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**The Independent Newspapers Limited
Study: An Investigation into
Occupational Overuse Syndrome
Within the Newspaper Industry.**

A thesis presented in partial
fulfilment of the requirements
for the degree of Master of
Arts in Psychology, at
Massey University.

Ross Pirie

1993

$\frac{7}{613}$

Dedicated to my father
John George Pirie.

ABSTRACT

An investigation was undertaken into occupational overuse injuries. Overuse injuries are commonly associated with repetitive movements, sustained or constrained postures, and forceful movements. Other factors, such as work environment, amount of keyboard use, and the ergonomic status of the work area, have been identified as elements in the development of overuse injuries. These perspectives were used to provide research objectives in studying a sample of subjects working in the newspaper industry.

Five hundred and seventy five respondents completed a questionnaire, which included a measure of the incidence and severity of overuse injuries, and questions aimed at discovering the effectiveness of different types of treatment and intervention strategies. Using a combination of descriptive and bivariate statistics, this data was analyzed.

The analysis revealed low levels of reported muscular aches and pains. Of those subjects who did report some form of ache or pain, the majority answered that the level of their aches and pains had remained the same. As well, the image of the aetiology of overuse injuries which emerged, was in contradiction to much of the proceeding research in this area. The analysis also demonstrated that the treatment and intervention strategies being employed were ineffective. This was despite the fact that subjects often reported that they considered a particular strategy to be productive in managing their overuse injury.

In the discussion section, the limitations of the questionnaire as a survey technique in this area of research was considered, and the possible effects these limitations have on the present study. This point has special relevance to the application of clinical models of overuse injury.

It was concluded that the results demonstrated a need for research into effectively manipulating working conditions to counter-act the development, incidence and severity of overuse injuries. Such strategies as job enlargement and job rotation were suggested.

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GLOSSARY

Anthropometry: the physical measurement of human beings both static and dynamic.

Biomechanics: the forces acting on the human musculoskeletal system through the combined effect of muscle action and gravity.

Bursitis: Bursae form over all areas where projecting parts of the body are in frictional contact with their surroundings, for example, the bunion. Bursitis at these sites leads to inflammation and swelling.

Carpal Tunnel Syndrome (CTS): a nerve entrapment syndrome, where pressure on the median nerve in the front of the wrists results in recurrent pain in the palm and on the volar aspect of the wrists, with a corresponding weakness of the wrists and weakness of grip.

Epocondylitis: pulling or tearing of the tendinous insertion on the outside of the elbow. It is here that wrist extensor muscles attach to the bone and it may be a point of weakness when strong or rapid extensions of the wrist are required.

Ganglia: usually from the tendon sheaths around the wrist. They should often be taken as a indication of overuse, and usually signify tenosynovitis by may also occur in rheumatoid arthritis.

Reflex Sympathetic Dystrophy (RSD): this is a rare form of OOS, and can be seen as an extreme extension of Raynauds disease. RSD presents itself typically as an intense burning sensation and swelling.

Rotor Cuff Injuries (RCI): characterized by a painful arc when the arm is raised. Is typically caused while reaching up above the head to carry out a job, or lifting with the arm abducted.

Tendonitis: inflammation of a tendon, may occur when a tendon has been repeatedly used.

Tenosynovitis: inflammation of a tendon within a sheath, leading to pain, restriction of movement and sometimes a loss of ability to apply force. It occurs most commonly on the back of the wrist and on the radial side of the wrist, as in the thumb tendons.

Peritendinitis: inflammation of the muscle-tendon junction above the sheath, commonly occurring on the back of the forearm.

CHAPTER ONE

INTRODUCTION

1.1 The Electronic Office.

The arrival of a variety of new information processing technologies into the work place has led to the emergence of what is commonly called the "electronic office". The widespread use of computer systems has resulted in many diverse benefits, ranging from increased office efficiency, to reduced work hours, to general cost saving.

This cost saving is due to the rapidly falling cost of computer equipment in real terms, linked with its increased capacity to store and manipulate large volumes of information rapidly and accurately. This has, not surprisingly, strongly influenced decisions towards wide spread investment in modern electronic equipment. Moreover, the need to increase productivity through efficiency and to reduce escalating labour costs through rationalization of the work force, is a matter of urgency to most management in recessionary times.

The decision to increase technological resources is apparent through the general availability of cheap, sophisticated software and the increased simplicity of programming computers capable of facilitating information transfer on larger scales than previously - with corresponding increases in productivity and efficiency.

This 'efficiency' is the direct result of the computers capability to provide rapid access to information, which in turn enables the office worker to respond quickly and directly to the needs of a range of consumer groups.

For many office workers this has led to a more streamlined work environment, and eliminated many of the more repetitive and tedious aspects of their jobs. For example, the advantages of the word processor is that a secretary who is not occupied with retyping a report for the third time, can be doing other work. This brings obvious advantages to both the employee and the employer.

The flexibility of these systems has also meant that any one worker may be able to take on new 'tasks', or tasks previously thought to belong to the domain of other workers. As an example of this, a typist may find their work load increased to include not only typing and retyping, but also clerical and reception type chores, such as sorting, filing and message taking. This means not only more varied and interesting work, but also in certain circumstances, additional responsibilities and the opening of new career opportunities.

This trend has however, seen the status of the traditional, general office roles decline, and a corresponding increase in the status and importance of relatively new occupations associated with the transfer of 'work' to computers, for example, systems designers and computer programmers. Many older workers have found the positions that they hold swiftly becoming redundant.

There are other negative aspects of the emergence of the electronic office, and it has been recognised that where the electronic office can provide both the employee and the employer many new opportunities, it also poses several serious problems.

For example, the general employment implications of the electronic office is a major issue of concern. Where a typist may be able to use their computer system to take on the work formerly carried out by a secretary and a receptionist, there will now be a decreased employment opportunity for secretaries and receptionist within organizations. One person doing the work of three is definitely more efficient, but leaves two former employees now 'redundant'. The increased efficiency of new technologies is then directly equatable on many levels with job losses. Many trade unions are naturally disturbed at this trend and the negative effects it signals not only for their own members, but for overall employment levels (Bammer, 1987; Dy, 1985).

The electronic office has also been associated with negative effects on the content and organization of work and on the mental and physical well being of the worker (Bammer, 1987; Smith, Cohen, & Stammerjohn, 1981).

With the introduction of new technologies into the work place a 'fragmentization of work',

typically takes place. The direct impact of such 'fragmentation', is that the workers autonomy and power of discretion within the job becomes severely abated. Many workers find that 'fragmentization' through the introduction of the electronic office "deskills" those jobs that remain. By allocating as much content as possible to the operation of the new technologies, jobs are reduced to minimum skills. These workers can quickly find themselves chained to their personal computer, and that former unsatisfying, repetitive, menial tasks are replaced with new tasks with as little or even less interest and status. This situation can actively generate feelings of alienation from the job (Ostberg, 1975; Dy, 1985).

In addition, the electronic office can devalue or render obsolete hard-learned skills, by replacing them with computer driven skills that all workers are expected to have, as for example, word processor abilities.

The electronic office can also be recognized as not only streamlining office operations, but also expanding managerial supervision significantly. Many workers resent loss of control over their own jobs, with many complaining about increased workload, work intensity and associated high levels of stress.

Finally, the implication of the electronic office on workers physical well being has also been recognized. Increased rates of reporting of aches and pains, eye-strain and other hazards, are associated with the increased use of modern technologies. As new technologies dramatically changed working conditions, the focus of health and safety experts also fundamentally changed to meet the new demands. Of especial concern was the reporting of muscular aches and pains directly associated with extensive use of visual display and keyboard systems. Health experts indeed began to describe injuries in the context of "overuse" of such systems.

It must be said that the reporting of problems associated with the workplace is in itself certainly not a new phenomenon. With that however, the introduction of visual display units (VDU) into a vast number of modern working environments, represented a substantial transformation in the regimen of work for many people, and led to an alarming increase in the reporting of occupational overuse injuries.

Thus, while the electronic office holds enormous potential to improve the content of jobs and working conditions, the reverse can also occur. The electronic office can help to initiate, reinforce or perpetuate management systems, work methods and working conditions which have negative mental and physical effects on office workers. Though much depends on the choices made concerning how new technology will be used and how it will be introduced, it has to be said that the very design of the new office technology, very flexible though it is, has to be applied in appropriate ways if its potential is to be realised.

1.2 International Experience of Occupational Overuse Injuries.

The electronic office is a multifaceted place, wherein exist a wide variety of jobs. These jobs are distinguishable by the influence of computerisation. The main focus of them has become the encoding of alphanumeric data by hitting the keys of a QWERTY style keyboard.

With that, even within one particular job category, be it secretary or typist, there are important distinctions to be made.

"In order to understand the nature of data-entry jobs, it is necessary to make a distinction between encoding alphanumeric data on a full-time basis and doing it as part of a job. Data encoding is a task: it can be combined with other tasks to make a job, or can in itself be the job when it is the only activity performed. For example, a secretarial job can include the tasks of stenographer, filing, typing etc., while a typist in a typing pool only has one task, that of keying or typing. Similarly, there is a distinction between using a machine occasionally as an adjunct or aid and using it full time." (Dy, 1985, p.3)

There have been several studies into the health issues related directly to data-entry work. For example, between 1960 and 1980 studies into an epidemic of overuse injuries, described as occupational cervicobrachial disorders (OCD), were reported in Japan (Maeda, 1977). OCD was reported initially in 1958 among punch-card perforators and was subsequently found to affect typists, telephone operators, and office keyboard operators. These are all workers involved in jobs characterized by repetitive work activities, which leads to overuse of certain

muscles. In 1964, the Japanese Ministry of Labour reacted to this problem by issuing the first major guideline for keyboard operators. This guideline required keyboard operators to undertake several new activities intended to reduce their reporting of muscle aches and pains (throughout this thesis, the phrase 'muscle aches and pains' and the term 'discomfort' will be used interchangeably), and included not working for longer than five hours a day, having a 10-minute rest-break each hour, and to insure that they performed fewer than 40,000 keystrokes a day (Aoyama, Ohara, Oze, & Itani, 1979).

The rate of reporting OCD for Japanese cash-register operators, particularly where their arms and hands were concerned, was significantly reduced after the introduction of other counter measures which limited keyboard operating hours and introduced job rotation (Aoyama et al., 1979). The obvious constraints of the application of these regulations to some industries, for example, limiting a worker to only 5 hours work a day, did not reduce their usefulness as a guide to approaching overuse injuries.

In Australia between 1970 and 1990 several reports were released, related to the incidence of overuse injuries (Bammer & Blignault, 1988; Ferguson, 1971; McDermott, 1986; Ryan, Mullerworth, & Pimble, 1984). These reports were stimulated by a marked increase in the reporting of overuse injuries. In some cases there was an unusual pattern to the reporting of these injuries, and this led to scepticism as to the existence of overuse injuries in some quarters (Hall & Morrow, 1988). A prime example of the unusual nature of the reporting of overuse injuries was provided by a review of overuse injury figures for workers at the various offices of the Australian Bureau of Statistics. Where there was particularly high reportage of overuse injuries at the Victorian, New South Wales, and the Australian Capital Territory offices, incidence in the Queensland, South Australian, West Australian and Tasmanian offices remained low and static (McDermott, 1986).

There were also inconsistencies in the ergonomic analysis of overuse injuries (Gould & Grischkowsky, 1984; Ryan & Bampton, 1988; Sauter, Shleifer, & Knutson, 1991; Stock, 1991), which directly added to the medical scepticism regarding the role of ergonomic factors in this 'epidemic' (Hocking, 1987; Kiesler & Finholt, 1988; Royal Australasian College of Physicians, 1988).

