until the exact effect of the above variables on the development of RSIs is known and a legitimate prevention plan instituted in sonography, it is important for every sonographer to become familiar with the principles of ergonomics, and attempt to minimize musculoskeletal health hazards, such as those that have comprised the *work-habit score* in this study amongst many others.

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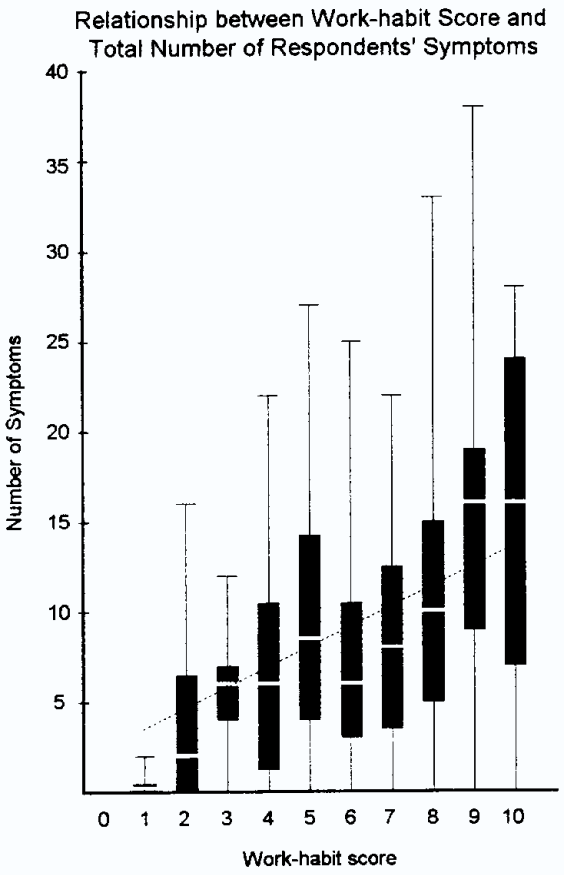
TABLE 1

Comparison of Asymptomatic and Symptomatic Respondents, and RSI sufferers based on physical attributes, work-load, work habits, and symptomatology

	Asymptomatic			Symptomatic			RSI Sufferers		
	Mean	**SD**	**Med**	**Mean**	**SD**	**Med**	**Mean**	**SD**	**Med**
Number of Repondents	27			99			23		
Females	21			85			20		
Males	6			14			3		
Female:Male Ratio	3.5			6.1			6.7		
Height (inches)	65.7	±4.0	65	65.2	±3.6	65	65.0	±3.6	65
Weight (pounds)	140.5	±31.7	133	142.5	±30.0	137	145.3	±30.5	145
Years Worked	10.5	±7.16	10	11.4	±5.9	11	14.6	±4.6	15
Hours/Week Worked	35.4	±9.2	40	36.5	±8.6	40	38.2	±10.0	40
Scans/Week Performed	36.0	±13.1	40	39.1	±16.0	40	40.9	±15.6	40
Work-Habit Score	4.8	±2.8	5	6.2	±2.0	6	7.3	±2.1	8
Stress in the Work-place	2.2	±1.0	2	2.5	±0.9	2	2.6	±0.9	3
% of Time Sitting while Scanning	64.9	±35.3	80	73.4	±31.9	90	68.1	±35.4	90
Number of Breaks/Day	1.5	±1.3	1	1.7	±1.7	2	1.7	±1.2	2
Total Number of Symptoms	0	±0	0	9.9	±6.5	8	10.5	±6.8	9
Number of Symptomatic Areas	0	±0	0	4.5	±2.2	4	5.7	±2.1	6
Acquired Ganglion	0%			13%			22%		

GRAPH 1



GRAPH 2

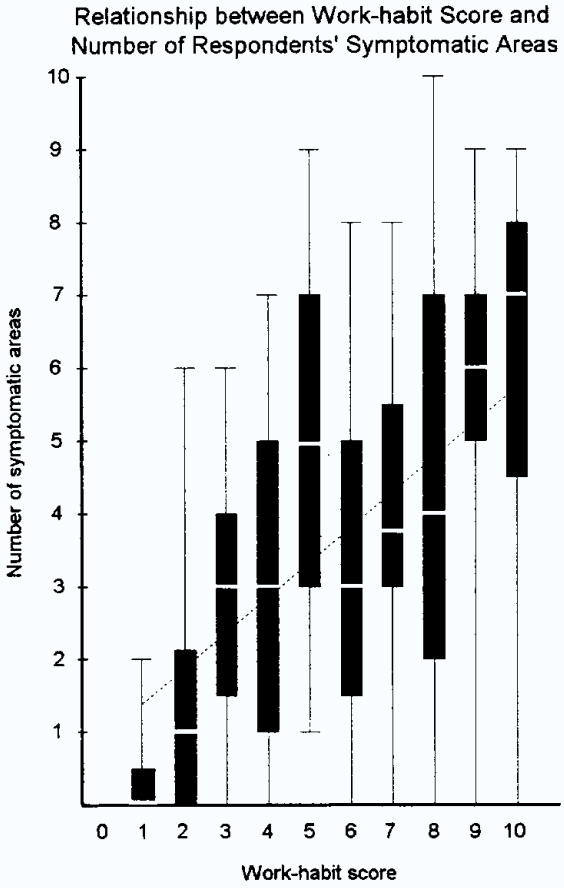


TABLE 2

Descending Distribution of Symptomatic Respondents Suffering Symptoms in Surveyed Anatomical Areas (n=99)