Studies of health issues related to the general area of overuse injuries revealed that data-entry workers or keyboard operators report experiencing significant rates of neck, shoulder and arm pains, especially when compared with previous and existing comparative job categories (Maeda, 1977). To a lesser degree such injuries have also been observed in other occupations, such as cleaners and staff working on store "checkouts" (Gun, 1990; Hadler, 1986). Additional research into overuse injuries in other occupational sectors established that there is **no specific category** of workers affected by such injuries, since the problem was seen to occur to an equal extent in workers industrial vocations, data/information processing services, and with professional musicians (Fry, 1986).

Having said that, the perception of these injuries remains predominantly associated with two classes of occupation; repetitive process work, as in rapid, cycled production line work, and VDU or keyboard operation (Cohen, Arroyo, Champion, & Browne, 1992).

Thus, one major area of research became the investigation into the reportage of overuse injuries linked to data-entry work. This research led to VDU operators being identified as one of the occupational groups most at risk from developing such injuries (Arndt, 1983; Cohen et al., 1992; Maeda, 1977).

The international literature details an extensive number of studies into overuse injuries from an extensive number of countries, including Finland, Sweden, Switzerland, France, the United Kingdom, New Zealand, the United States and Canada (McDermott, 1986).

These studies have covered a wide range of possible factors associated with increased reportage of injury. Usually the VDU is seen as the independent variable in such studies, with such considerations as the number of ergonomic problems with a workstation (Arndt, 1983; Crespy & Rey, 1983; Department of Health (DOH), 1984; Huening, Grandjean, & Maeda, 1980), the physical work environment (Aoyama et al., 1979; Cohen et al., 1992), and the personal motivation and abilities of workers (DOH, 1984; New South Wales Government, Department of Industrial Relations (DIOR), 1984), being directly studied in relation to the onset and severity of occupational overuse injuries.

Other work has concentrated itself on the actual physical nature of the injuries (Feldman, Goldman, & Keyserling, 1983), the proposed aetiology of the overuse injuries (National Occupational Health and Safety Commission (NOHSC), 1986), and formulation of prevention guides (DIOR, 1984; DOH, 1985; Standards Association of Australia (SAA), 1987).

As the issue was investigated, a picture of manifold factors combining within the work place emerged. These factors include the static or fixed working position that keyboard operators adopt, the nature and organization of the task within the work place, equipment design and the working environment (Green & Briggs, 1990).

With increased research in this and associated areas concerned with reporting or incidence of occupational overuse injuries, a variety of labels designed to categorize these injuries appeared. As will be discussed later, this produced a confused picture of occupational overuse injuries.

1.3 Problems With the Terminology of Occupational Overuse Injuries.

Initially in Australia and in New Zealand, the term "repetition strain injury" (RSI) was used as an umbrella expression for all occupationally grounded overuse injuries. The term grew to encompass a variety of conditions. These conditions were characterized by discomfort or persistent pain distinctive to muscles, tendons and other soft tissues in the neck, shoulders and upper limbs. In Australia during the 1980s, RSI gained an uncommonly high profile for an occupational illness (Miller & Toplis, 1988). The issues surrounding these injuries was clouded when it was recognised that the actual "occurrence" of RSI was an epidemic exaggeration of what are endemic complaints in certain occupations. A good example of this is the case of the apparent discrepancies of reportage in comparative sectors of the Australian civil service (Bammer & Blignault, 1988). Such findings helped foster claims RSI reportage was "... an epidemic form of hysteria ..." (Lucire, 1986).

In describing the nomenclature of occupational repetitive movement injuries, it has to be said that where the application of the term RSI was particular to Australia, New Zealand and the United Kingdom, other countries continue to use a variety of umbrella terms which referred

to the same overuse injuries.

For example in Japan, the term "occupational cervicobrachial disorder" (OCD) had been used since the late 1950s to describe occupational overuse injuries (Aoyama, 1985; McDermott, 1986; Maeda, 1977). Yet in the English language research literature, such overuse injuries appeared in a multiplicity of guises, ranging from "industrial rheumatology" (Hadler, 1986), "chronic upper limb pain syndrome" (Ellis, 1988) to the ubiquitous "repetitive strain injury" (RSI)(Chatterjee, 1987).

In the United States, the same order of occupationally based overuse injuries were labelled "cumulative trauma disorder" (CTD) (McDermott, 1986). Lately, a new term, "refractory cervicobrachial pain syndrome" (RCBP)(Cohen et al., 1992), has been added to this list.

This range of umbrella terms was one of the main contributors to the confusion within the medical profession, as to the history and aetiology of occupationally centred overuse injuries. It also increased the number of complications associated with the correct classification and diagnosis of specific repetitive movement complaints (Browne, Nolan, & Faithful, 1984). For example, although it was claimed that RSI was an illness specific to localized areas (Awerbuch, 1985; Bell, 1986), such as the hand, wrist or shoulder, there are many publications to testify to the contrary (Aoyama, 1985; Maeda, Huening, & Grandjean, 1980; Waris, 1979).

The difficulties for correct diagnosis continue to exist. This is despite the fact that the problems of classification and diagnosis were highlighted over ten years ago, in a series of reviews, which originated from researchers working at the Institute of Occupational Health in Finland (Kurpa, Waris, & Rokkanen, 1979a, 1979b; Waris, 1979).

These early Scandinavian reviews dealt with the overuse injuries tenosynovitis and peritendinitis (Kurpa et al., 1979a), occupational cervicobrachial disorders (Waris, 1979), and epicondylitis (Kurpa et al., 1979b). These researchers also identified problems such as the lack of standard diagnostic techniques, and difficulties associated with the systematic classification of disorders according to the International Classification of Diseases. At this time, the researchers considered that there was little research focusing directly on the

relationship between work activities and the prevalence of overuse injuries, and they proposed methods for the epidemiological screening of injuries (Waris, 1979). This can still be held to be true.

In the United States, during the period 1970 to 1980, two important reviews focusing on the overuse condition carpal tunnel syndrome (CTS) were being carried out by Armstrong and Chaffin (1979), and Cannon, Bernacki, and Walters (1981). Since this research was published, CTS has become a recognized occupational disorder in the United States, and much of the literature on CTS stems from this country. Yet little attempt has been made to "internationalize" this North American work.

That the problems of aetiology and accurate diagnosis of overuse syndromes has still not been adequately dealt with, is revealed by the 1987 Wallace and Buckle study. They reviewed contributions to the literature on musculoskeletal disorders of the neck, shoulder and upper limbs. They concluded that the terminology or vocabulary of overuse injuries, remains problematic (Wallace & Buckle, 1987). In fact, so does a comprehensive understanding of the pathophysiology or psychophysiology of these repetitive movement injuries. As stated, diagnosis and treatment therefore, continues to be complicated.

1.4 The Development of the General Construct of "Occupational Overuse Syndrome".

To attempt to deal with these various problems, following respectively the recommendation of the National Occupational Health and Safety Commission in Australia in 1986, and the lead of the Occupational Safety and Health unit of the Department of Labour in New Zealand in 1989, the term RSI has been replaced in usage by the more comprehensive term, "occupational overuse syndrome" (OOS). The reasoning behind this was explained so,

"From a general community viewpoint it was realized that an unsatisfactory umbrella term already existed and if it was not replaced with another more satisfactory term RSI would remain in use." (Ellis, 1988, p.133).

This updating of the operational nomenclature was mirrored in a number of other specialist

Australian and New Zealand organizations, and reflected the "failure" of RSI as a concept, and the desire to remedy the problems already outlined.

OOS symptoms are described as persistent or recurrent pain in either the hands, wrists, forearms, elbows, shoulders, neck, back, or any combination of these aches and pains. They appear to be associated with excessive and cumulative dynamic overloading, for example, excessive number of VDU keystrokes per day. This overloading is sometimes in conjunction with cumulative static overloading, for example, postural problems associated with poorly designed seating stressing the musculoskeletal system beyond its capacity to recovery. The following definition of OOS has since been incorporated into an Australian standard,

"... a generic term for a range of ailments characterized by discomfort and/or pain in muscles, tendons, and other soft tissues, with or without physical manifestations. It can be caused or aggravated by work or other activities and is associated with either repetitive movements, sustained or constrained postures and/or forceful movements. Psycho-social factors, including stress in the working environment, may be an important factor in the development of overuse syndromes." (SAA, 1987, p.4)

1.5 Aetiology.

That OOS is a generic, rather than a specific diagnostic term, needs to be underscored. Because of the variety and disparity of symptoms that exist for any one particular "syndrome", there is an obvious risk that the formation of such a term causes the arbitrary grouping together of a number of heterogeneous entities under one flawed "catch all term", as with RSI. RSI as a term implies a common pathology for the various injuries using a disease type criteria - and this is a fundamental epistemological error. The term OOS is definitely regarded as solely collective in concept, and any attempt to treat it as other than that is to be avoided. This is particularly pertinent when one realises that these types of overuse injuries do not differ conceptually or theoretically from pain developed through hobbies, sports, or non-remunerative "work" (Hadler, 1986).

The National Occupational Health and Safety Commission, known as Worksafe Australia, was

established in 1984 at the height of the RSI epidemic in Australia. In 1986 the commission released a report that characterized the aetiology of RSI as falling into 2 groups. The first group was described as being constituted of well defined and clinically recognizable musculoskeletal conditions, also known as localized conditions (NOSHC, 1986). The most common causes of localised conditions have been described as over-exertion, sprain, or local blunt trauma (Kurpa et al., 1979a).

The second group of diffuse muscle conditions was represented as consisting of a variety of diffuse presentations of pain - with or without clinically obvious symptoms. The Worksafe Australia report noted that the aetiology of these diffuse muscle conditions were uncertain, but that there appeared to be four main determinants of their onset; psychosocial stressors at work, such as high work demand and low personal autonomy; the operation of neurovascular mechanisms, such as the effect of static muscle work to maintain working posture; chronic muscle fatigue through overuse of muscles, such as dynamic muscle work for repetitive activity; and psychiatric disorder (Ellis, 1988).

Several extra factors which have been reported as important in the aetiology of repetitive injuries are, unfavourable environmental conditions, poorly designed working conditions and poor personnel management (Aoyama et al., 1979), worker cyberphobia (distrust of computers) (Kleeman, 1988), gender of worker (Kiesler & Finholt, 1988; Reid, Ewan, & Lowy, 1991), levels of technological change (Bammer, 1987), while personal and environmental factors cannot be ignored (DIOR, 1984).

This aetiological description can be extended to include the basic premise that the likely paradigm for OOS is that there are underlying endemic musculoskeletal problems associated with certain occupations (Waris, 1979). Despite this, the hypothesis of causal factors related to work and the development of OOS has not been adequately scientifically tested. This is mainly because,

"It is well known that certain types of manual tasks and these diseases correlate clinically, but this correlation does not necessarily imply the existence of a causal relationship." (Kurpa et al., 1979a, p.23)

So, though the connections between external work load and acute muscle fatigue and ache have been well established, the occupational basis of OOS has been only indirectly indicated by the objective clinical, electromyographic, biographical, and laboratory findings (Kurpa et al., 1979a; Waris, 1979).

Other contributing factors are the psychological and physiological constitution of the worker (Waris, 1979). It is known that certain sites are more at risk than others to overuse syndromes (Feldman et al., 1983). New beginners and workers who resume work after an absence due to vacation or a long sick leave report developing OOS symptoms more often than others (Kurpa et al., 1979a). While Knave, Wibom, Voss, and Hedstrom (1985) stated that women reported consistently more disorders than men, regardless of whether or not they were employed in VDT work.