Anatomical Area	Percentage of Respondents Suffering Symptoms in Surveyed Anatomical Areas
Neck	76%
Shoulder	66%
Wrist	61%
Upper Back	53%
Lower Back	46%
Fingers	40%
Elbow	33%
Feet	27%
Dorsum of Hand	25%
Palm	22%

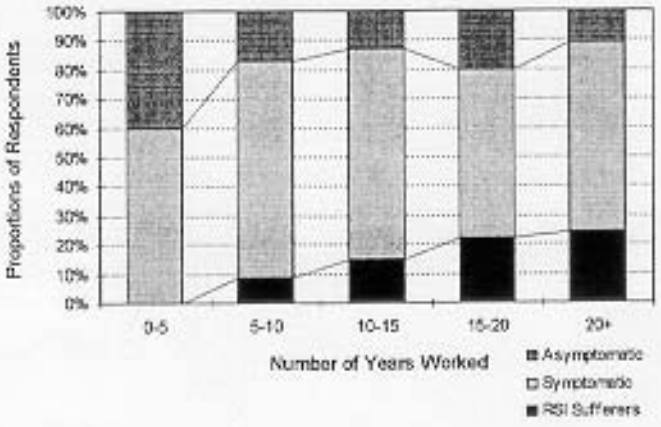
TABLE 3

Descending Distribution of RSI Sufferers with Repetitive Strain Injuries in Surveyed Anatomical Areas (n=23)

Anatomical Area	Respondents Suffering RSIs in Surveyed Anatomical Areas	
	No.	%
Shoulder	9	39%
Wrist	8	35%
Back	3	13%
Forearm	3	13%
Elbow	2	9%
Feet	2	9%
Hand	1	4%
Neck	1	4%

GRAPH 3

Proportions of RSI Sufferers, Symptomatic and Asymptomatic Respondents with Respect to Number of Years Worked



Personal Information

•Name: _____ •❑Male ❑Female

•Height:_____ •Weight:_____ •❑Rt-handed ❑Lt-handed

•What is your subjective opinion about your state of health:

❑Excellent.....❑Above average.....❑Average.....❑Below average.....❑Poor

General Work-related Information

•What is your specialty? If more than one, please specify what percentage of time you spend practicing each one (e.g. Abdomen 65%, OB/Gyn 20%, Vascular 5%, Echo 5%).

_____

•How many years have you been working in ultrasound? _____

•How many days/week do you work?_____ •How many hours/day? _____

•How many exams/day do you do? _____ •How much time/per scan?_____

•How many (at least 10 minute) breaks/day do you get? _____

•What % of time do you sit when scanning? _____

•What manufacturer's equipment do you use? _____

•How would you grade your ultrasound system based on comfort of use?

❑Excellent.....❑Above average.....❑Average.....❑Below average.....❑Poor

•Does the design of the transducers fit your hand? ❑Yes.....❑No

Personal work-habit and work Environment information

•What hand do you scan with?.....❑ Rt. Hand.....❑Lt. Hand

•During the course of an average day, do you find yourself doing the following

❑Gripping the transducer..... ❑Applying sustained pressure to the transducer

❑Scanning with flexed wrist..... ❑Scanning with hyperextended wrist

❑Maintaining twisted posture..... ❑Strenuously lifting patients

❑Frequently leaning over the patient

❑Frequently over-stretching one arm to reach the control panel of the machine

❑Moving ultrasound equipment that is too heavy for you at least once a day.

•Which exam do you consider the most physically demanding? _____

•Do you usually feel rushed during the day? ❑Yes.....❑No

•What is the level of stress you experience in your workplace?

❑Minimal.....❑Mild.....❑Average.....❑Moderate.....❑Severe

•Are you seriously concerned about the impact of your job on your health? ❑Yes.....❑No

•Have you taken steps to minimize potential health hazards at your work? ❑Yes..... ❑No

If yes, please specify:_____

_____

•Are you familiar with the term ergonomics? ❑Yes.... ❑No

•During the course of an average day do you

❑Adjust the equipment and the stretcher to suit your comfort?

❑Feel pressed for time and scan uncomfortably?

Current musculo-skeletal symptoms

•Fill out the following table concerning your current musculo-skeletal symptoms..
Check the corresponding boxes and
fill out the bottom three statistical rows using terms such as (4/month, 2days, 3years)

	Fingers	Palm	Dorsum of hand	Wrist	Elbow	Shoulder	Neck	Upper Back	Lower Back	Feet
Swelling										
Pain										
Aching										
Tension										
Itching/ burning										
Tingling										
Numbness										
	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩
How frequently do you get these symptoms?										
How long do symptoms last?										
How long have you had these symptoms										

•Have you acquired a ganglion (or ganglia)?
❑Yes..❑No If yes, how many and where?_____

•Do you suffer from any other work-related musculo-skeletal symptoms?
❑Yes..❑No If yes, please specify_____

Known Repetitive Strain Injury information.

Fill out this section only if you have been diagnosed with Repetitive Strain Injury (Cumulative Trauma Dysorder).

•Have you been diagnosed with Repetitive Strain Injury? ❑Yes.... ❑No

•If yes, please specify which_____

•What repetitive activities do you believe have caused your injury?_____
_____

•What treatment did you receive?_____

•Was it successful?_____

•Do you continue sonography now? ❑Yes, full-time.. ❑Yes, part-time. ❑No

Thank you for taking the time to fill out and return this questionnaire promptly.
Please feel free to enclose any additional comments.