This body of research combined to form a concept of a multifactorial aetiology of OOS. This view point is supported by other sources (Browne et al., 1984; DIOR, 1984; DOH, 1985; Green & Briggs, 1990; NOHSC, 1986; Ryan & Bampton, 1988; SAA, 1987).

1.6 Developing Occupational Overuse Syndromes through VDU work.

Theory linking specific health effects to specific causal factors is still imprecise, but there are two reasons to support the argument that VDU use occupations, are "at-risk" occupations.

- (1) because of the number of static and dynamic loading factors associated with pain, that arise from working with VDUs or keyboards (Arndt, 1983).
- (2) postural discomfort associated with the keyboard operator performing VDU activities, such as looking at source documents, the display screen or keyboard, operating the keyboard and working with source documents.

The "direct effects" of static and dynamic loading factors have been described thus,

"Static loading or sustained isometric contraction may be required of the muscles of

the neck, shoulders, and upper arms to support and fix the arm in a position of function. Dynamic loading or repetitive movement is required of the forearm, wrist, hand, and fingers (and sometimes of the upper arm at the shoulder) to execute a task." (DOIR), 1984. p. 39)

VDU and keyboard operation typically involves precisely such prolonged periods of constrained posture and repetitive movements. For example, the need to sit for long periods before the VDU while processing data, are characterized by static loading of muscles and constant, repetitive key typing motion.

"Under such conditions blood circulation may be reduced, preventing the proper supply of nutrients to the muscles and removal of muscle activity by-products, leading to rapid fatigue and pain. If these conditions persist on a daily basis, the result may be chronic problems often including the joints and tendons." (Arndt, 1983, p. 437)

The level of blood supply to muscles has been described as causing the muscle to contract in "a different and more damaging way" (Owen, 1985), in workers with overuse injuries.

The second point, and perhaps the most pertinent area of interest within the electronic office lies with the symptoms of postural problems with the seating arrangements of workers, which have been linked with the development of aches and pains. Postural discomfort often occurs when the keyboard operator performs unique VDU activities, such as looking at source documents while typing, watching the display screen or keyboard, and physically interacting with the keyboard while working on source documents.

"In doing this, the operator may assume a posture which ultimately leads to discomfort and pain. For example, certain movements (e.g., bending the head and upper part of the body to view the screen, keyboard and source documents; sideways movement and twisting in looking from the screen or keyboard towards the document; and bending and stretching when alternately viewing the screen and keyboard) can place loading on different parts of the spinal column." (Dy, 1985, p.58)

These are the major considerations in regards to VDU work and the risk of developing an overuse injuries, though other factors have been identified as directly or indirectly contributing to risk (Aoyama et al., 1979; Arndt, 1983; Bammer, 1987; DIOR, 1984; Kleeman, 1988; Kiesler & Finholt, 1988; Reid, et al., 1991).

An aetiology of OOS **specifically** for keyboard operators has been outlined in several guidelines, and can be said to be:

1. That the work station is not designed in accordance with good ergonomic principles.
2. That the worker has adopted an incorrect work posture.
3. The frequency and number of repetitive movements, for example, the daily number of keystrokes.
4. The need for sustained muscle tension on light-touch keyboards.
5. The introduction of an unaccustomed or novel work regimen for some workers.
6. The apparent variation in individual susceptibility to OOS.
7. The existence of work pressure to meet deadlines (a factor especially relevant to our study of newspaper staff).
8. A lack of knowledge and understanding of factors relating to occupational overuse injuries (DOL, 1985; SAA, 1987).

The degree of impairment associated with overuse injuries is then dependent on a number of features, with there being several factors which can tip the balance towards the rapidity of onset and severity of the overuse injuries.

1.7 Ergonomics Aspects.

For a long period there was the same level of uncertainty as to the specific ergonomic issues related to overuse injuries. Though this debate was not as mendacious as the one that raged through medical circles, there were serious questions raised about whether a definite and clear conclusions could be reached, in regards to the contribution of workplace ergonomic factors to developing overuse injuries.

Sauter et al. (1991) noted in their research, that initial field studies found positive associations between work posture and symptoms of overuse injuries amongst VDU and keyboard operators (e.g., Dainoff, Happ, & Crane, 1981; Huenting, Laeubli, & Grandjean, 1981; Maeda, Huenting, & Grandjean, 1982; Smith et al., 1981), but that all subsequent work refuted these early findings (Ryan & Bampton, 1988; Sauter, Gottlieb, Jones, Dodson, & Rohrer, 1983; Starr, Shute, & Thompson, 1985).

The Sauter et al. (1991) study was structured so as to overcome many of the methodological shortcomings of the prior research, which they conceived of as being the root cause of the discrepancies in result findings. They also directly addressed the issue of "the regional pattern of musculoskeletal symptoms among VDT users".

Sauter et al. (1991) findings clearly demonstrated a relationship between musculoskeletal discomfort and the physical demands of VDU and keyboard operator work, and that,

"... the effects of ergonomic factors are especially apparent in the prediction of arm discomfort" (Sauter et al., 1991, p.162).

They extended this point, by stating that the wrists and hands in particular may be regarded as especially susceptible to the development of musculoskeletal disorder. It was also suggested that their findings stressed the need for greater attention to the relief of load on the neck and shoulder girdle.

Interestingly, Winkle and Oxenburgh (1991) had independently concluded that neck and

shoulder girdle discomfort in VDU operators stems mainly from static load, and that the only satisfactory solution to this problem may be job enlargement. This issue will be discussed in greater detail later.

Further support for the position Sauter et al. (1991) espoused, was provided by Stock (1991), in her meta-analysis of studies of workplace ergonomic factors, such as repetition, force, and static muscle load, and the development of musculoskeletal disorders. Stock concluded through her analysis, that when the results of valid studies in this area were compared and aggregated where appropriate,

"... they provided strong evidence of a causal relationship between repetitive, forceful work and the development of musculoskeletal disorders of the tendons and tendon sheaths in the hands and wrists and nerve entrapment of the median nerve at the carpal tunnel." (Stock, 1991, p.87)

Such findings are supported by other recent research (Eisen & LeGrande, 1989; National Institute for Occupational Safety and Health, 1990).

Thus, although there has been little consensus amongst medical practitioners in the search for a clear conception of OOS, the most current ergonomics literature does support the concept.

Ergonomics is defined as the systematic study of the design of equipment, processes and environments. A task is designed to fit the psychological and physiological limitations of the workers using that equipment, involved in that process, or working in that environment. This then allows the worker to make the best use of their abilities. Ergonomics is characteristically called, "fitting the task to the person, and fitting the person to the task". This approach incorporates a number of features, including aspects of the workstation such as seating, the VDU screen and table, heating, air conditioning, noise and amount of working space. This last point is particularly interesting, when one realizes that the traditional office is often inadequate as a VDU working environment.

The ergonomic approach to OOS may be divided into three areas: anatomical, physiological

and psychological. It is from these information sources that the necessary expertise to deal with ergonomic design and redesign comes.

Anatomical considerations include anthropometry and biomechanics, and it is well recognized that depending on the position associated with VDU work and the design of the VDU workstation, a load is placed on the musculoskeletal system (Duncan & Ferguson, 1974; Maeda et al., 1982; Sauter et al., 1991). Though the maximum capacity of the musculoskeletal system is ordinarily not approached even in the most extreme positions, discomfort, fatigue, aches, pain and impediment to physical movement are attributed to the amount of effort directly required to support the posture of the body and the position of the limbs and the head, in a range of ergonomic sources (Arndt, 1983; DOH, 1984; Huening et al., 1981, 1980b).

To avoid such problems, the workstation must be designed to minimize muscular loading. To avoid the long term effects of static loading, relief in the form of movement or variations in posture are often recommended (Accident Compensation Corporation (ACC), 1992; Arndt, 1983), in association with better VDU workstation design (DOH, 1984).

Physiological factors include such aspects as efficient energy expenditure at work, and the gauging of the effects of the physical work environment on performance. For example, it is known that certain groups of musculoskeletal disorders and symptoms are common in the "worker" population, with such disorders typically grouping predominantly in the lower back (Troup & Edwards, 1985), and neck and upper body limit (Armstrong, Foulke, Joseph, & Goldstein, 1982; Oxenburgh, Rowe, & Douglas, 1985; Waris, 1979). Mechanical factors contribute to the development of these problems and in general influence symptoms (Kilbom, Persson, & Jonsson, 1986; Maeda et al., 1979; Pope, Frymoyer, & Anderson, 1984).

A further example. As already outlined VDU operators postures tend to be more constrained than when compared to other office workers, such as clerical workers. In describing VDU and keyboard operator posture, it has been said that there are three interfaces that exist between the VDU operator and their work-station: between the hand and the keyboard; between the operators body and the chair; and between the eye and the screen and other documents (Arndt,

1983). It is when these relationships are not established properly, that stressful posture can result.

As well, it has been shown that rapid, repetitive movements are associated with overuse injuries. For VDU and keyboard operators, this often takes the form of high-speed work with continuous and frequent repetitive movements of the arm and hands. These factors have long been recognized as causative factors in the development and severity of overuse injuries (Nakaseko, Tokunga, & Itani, 1976).

Psychological factors include the acquisition of task skills, such as typing proficiency. On a wider scale they may include the accumulation of such industrial and occupational psychological abilities as knowledge of employment selection, worker training, motivation, effort, and the concept of accountability of personal productive output.

It is often the case that an ergonomic problem in itself, reflects a mediation of an arrangement of all three sciences.

"The thorough application of ergonomics in the workplace is the ultimate tool for the long term prevention of repetition injuries. It should be applied to the selection, design and installation of new equipment, including standard furniture, the selection of tools or design of special tools, the workplace layout, and the details of methods to be used. Universal and effective application is most likely to be achieved by individuals from within the organisation who have had some formal training in ergonomics. Poorly designed chairs, benches, conveyor and footpedals; poor task design causing unnecessary movements; or even organisational problems such as inadequate training and induction, all require ergonomic solutions." (DOIR, 1984, p. 13)

It is theorized that any introduced ergonomic design and redesign approach should contain three main constituent elements:

- "1. Job analysis, modification and design.

2. Evaluation and design of the workplace which includes tools, furniture and equipment.
3. Work organisation factors, upon which task and workplace changes will depend. Into this area fall aspects of an organisational nature such as financial and managerial support which enable ergonomic changes to occur. Commitment to change must come at the highest level of the company because, like safety programmes, ergonomics can only be successful when all levels of management are involved." (DOIR, 1984, p. 14)

Thus, a problem will not usually be solved by merely purchasing new equipment, such as ergonomically designed chairs. Instead, it is of equal importance that detailed studies of methods, training schemes, proper maintenance and attention to personal characteristics and social problems be made in correspondence to the introduction of new "hardware".

"An organization should therefore plan not only for a once-off capital cost, but also for continuing costs of extra technical personnel. However, these costs will almost certainly be covered by savings in workers compensation insurance premiums, labour turnover and absenteeism costs, lost production costs, training costs, etc." (DOIR, 1984, p.14)

To help distinguish or delineate the problem and its relationship to work factors, the development of methods to estimate and record musculoskeletal symptoms have tended to rely on the questionnaire format (Kuorinka, Jonsson, Kilbom, Vinterberg, Biering-Sorensen, Andersson, & Jorgensen, 1987).

1.8 Personal, Social and Environmental Aspects.

It would be inaccurate to describe OOS injuries with the bias of only outlining ergonomic factors, as it has also been identified that personal and social stress, interpersonal "frictions" and work environment factors may act as the catalyst for the development of OOS problems with some workers (DOIR, 1984). Some relevant factors are listed in Table 1.1.

Table 1.1
Factors influencing Physical Capacity.

Personal:	(a)	Age ¹ , sex ² , constitution, health and physical fitness.
	(b)	Aptitude, skills, training and practice in the task.
	(c)	Habits of diet ³ , sleep and rest, recreation ⁴ , medication ⁵ , alcohol, tobacco.
	(d)	Personality, emotional stress, mood, morale, job expectations, job satisfaction, ability and opportunity to communicate, mental and physical fatigue ⁶ .
Social:	(a)	Cultural attitudes to work, motivation, incentives, company morale, security, anxiety, frustration, boredom.
	(b)	Personnel selection, workers' attitudes to compensation system.
	(c)	Cultural attitudes to health and sickness.
	(d)	Supervisory practices and relations with other employees.
Environmental:	(a)	Adverse degrees of noise ⁷ , heat ⁸ , cold ⁸ , light, pollution ⁹ , lack of oxygen, and other environmental influences.
	(b)	Design of tasks, tools, machines, equipment, workplace and work space and processes.

1. Age - younger workers usually do not have the skills and experience of older workers; older workers are usually less strong and fast than they were when they were younger and are more likely to be subject to the effects of physical wear and tear.
2. Sex - statistically women have on average ^{two thirds} the strength of men. Also on average they are smaller in stature and hand dimensions.
3. Diet - poor nutrition leads to a reduced physical capacity and increased tendency to disease and illness.
4. Recreation - hobbies, sports and activities away from work are conducive to mental and physical good health.
5. Medication - both prescribed and self prescribed, may interfere with a person's ability to work to their normal capability.

6. Fatigue - either mental or physical or both leads to a reduced capacity to work and increased risk of injury; chronic fatigue may lead to ill health thereby again increasing the risk of injury.
7. Noise - excessive noise may damage hearing; nuisance noise can disturb concentration.
8. Heating - warm temperatures can induce drowsiness in sedentary jobs; cold can reduce dexterity and manual performance.
9. Environmental pollution or insufficient oxygen -can reduce capacity for physical work. (Developed from DOIR, 1984, p. 12)

The relevance of these considerations, has been supported by other sources (SAA, 1987).

CHAPTER 2

MANAGEMENT AND TREATMENT STRATEGIES

2.1 Management and Prevention.

As a general approach to management of OOS it has to be held that the first goal of management is to reduce pain. The key factors in the successful management of occupational overuse injuries, depend on the implementation of a diverse range of strategies. The list of conventional strategies includes identifying and modifying risk factors in tasks, equipment and work environment, and the setting up of a reporting system of persistent symptoms by the employee to an appropriate professional health expert, such as the organizational health nurse.

Less conventional strategies include taking the opportunity to introduce work variation, which can occur through the alternation of repetitive with non-repetitive tasks at regular intervals through either job enlargement, job rotation, job enrichment or job sharing, and the creating appropriate and effective training and education programmes (ACC, 1992; Browne et al., 1984; SAA, 1987; DOIR, 1984; DOL, 1985; Linton, 1991; Winkle & Oxenburgh, 1991).

Ideally, there should be a series of strategies or intervention policies, covering all these aspects in every workplace where there is a VDU, and overuse injuries have been reported.

It should be stressed that within any organization, it is the interaction between the affected worker and the supervisor or the occupational health nurse or physician which is critical in determining the recovery from and the outcome of repetitive movement injuries. It must be also emphasized that where medical treatment is recommended, this should be in concert with the effective rehabilitation methods required (SAA, 1987).

2.2 Treatment or Management of Localized Conditions

Suggested treatments which are drawn from the literature are listed here for a number of localised overuse conditions. These treatments stress the particular and specific implementation of treatment methods for specific conditions.

(a) Tenosynovitis and tendonitis.

Are commonly observed overuse problems of the hand and wrist, and are seen as being interrelated (Kurpa et al., 1979; Occupational Safety and Health Service (OSH), 1992).

The introduction of a mediation strategy to deal with the exacerbating activity is of the greatest importance. The reduction of workload and the implementation of simple ergonomic modifications of the work and work pattern are appropriate. These steps are recommended in all OOS situations.

The use of local heat and anti-inflammatory medication may be also prove useful in reducing pain and swelling in the joints. However, it has been found that the response to management can be slower and less complete than in cases of acute tenosynovitis (OSH, 1992).

"Where there is clear evidence of acute tenosynovitis, injection of steroid, with modification of activity rest and/or splinting is usually effective." (OSH, 1992, P.25)

(b) Rotor Cuff Injuries (RCI)

The use of rest and analgesics is suggested. If this proves unsuccessful, local injection of steroid into subdeltoid bursa usually gives sufficient relief for sleep.

Modification of work pattern is undoubtedly an imperative if there is going to be any guarantee that unnecessary stretching or reaching will be avoided. It is seen as essential to advise workers that they should keep their elbows in at the sides of the body, and to caution them against any unnecessary raising of the arms. Unless these action are avoided, pain will almost certainly recur when the steroid wears off after three or four weeks.

There is also a meaningful role for physiotherapy to play in the treatment of RCI, and it should be tried for patients who do not respond to other strategies.

(c) Epicondylitis

Rest and medication are recommended, with physiotherapy being noted as typically a more useful strategy than for other localized OOS conditions. For example, a trial of ultrasound is advised (OSH, 1992). Steroid injections have also been used in severe cases.

Recurrence of OOS is likely even after the implementation of these techniques, unless the cause of the original aggravation is dealt with or appropriate ergonomic advice is not received. Such advice includes keeping the load off the wrist extensions and taking frequent breaks.

(d) Bursitis

The cited control of bursitis (OSH, 1992) is by removing the external causes where they exist. This can be through simple surgery. Steroid injection can also be used in acute bursitis cases.

(e) "Trigger Finger"

The workplace should be ergonomically redesigned to ensure the reduce likelihood of a relapse. Again, steroid injection can be used to give temporary relief.

(f) Ganglion

The removing of the ganglion without dealing with their causes, will typically prove unsuccessful.

(g) Carpal Tunnel Syndrome (CTS)

This condition is located in the wrist and localized injection of a steroid preparation into the flexor sheath at the wrist is recommended. This is described as a minor procedure with diagnostic and therapeutic value (OSH, 1992).

In addition, long term management and treatment relies on ergonomic changes being made and

the subjects work pattern being modified.

(h) Reflex Sympathetic Dystrophy (RSD)

Management of RSD is normally achieved through Guanethidine or sympathetic blockade.

Feldman et al., (1983) also noted that certain localized areas are at greater risk for developing OOS symptoms than other areas. They discussed the risk that the ulnar nerve may become entrapped in the hand or at the elbow, the median nerve at the wrist or on the forearm and the radial nerve in the upper arm. Expert advice is recommended for these conditions (OSH, 1992).

2.3 Treatment of Diffuse Muscle Conditions.

The general principles of treating diffuse muscle conditions are to insure the early identification of symptoms of OOS. For the diffuse muscle condition these warning symptoms may include fatigue, muscle discomfort and aches and pains.

2.3.1 Acupuncture/Acupressure.

Though often thought of as an "alternative medicine" (Bammer & Blignault, 1987), in acute cases acupuncture may be tried to reduce pain so that other approaches can be given a chance to work. With that, such strategies should not be expected to solve the problem in the long run.

"Acupuncture and analgesia may therefore have a role to give other methods a chance. Heat diathermy and ultrasound are normally ineffective and may aggravate symptoms."
(OSH, 1992, p.33)

2.3.2 Relaxation.

The instruction relaxation therapies is given much emphasis in approaching the management

of OOS in several guides (OSH, 1992; SAA, 1987), and as an approach, should be instituted immediately an overuse problem is detected. Working in a relaxed way is a key means to avoiding OOS.

"Differential relaxation is a common relaxation technique. This relies on contraction of muscles to relax its antagonist and on the fact that after a muscle is tensed, it automatically relaxes. Differential relaxation is inappropriate for most people with diffuse muscle OOS as the contracting phase of the technique will aggravate their pain." (OSH, 1992, p.34).

In fact, any system that deliberately reduces the stress or pressure involved in a "job" orientated task, such as stress or pressure related to meeting deadlines in the newspaper industry, has been argued as having benefits (Fowler, 1990).

2.3.3 Rest.

Many symptoms improve with rest, such as taking annual leave, but in advanced cases progress is slow. It has also been reported that once the worker is back at their work place, that the original symptoms can quickly reappear.

2.3.4 Postural Advice.

Instruction on posture is essential, and recommended in a variety of guidelines (DOH, 1984; OSH, 1992; SAA, 1987). This follows several basic postural points. For example, relaxing the shoulders, leaving elbows free and not slouching or slumping, are all recommended.

2.3.5 General Exercise.

Exercises are generally considered beneficial, but only when pain or tension in muscles is absent. Walking, swimming or other forms of general body exercise have been found beneficial by many people with OOS in their efforts to control pain.

Warm-up exercises before or during work are desirable for everyone in an at risk occupation, and tend to reduce incidence of OOS through the lengthening and strengthening of muscles, by maintaining blood flow and improving muscle balance.

Such exercises can include aerobic warm-up, tendon stretching, or local exercise to stimulate blood flow and promote relaxation. Such workplace exercises are important in modifying work behaviour, and are often promoted as means for the workers themselves to actively "modify" their work behaviour (DOH, 1985).

Adopting a recreation form of exercise, such as playing football or tennis, can also be beneficial in combating the overuse of certain muscles in the workplace.

2.3.6 Medication.

Drug use such as steroid injection or anti inflammatory drugs, are useful for some of the localized conditions. They have a smaller role to play with the diffuse muscle areas, where it is suggested that they should be only used to restore sleep (OSH, 1992).

Injections of local anaesthetic, or local anaesthetic and steroids together at trigger points, may help temporarily.

2.3.7 Splinting or Binding.

Splinting or binding of the affected area can be used to immobilize the effected arm and/or hand (Bammer & Blignault, 1987). It has a place in the treatment of OOS, and can take the form of simply bandaging the effected area.

The problem with such a strategy, may be that it could be counterproductive in signalling "injury" and endearing a long lasting passive dependent role for the affected worker. This building up of a resistance to a more constructive treatment of the injury, is obviously to be avoided.

2.3.8 Heat treatment.

Heat treatment, such as regular saunas, are a popular, informal method of treatment, but their application comes with a caution.

"The application of heat may be of benefit in some stages, but should not be applied in the acute or early stage ... [of OOS] ..." (DIOR, 1984, p. 42).

2.3.9 Physiotherapy.

"Physiotherapy" as a term is an ambiguous expression. The term can include a variety of treatments, ranging from muscle massage to ultrasound treatment. There is a certain amount of debate over the general use of physiotherapy, with some sufferers strongly arguing its general use, while certain recommended exercises have been reported as making certain overuse injuries worse (OSH, 1992).

2.3.10 Massage.

Massage is a popular and widely available form of treatment, both in-formally and formally. Many sufferers report it as being beneficial. Its use in a professional setting, such as physiotherapy, can also be applicable to moderate overuse injuries.

2.3.11 Surgery.

Surgery is usually reserved for only extreme cases of CTS or RSD, and as such, has little relevance for most OOS conditions that emerge with VDU and keyboard operators. The tendency is that these syndromes do respond well to surgery, but that the long term results of such surgery is that the OOS sufferer is unable to return to work.

2.3.12 Occupational Therapy.

Occupational therapy in this sense means the adoption of such "job based" strategies as using

"job rotation" or "job enlargement" to combat OOS. Though widely recommended (DIOR, 1984; DOH, 1984; SAA, 1987; Winkle & Oxenburgh, 1991), there tends to be little actual emphasis on the adoption of such strategies in the workplace.

2.3.13 Changing the Job design.

Changes in job design include the reduction of work rate, employment of work variation within a job, and allowing for micropauses or more regular rest breaks, all of which are recommended treatment methods (DIOR, 1984; DOH, 1985). As mentioned in the section on general exercising, muscle stretching exercises at regular periods, can also be beneficial.

Another aspect of altering the overall job design has been suggested through the increased role of supervisors in the detection of OOS symptoms. It has been shown that a behavioral workshop for training immediate supervisors can be an effective means of reducing musculoskeletal pain injuries (Linton, 1991).

In the Linton (1991) study, subjects reported that after the implementation of training workshops for supervisor, that there were positive changes with regard to their knowledge about musculoskeletal pain, as well as actual use of the methods they were taught for dealing with these problems. Workers also reported improvements in the way their supervisors handled musculoskeletal issues, suggesting that the supervisors maintained the program.

2.3.14 Changing the Ergonomic design of the Workplace and/or Worktools.

A standard and widely employed solution to increased rates of OOS reportage is to reevaluate the office VDU work-stations, and to bring equipment in line with accepted ergonomic recommendations (Darby, 1984; DIOR, 1984; Ferguson, 1974; Huenting, Laeubli, & Grandjean, 1980; SAA, 1987; Sauter et al., 1991).

However, it has been noted that,

"... in some organizations where considerable investments have been made in ergonomic equipment ... to insure that peoples' wrists are held properly, the incidence of carpal tunnel and other RSI syndromes has continued unabated or has even increased." (Kiesler & Finholt, 1988, p.1004).

2.3.15 Miscellaneous.

The Alexander technique and the Feldenkrais method have been found helpful as methods of postural correction, breathing control and relaxation, at least temporarily. They are highly spoken of by some sufferers, but have not been researched.

CHAPTER 3

THE CLINICAL PERSPECTIVE OF OOS

3.1 Clinical Classification of Occupationally Derived Overuse Injuries.

We must remember, that the term OOS is only to be regarded as an umbrella term, as the injuries which are covered should not be treated as having the same neurophysiology or psychophysiology. The dangers of considering OOS as any more than an umbrella term, has already been highlighted in the case of the "misuse" of the term RSI,

"Much virulent debate was engendered by the name RSI and its clinical connotation, and much energy was expended in denying that it was an "injury" (as defined by identifiable tissue damage), let alone caused by "strain" or attributable to "repetitive" actions. It is clear that the term was an unfortunate choice, as not only did it obscure the real clinical nature of the problem and thus trigger a variety of heuristic attempts by a number of disciplines to make it conform to conventional wisdom but also its interaction with the existing sociopolitical structures made it easy prey for adversarial argument rather than clinical judgement." (Cohen et al., 1992, p. 432)

Although RSI as a clinical concept has been assessed as being a "failure" (Wright, 1987), the need for a clinical construct or a theory of occupational overuse injuries remains. Cohen et al., 1992, analyzed RSI from the viewpoint of clinical and scientific knowledge and proposed an hypothesis of its pathogenesis based on careful clinical studies, to be used as a guide in its diagnosis. They argued that RSI evoked three sets of responses: medical, psychiatric and sociological. They further argued three general points;

"Firstly, although many cases of ... [OOS] ... clearly did not fit descriptions such as arthritis, tenosynovitis, "carpal tunnel syndrome" and cervical spondylosis (*sic*), those labels were nonetheless applied, with treatment predicted accordingly. That such therapy was unsuccessful seemed not to induce reconsideration of the clinical labelling." (Cohen et al., 1992, p. 432)

Secondly, they described how the term RSI evolved in Australia to encompass,

"... any pain in the upper limb, pectoral girdle or neck, whether discrete or diffuse in nature, even when verifiable alternative diagnoses could be made." (Cohen et al., 1992, p. 432)

Through this the common clinical elements or denominators were obscured, and it was made impossible to determine the clinical "nature" of the population of patients under scrutiny.

"This failure to distinguish the denotation of the term RSI from its connotation may be seen as the fundamental epistemological error in the saga." (Cohen et al., 1992, p. 432)

The third point that they made, concerned the formation of "diagnostic criteria" and "staging" models for RSI. They argued that such criteria were advanced in an attempt to equip medical practitioners with a conceptual or theoretical framework through which to process the clinical problem (Browne et al., 1984). However, as Cohen et al. (1992) asserted, these criteria were not effectively and directly linked to pathophysiology, or even to clues therein, and became tautologous.

Cohen et al. (1992) accurately point out the whole issue of diagnostic criteria for RSI had been compounded by statements from the ranks of physicians in particular, who repudiated the possibility of an organic basis for the problem in an attempt, they state, as being motivated by a desire to "... remove the problem from the jurisdiction of internal medicine." (Cohen et al., 1992, pp. 432 - 433).

As already mentioned, VDU and keyboard work have been identified as OOS "prone" tasks (Cohen et al., 1992; DOIR, 1984; Maeda, 1977), because of a conglomeration of factors including that they often require rapid, repetitive, movements of forearms, wrists and fingers, in tandem with musculoskeletal load associated with sitting at a workstation for long periods of time.

These factors can directly lead to injuries of the muscles and tendons of the forearms, hands, shoulders, neck, elbows and back, and often a combination of injuries to a variety of these areas. To detect these overuse injuries, careful, clinical examination is required with their initial reporting, and at any subsequent follow-up examination. In the treatment of the injury, it is especially important to assure that the injury is accurately diagnosed at this early stage, and implement a therapeutic strategy. However, the physical findings will often be "semi-objective", with descriptions of local tenderness or pain in the movement of a joint, only being demonstrated after stretching of the muscles and the reproduction of paraesthesia and numbness by evocative manoeuvres by the diagnostician. This produces a tendency to incorrectly diagnose the severity of the symptom.

This problem exists at this stage of the condition, because objective features such as heat, swelling, and crepitus are unusual in the most chronic repetitive injuries and are more often found in the most acute stage (DOL, 1985). The pathophysiological nature of occupational repetitive movement injuries has been a contentious point, with a debate raging between those supporting the existence of overuse injuries, and those denying its physiological verity. As McDermott states,

"There is no agreement concerning the cause; the pathology is unknown; the clinical features are diffuse; there are no useful diagnostic investigations; and the prognosis is uncertain. ... [and there is also] the assertion by a number of medical practitioners that there is no physical basis for RSI. ..." (McDermott, 1986, p. 196)

What does remain constant is that "reported" pain occurs in all cases and some tenderness is usually evident. This tenderness is frequently diffuse and may be detected in the muscle bellies and tendons of the forearm muscles, in the hand muscles and in joint capsules (Fry, 1986).

"Tenderness of cervical and shoulder muscles or in the capsule of the first carpometacarpal joint of radial ligament of the wrist may be present. Weakness, numbness or paraesthesia or swelling may also be present. It is more common for the patient to complain of a sensation of swelling than for swelling to be found on clinical

examination. Depression is common in patients with persistent symptoms." (McDermott, 1986, p. 198)

Several diagnostic tests exist and manipulative tests may be used to aid the diagnosis of OOS. These involve the assessment of active, passive and resisted movements of the upper limb and shoulder and of the neck region. They include passive wrist flexion and extension, passive ulnar and radial deviation, resisted flexion of the wrist and elbow, and passive and resisted movements of the shoulder and neck.

Other diagnostic tests include nerve conduction velocity (before a carpal tunnel operation) and electromyography, to detect excessive muscle tension. Passive wrist flexion and extension can be used, where passive movements give information about inert structures such as the ligaments and joint capsules. In OOS, passive movements also give information about tight muscles, with discomfort at the extreme range of movement. There is also the technique of passive ulnar and radial deviation. These movements give information about the state of the ulnar and radial wrist ligaments (OSH, 1992)

It has been suggested that the specificity of some of these tests is not high. Resisted movement test may be too severe where diffuse muscle conditions are present and may induce severe pain. They should, therefore be used with extreme caution (OSH, 1992)

3.2 The Three-Stage Clinical Model.

Although the proposed clinical stage models have not proven overwhelmingly successful, the formation of earlier models was frustrated by the arbitrary grouping together of a number of heterogeneous entities under the imperfect RSI term. This was a term which implied a common pathophysiology for the various injuries being reported.

This cardinal epistemological error has been avoided in the formation and use of OOS.

The paramount criteria for labelling an injury as an OOS injury, is that the injury be directly linked to the severity, reversibility and occupational activity of the subject. The use of such measurable properties makes it feasible to then attempt to construct and validate severity or

staging models of OOS.

Several staging models for RSI or OOS have been proposed, for example, the five-stage model advanced by Fry (1985), which he commented was very similar to that developed by the Commonwealth Health Department, Victorian Division. In competition to this model the Occupational Repetition Strain Injuries Advisory Council of the New South Wales Government Department of Industrial Research, developed a three-stage system for overuse movement injuries in 1984. Although their model was originally proposed for RSI, it has gained a wide acceptance within the overuse injury field.

In the DIOR system, repetition injury symptoms can be staged clinically according to their severity, reversibility and outcome. Their arbitrary, but clinically useful system of staging, has been used by other researchers (Browne et al., 1984; DOL, 1985).

The DOIR model describes how in the first stage there is usually aching and tiredness of the affected body area, such as the arm or hands, which develop sometime during the work shift, but settle overnight and are not obvious on days off work. There is no significant impairment in work performance, and a medical examination doesn't normally detect any pathological signs of the presence of an injury. The reporting of a symptom at this stage is often confounded by a lack of awareness of the hazards of the syndrome by the affected worker, or supervising staff. This stage of the condition can persist for weeks or months, and symptoms are readily reversible by resting the affected body part, either over the weekend, or during holiday periods.

In the second stage, the aching and tiredness are recurrent and increasingly occur earlier and persist longer in the work shift. The symptoms fail to ease overnight, can disturb sleep, and are linked with a reduced capacity for the person to do repetitive work. A medical examination may detect physical signs. This stage of the condition usually persists for months. It requires longer breaks from work for there to be a reversibility of symptoms.

In the third stage, the pain, aching, fatigue, and weakness continue even when the affected

body areas are at rest. Non-repetitive movements cause pain and the person is generally unable to perform light duties, while also having difficulties with tasks outside work. The symptoms cause disturbance of sleep. Physical signs are also present. This stage of the condition may last months or years, and often the affected worker is forced out of the workforce by the severity of the injuries (Browne et al., 1984; DOIR, 1984; DOL, 1985).

3.2.1 A Description of the Three-Stage Clinical Model.

" *Stage 1 (Early Stage)* - Aching and tiredness of the affected limb which occurs during the work shift, but settle overnight and on days off work. There is no significant reduction of work performance nor any physical signs. This condition can persist for weeks or months, and is reversible.

Stage 2 (Intermediate Stage) - Recurrent aching and tiredness which increasingly occur earlier in the work shift and persist longer. Symptoms fail to settle overnight, cause disturbance of sleep and are associated with a reduced capacity for repetitive work. Physical signs may be present. This condition usually persists for months.

Stage 3 (Late Stage) - Aching, fatigue and weakness persist at rest and pain occurs with non-repetitive movement. The symptoms cause disturbance of sleep. The person is unable to perform light duties and experiences difficulty with non-occupational tasks. Physical signs are present. The condition may last for months to years." (DOIR, 1984, p. 198)

CHAPTER 4

THE OBJECTIVES OF THE STUDY

4.1 The Present Proposal.

The research project that this thesis describes, was instigated by Independent Newspapers Limited (INL) Human Resources division through the Occupational Safety and Health unit of the New Zealand Department of Labour, to identify the personal, environmental and occupational factors associated with the development of occupational overuse syndrome among their VDU and keyboard operators.

Though there has been a backlash against the notion and discipline of occupational repetitive movement derived injuries (with some commentators saying that the issue has been "put to rest" (Ferguson, 1987)), the questions of aetiology, methodology, epistemology and semiology remain basically "unanswered".

This research project is aimed at specifically describing the aetiology of OOS at INL. It was fully expected that the research would confirm a multifactorial aetiology. A three-stage clinical model was employed, with the intent of identifying successful therapies or intervention strategies already being utilized by the sample group to deal with these syndromes.

Though the study was limited to INL divisions, the diversity of those divisions and the VDU operations taking place in them, led this researcher to anticipate being able to generalize the results of this project, to a more general population of VDU and keyboard operators.

4.2 The Independent Newspapers Limited Study.

During early 1991, the study was initiated with INL. Some 1000 VDU and keyboard operating staff working at Independent Newspapers eight newspapers in Auckland, Hamilton, New Plymouth, Palmerston North, Wellington, Christchurch, Timaru and Invercargill, and the many "local" newspapers also published under the INL banner, were to be sampled. The introduction of VDU into these various divisions had not been a standardized operation, and

interesting perspectives of general VDU use were expected. Though there has been a corresponding increase in the reportage of OOS in all the VDU and keyboard operators, the "job categories" seen as most at risk at INL were reporters and sub-editors.

The study also planned to evaluating the frequency of OOS injuries of the sample of keyboard operators. Job categories under scrutiny included reporters, sub-editors, visual display setting personnel, tele-ad receptionists, and accounting and clerical staff.

The objectives of the study were then to:

1. Develop further our understanding of the aetiology of Occupational Overuse Syndromes with the INL VDU and keyboard operators.
2. Investigate a theory of a three-stage clinical model (Browne et al, 1984; DOIR, 1984; DOL, 1985).
3. Test the severity and reversibility of the overuse movement injuries, to be able to assess the causal and mediating factors associated with the prevalence of OOS injuries.
4. Assess effective existing treatments being used to cope with overuse injuries

In other words, the aetiology of OOS was to be researched and related to the three-stage model, with the intent of identifying successful therapies or intervention strategies being used within our sample to deal with these syndromes.

CHAPTER 5
METHOD

5.1 Subjects

Questionnaires containing biographical and musculoskeletal discomfort data were returned by 575 of the total sampled population of 980 subjects, employed in the eight divisions of Independent Newspaper Limiteds' New Zealand wide chain of daily and weekly newspapers.

Table 5.1.
Occupation Categories

Label	Frequency	Percentage
Reporter	131	22.8
Sub Editor	112	19.5
Tele Ads	59	10.3
Displays	57	9.9
Accounts	116	20.2
Other	95	16.5
Missing	5	0.9
	-----	-----
Total	575	100.0

The subjects by occupation category are represented in Table 5.1 and Figure 5.2. The break down of those respondents who answered to "other" than to these main occupation categories are represented in Table 5.2 and Figure 5.2. Reporters (131), sub-editors (112), and worked in accounts or clerical positions (116), made up the largest portions of the sample.

Of the total number of respondents in the sample 219 were male, and 353 female. The three missing cases are respondents who did not reply to this question.

The range of ages was from younger than 20 (25), 21 to 30 (210), 31 to 40 (150), to 41 and over (100), with the two missing cases being respondents who failed to answer this question. In relation to VDU use, there were 64 left handed people and 508 left handed. There were three missing cases, due to these respondents failing to answer this specific question.

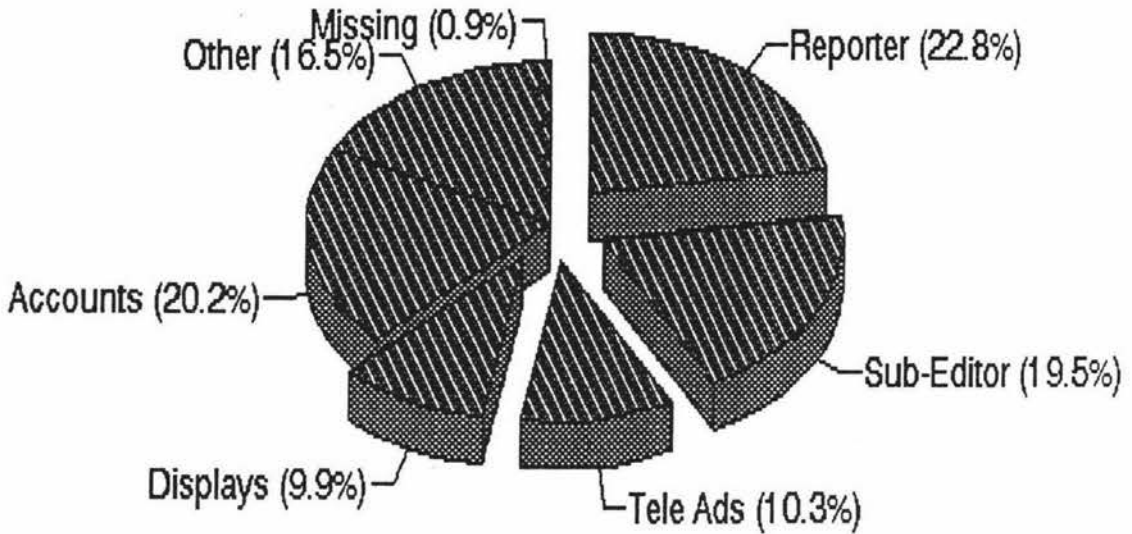


Figure 5.1. *Pie Graph of Occupation Categories.*

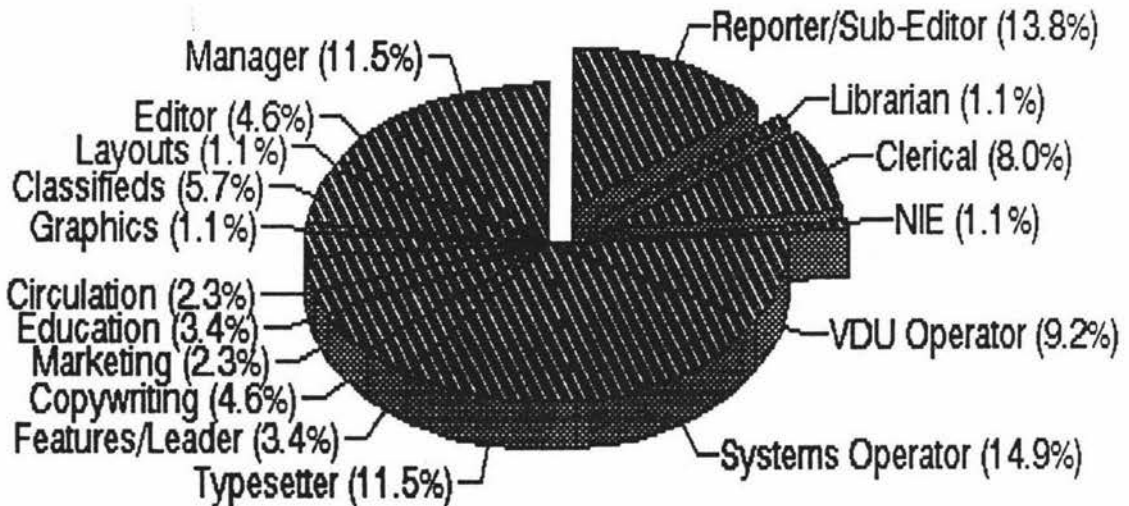


Figure 5.2. *Pie Graph of Other Occupation Categories.*

Subjects jobs involved the computer entry of handwritten alphanumeric information from a range of sources using a VDU with a detached QWERTY keyboard. The position of the keyboard in the workstation varied. Documents were typically manipulated with the left hand, and the right hand was used almost exclusively for keyboard operation. Wrist rests and foot

Table 5.2.
Other Occupation Categories.

Label	Frequency	Percentage
VDU Operator	8	9.2
Reporter/Sub-editor	12	13.8
Manager	10	11.5
Systems Operator	13	14.9
Features/Leader	3	3.4
Graphics	1	1.1
Clerical	7	8.0
Typesetter	10	11.5
Classifieds	5	5.7
NIE	1	1.1
Editor	4	4.6
Librarian	1	1.1
"Education"	3	3.4
Marketing	2	2.3
Layouts	1	1.1
Circulation	2	2.3
Copywriting	4	4.6
Total	95	100.0

rests were available, but not always in use. There was little opportunity to adjust the keyboard or video display setting. Worktables could not be adjusted. The chairs met modern ergonomic requirements as regards to adjustability.

5.2 The Research Measure.

Studies in the area of repetitive movement injury tend to rely on the questionnaire format. Questionnaires provide a means of quick, and extensive sampling of large target populations, and have proved to be most comprehensive means of collecting the necessary data (Kuorinka et al., 1987).

The research questionnaire for this study, is formulated so as to measure several factors already described, and recognized as being mediating or causative to the onset, extent and severity of occupationally derived repetitive movement injuries. The questionnaire draws on several major sources, and was developed as a self-administer measure. In it, the subjects are requested to complete a series of questions. These questions were either open ended, forced choice binary or multi-choice questions. The questionnaire employs a self-administered

format, and the study used a cross-sectional sample of VDU and keyboard operators at INL, using a within-group design.

The questionnaire consists of three general sections. The first asks about general biographical information concerning the respondent, as in type of work, sex, age, and if the subject is right or left handed.

The second section presents questions about muscular aches and pain, such as if the respondent actually suffers from any discomfort, and if they do, whether they have mentioned it to their manager or supervisor.

The third section presents questions about the respondents workstation and its ergonomic aspects; as in asking about the respondents seating, screen and table.

Briefly then, respondents were presented with questions which generally asking:

1. If they feel discomfort.
2. If they do, what is the nature of that discomfort and where is it located.
3. Have any changes occurred in their work patterns or work stations.
4. Have they adopted new types of behaviour, and if so, is this because of any discomfort they feel.
5. If they feel discomfort, what means (ie., therapy), if any, have they adopted to alleviate this discomfort.

The first asks about general information concerning the respondent, as in type of work, sex, age, and if the subject is right of left handed (10 questions). The logic of asking questions on preferred hand use is that,

"Many extremes processes are designed for right-handed persons, which left-handed persons find extremely difficult to perform. Right-handed designed equipment may be strain inducing when used by left-handed persons." (SAA, 1987, p.3)

If the respondent answered "Yes" to Question 9. "Do You Have Any Discomfort Now?", their second section incorporated questions about muscular aches and pain, such as if the respondent actually suffers from any discomfort, and if they do, whether they have mentioned it to their manager or supervisor (37 questions). This section also asks the respondents to rate the severity of their injury on a 7-point Likert-scale ranging from 1 (mild) to 7 (extreme), in 11 specific upper and middle body areas.

If the respondent answered "No" to Question 9., their second section consisted of questions on muscular aches and pains as well, but in the past tense, for example, have you ever had neck or shoulder pain, and have you ever had pain in your lower back.

The third section that all respondents were asked to complete, presents questions about the workstation and its ergonomic aspects, as in asking about the respondents seating, screen and table.

The design of the questionnaire, draws on five major sources:

- (1) The recommendations presented by Mr. Frank Darby (ergonomic scientist) of the Occupational Health Service (OSH), Department of Labour, in the draft protocol for this research programme.
- (2) The questionnaire developed by Green and Briggs (1990), to study prevalence of overuse injuries among keyboard operators. This questionnaire concentrated on:
 - (a) Biographical information - such as sex, age, preferred hand use.
 - (b) Job characteristics - job category, job title, job status. Job status was classified as either high or low from job title and was based on both salary and degree

of autonomy in the position as indicated by the university's Industrial Relations Officer. As well, duration of employment, number of hours spent at the keyboard during the a normal working week and during a busy (peak) working week.

- (c) Keyboard equipment - type of keyboard used (recognizing that more than one may be used - the major keyboard was defined as that on which the most time was spent), adjustability of workstation components and the extent to which this is used.
 - (d) Health status - presence of symptoms associated with overuse injury (pain weakness, stiffness, fatigue, cramps, numbness, tremor, swelling, heaviness) during a normal and peak working week (Green and Briggs, 1990).
- (3) The questionnaire developed by Slovak and Trevers (1988) in their research into workplace problems associated with VDT. They describe the development of their questionnaire thus;

"The questionnaire was designed to be comprehensive but simple and quick to answer. Certain features are worthy of special note. In order to obtain reliable answerers and an adequately high response rate, respondents must be certain that the information is confidential and in their control. This was clearly stated in the preamble. Also, the procedure to be used for responding to and acting upon the questionnaire was clearly outlined. A particularly important feature of the questionnaire was its differentiating of ergonomics and symptomatic problems so that their relationship could be subsequently be explored. Finally, certain issues, such as reproductive health, will be seen to be absent. The main reason for this was one of questionable relevance. Nevertheless, it seemed important to offer reassurance and the opportunity for confidential discussion if desired." (Slovak and Trevers, 1988, p.99)

The questionnaire is to be found as Appendix 1. to this thesis.

- (4) The body of work carried out by Huening, Laeubli and Grandjean (1980a, 1980b, 1981), in their research of the ergonomic requirements of the VDU workplace. Of particular interest was the work that they did in translating and further developing a questionnaire form used originally by the Japanese Committee on Cervicobrachial Disorder (1973), for the self reporting of musculoskeletal discomfort.

This form was used by the Japanese Ministry of Labour in 1974 to sample a population of 16,960,000 workers employed in private enterprises with 30 or more workers (Maeda, 1977). The relevant areas of this measure to this study was the sections that focused on postural pain;

"Postural pain: Inquiries on pains in the locomotor system were carried out by means of a questionnaire developed by the developed by the Japanese "Committee on cervicobrachial syndrome of JAIH" and used in a sample of 16.9 million workers. The questionnaire was translated, and modified and illustrated with anatomical drawings of the trunk, hands and arms; it was checked for suitability by Maeda and Huening (1980).

In the questionnaire, employees were asked about the following for different parts of the body.

pains	cramps
stiffness	numbness
fatigue (tiredness)	tremor

The possible answers were: "daily", "occasionally" or "seldom or never". Furthermore, the subjects had to judge their workplace and their work at the terminal: individual items were formulated as statements and five answer categories were given." (Huening et al., 1981, p. 919)

- (5) The work of Kuorinka et al. (1987), in the development of the Standardized Nordic questionnaire for the analysis of musculoskeletal symptoms.

The questions they developed are forced choice variants and were designed to be either self-administered or used in interviews. Kuorinka et al. (1987), concentrated on symptoms most often encountered in an occupational setting. Specific characteristics of work strain are expected to be reflected in the frequency of responses to the questionnaires. In explaining the *raison d'etre* of their work, Kuorinka et al. said,

"Standardisation is needed in the analysis and recording of the musculoskeletal symptoms. Otherwise it is difficult to compare the results from different studies. This consideration was the main motive for a Nordic group to start developing standardised questionnaires for the analysis of musculoskeletal symptoms." (Kuorinka et al., 1987, p. 223)

The questionnaire followed the tradition of some earlier medical questionnaires - eg, for cardiovascular (Rose & Blackburn, 1968) or pulmonary surveys (British Medical Research Councils questionnaire for chronic bronchitis (Anon, 1960a, 1960b)). They argued that however, the nature of the musculoskeletal symptoms dictates a different structure (Kuorinka *et al*, 1987).

The reliability of the various sections of the questionnaires were shown to be acceptable in several ways.

The reliability of the neck-shoulder questionnaire was tested on 27 women in clerical work, who answered the questionnaire twice with a 3-week interval. The percentage of disagreeing responses varied from 0 to 15%, except for question 4 and 13 where it was 30 to 22%. respectively. The validity was tested on 82 women in electronics manufacturing. The questionnaire responses were compared with those obtained when a physiotherapist filled out the questionnaire after a thorough interview about medical history. The percentage of disagreement between the subjects own responses and the physiotherapists estimates varied from 0 to 13%.

The reliability of a preliminary version of the low back questionnaire was tested on 25 nursing staff members who answered the questionnaire twice with a 15-day interval

varying from 0 to 4%, except for one question where it was 25%. As a consequence, this question was reformulated in the final version.

The questionnaire was further used as the basis of the British Health and Safety Executive (HSE) form. Though the HSE working group reported a significant number of improvements, these improvements lay mainly in the wording, layout and administration of the questionnaire (Dickinson et al., 1992). This work led to the a standardized HSE version of the Standardized Nordic Questionnaire being developed.

Using these sources, the present self-administered research questionnaire was developed for INL. In it, the subjects will be requested to complete a series of questions generally asking:

1. If they feel discomfort.
2. If they do, what is the nature of that discomfort and where is it located.
3. Have any changes occurred in their work patterns or work stations.
4. Have they adopted new types of behaviour, and if so, is this because of any discomfort they feel.
5. If they feel discomfort, what means (ie., therapy), if any, have they adopted to alleviate this discomfort.

5.3 Procedure.

The OOS and demographic questionnaires were distributed via office managers and the divisional occupational health nurses. The questionnaires were administered in May, 1992, and the data was coded and analyzed from July, 1992 onwards.

Attached to every questionnaire, was a covering letter outlining the intention of research, and

emphasising the importance of responding to the questionnaire. The initial distribution was backed up by the posting of two follow-up letters, aimed at improving the overall return rate (see Appendix 4).

The distribution was sponsored by the Occupational Safety and Health Unit of the Department of Labour, and sent out with the active participation of INLs' own Legal and Human Resources division. Support was also gained from the relevant unions, who officially endorsed the study.

Babbie (1979) recognized that useable return rates less than 50% frequently suggest cautious generalizability. Though such limitations are minimized when large samples or total populations are surveyed, there is a contrary view that suggests that unless a return rate exceeding 80% is achieved, the survey should not be analyzed (Dickinson et al., 1992).

The data analysis was conducted using a total of 575 returned questionnaires, a return rate of 58.61% (see Table 6.1).

5.4 Analysis Plan.

Analysis of the data proceeded in three stages. In the first stage, effects of biographic and VDU exposure variables were examined using the Statistical Package for the Social Sciences - Personal Computer Version 4.0 (SPSS/PC+)(Norusis, 1990).

The SPSS/PC+ FREQUENCY and CROSSTABS (cross tabulation) runs were used to identify trends within the data between musculoskeletal discomfort, and ergonomic and biographical data.

In the second stage scores for musculoskeletal discomfort were analyzed using SPSS/PC+ FREQUENCIES (Norusis, 1990), t-tests between the trichotomised severity measure and the 7-point Likert-scales, biographical data *vis* biographical and reversibility data. This was employed to test the validity and usefulness of the three stage clinical model. The variables used were derived from the range of severity scores. There was also an analysis of people

categorized into one of the three clinical stages, related to the therapies they have used to deal with their injuries (thus relating these therapies to the model). The location of the injury was also examined in relation to the specific therapies employed. Finally, the content analysis of the open-ended questions were quantified, and batteries of t-tests were carried out to identify the effectiveness of treatment strategies being used.

In the third stage, SPSS/PC+ CORRELATION (Norusis, 1990) was used to assess the relationship between the level of severity of discomfort in body areas, by the level of relationship between the level of severity of discomfort in other body areas. The intention of these correlations was to demonstrate linkages between reportage of pain in one area with specific areas, such as an increase in reported discomfort in the neck with an increase in the reporting of discomfort in the shoulders.

CHAPTER 6
RESULTS

6.1 Return Rates.

Table 6.1
The Distribution and Return Rate of the Questionnaires by the Eight Independent Newspaper Limited Offices.

Location	Number of Questionnaires	Number Returned	Percentage Returned
Wellington	292	149	51.02
Invercargill	86	63	73.26
Christchurch	210	129	61.43
Hamilton	107	59	55.14
Auckland	78	37	47.43
New Plymouth	68	43	63.24
Timaru	58	29	50.00
Palmerston North	82	66	80.49
Total	981	575	58.61

From the 980 persons sent the INL questionnaire, 575 responses were obtained, producing an overall return rate of 58.61%. Return rates for the eight newspapers ranged from 47.43% to 80.49% (see Table 6.1).

6.2 Demographic Frequency and Cross Tabulation Runs.

Frequencies were computed for all responses, on all items that the questionnaire generated. As well, the SPSS/PC+ CROSSTABS (Norusis, 1990) command was used to run a variety of frequency cross tabulations on the demographic and survey data, by the reportage of discomfort.

Using these cross tabulation runs, the level of the reported incidence of discomfort by body location was examined. The results for the eleven body area severity variables, were assessed

using the respondents rating of the severity of their discomfort, on the corresponding 7-point Likert-type scales.

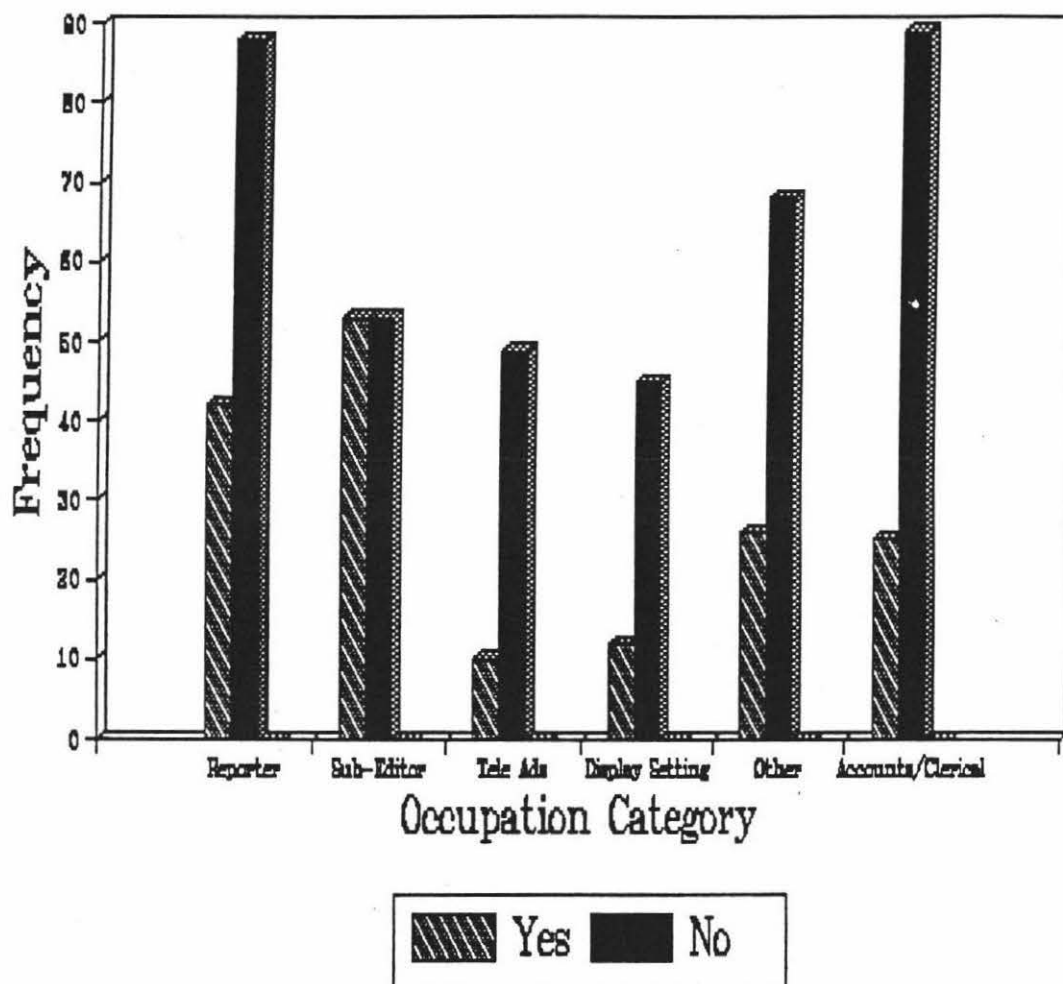


Figure 6.1 *The Reportage of Muscular Aches and Pains by Occupation Category.*

The frequency of muscular aches and pains was generally low, but the exceptions to this was the reportage for the occupation categories "sub-editors" and "reporters". Out of the total sample of sub-editors, some 112 subjects, 47.3% reported discomfort.

Amongst the sample of reporters, some 32.3% reported the presence of muscular aches and pains (see Figure 6.1). The experience of existing pain or discomfort from any part of the

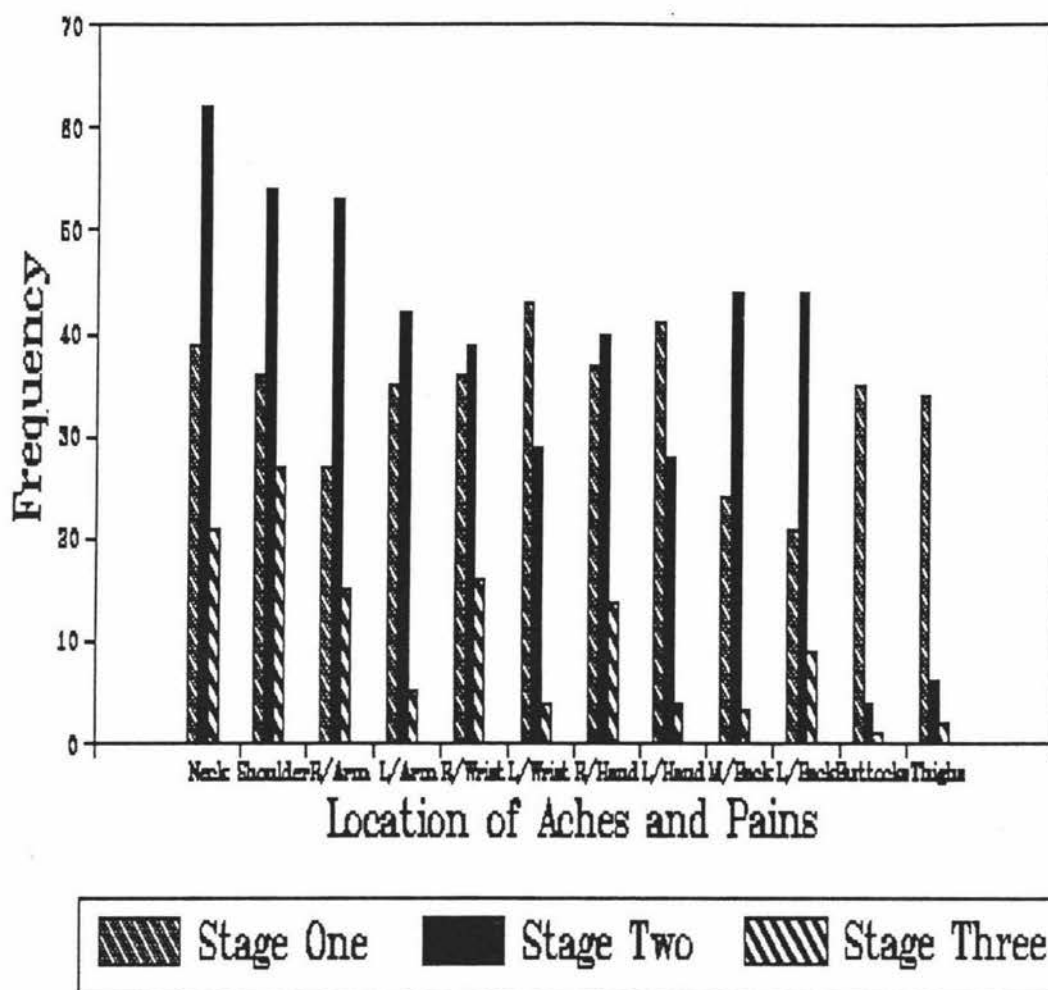


Figure 6.2 Distribution of the Reported Level of the Severity of Muscular Aches and Pains By Specific Body Area, Using a Clinical Three-Stage Model of Severity.

body was reported by 168 respondents from this sample, or 29.7%. The most common location of muscular aches and pains was found to be the neck, with 122 cases. Next came the shoulders, with 117 reported cases. This was followed by the right arm, with 95 cases, and the right hand and wrist with respectively, 95 and 91 cases (see Figure 6.2 for a breakdown of these figures). Of those with muscular aches and pains, 61.3% had consulted a health professional. There was a figure of 68 out of 168 cases (40.5%) who said that they had reported this discomfort to a manager, and 133 from 168 valid cases (79.2%) who had mentioned this discomfort to colleagues. Twenty six (17.0%) said that this discomfort had forced them to take days off work, at an average of 7.9 days.

Table 6.2
Reportage of Muscular Aches and Pains.

Characteristic	Discomfort Now					
	Yes		No		Totals	
	%	N	%	N	%	N
Respondents	29.4	167	70.6	401	100	568
Sex						
Male	29.2	64	70.8	155	38.6	219
Female	29.5	103	70.5	246	61.4	349
Age in Years						
< 20	33.3	8	66.7	16	4.2	24
20 - 30	31.7	66	68.3	143	36.6	208
31 - 40	31.3	47	68.7	103	26.4	150
41 >	25.1	47	74.9	140	32.9	187
Are You Left or Right Handed?						
Left	28.1	18	71.9	46	11.3	64
Right	30.0	151	70.0	353	88.7	504
Estimated Daily VDU Use in Hours						
< 2	17.1	6	82.9	29	6.2	35
2 - 4	22.9	22	77.1	74	17.1	96
4 - 6	28.8	47	71.2	116	29.0	163
6 - 8	35.6	90	64.4	163	44.9	253
8 >	12.5	2	87.5	14	2.8	16
How Long Have You Been Using a VDU in Years?						
< 1	34.6	9	65.4	17	4.6	26
1 - 2	31.9	30	68.1	64	16.5	94
2 - 5	31.9	98	68.1	209	54	307
5 >	22.0	31	78.0	110	24.8	141
Do You Work a Normal Shift? (8am - 6pm)						
Yes	32.1	116	67.9	245	63.9	361
No	25.0	51	75.0	153	36.1	204

Figure 6.3 shows that for the total sample, those who reported discomfort "right now", the majority of those cases reported that either their discomfort had become less severe, or remained the same.

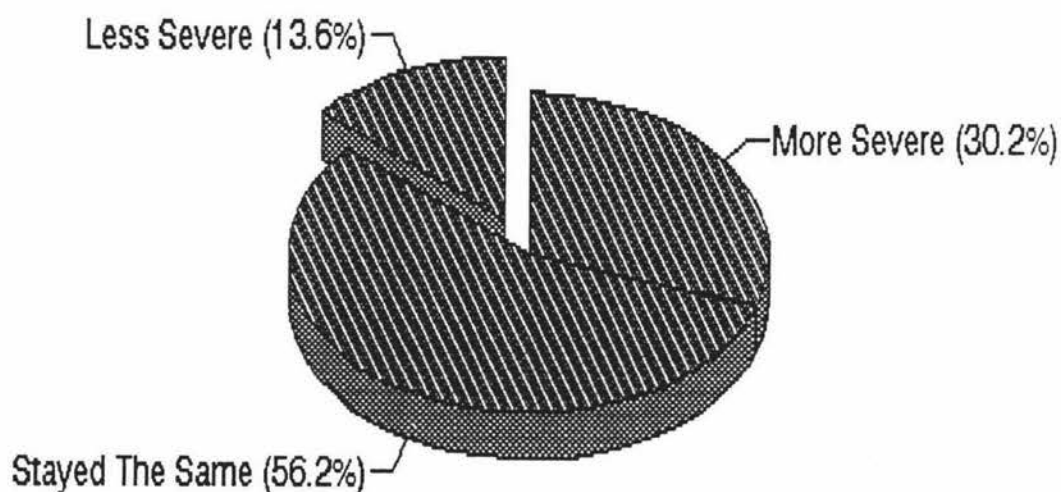


Figure 6.3 Reported Severity of Muscular Aches and Pains.

From Table 6.2 we can see that of the sample of 569 cases who answered the gender question, 349 or 61.4%, were female. Examining the reporting of the presence of muscular aches and pains shows that there was very little difference in the reporting rates for such discomfort between men and women, with 29.2% of males and 29.5% of females, answering that they felt some discomfort.

The age range of the sampled VDU and keyboard operators was between "20 or younger", to retirement age. Incidence of reporting of muscular aches and pains are shown in Table 6.2. The rate of reportage for discomfort by age fell off as the respondents age increased. The highest reportage of discomfort was for respondents under 20 years of age, with 8 out of the 24, or 33.3%, reporting discomfort. Of the 187 subjects 41 years or older, only 25.1%, or 47 cases, reporting feelings of discomfort.

The distribution of respondents who reported their dominant hand is shown in Table 6.2, as is the rate of reporting of muscular aches and pains. There was a predominance of the right hand being reported the dominant hand, with 504 cases or 88.7% of all respondents stating that they were right handed. Of all the valid cases, 28.1% of left handed respondents, and 30.0% of right handed respondents, stated that they experienced some level of muscular aches

and pains.

The distribution of daily VDU use is shown in Table 6.2, as are the associated rates of reporting muscular aches and pains. Of the total sample, the major number reported working with a VDU from between 6 to 8 hours daily, and of these 253 cases, 90 reported feelings of discomfort. This is 35.6% of the total number of valid cases. This was the largest single category by reportage of discomfort. It was followed by those respondents who reported that they used a VDU from between 4 and 6 hours a day. Of these 163 cases, 28.8% reported discomfort. The ends of the scale were that of those who worked less than 2 hours a day on a VDU, only 17.1% reported discomfort. Those who worked more than 8 hours per day on a VDU, had the overall lowest rate of reportage of discomfort, with only 2 out of 16 (12.5%) reporting muscular aches and pains.

How long the respondents had been using VDU equipment by their reporting of muscular aches and pains is shown in Table 6.2. The greater number of respondents reported having worked with a VDU system from between 2 and 5 years, and they numbered 307 cases, or 54.0% of the valid sample. Of this group, 31.9% reported discomfort. The highest category for reportage of discomfort was for the 9 out of 26 cases, or 34.6%, of people who answered that they had been working with a VDU for less than a year.

Respondents' replies to the question of whether they worked a "normal" work shift, defined as falling within the normal pattern of 8am to 6pm, Monday to Friday, by their reporting of muscular aches and pains, is shown in Table 6.2. From this question it was shown that 361 respondents replied that they worked a "normal" work shift. Of these 116, or 32.1%, reported feeling muscular aches and pains. Of the 204 respondents who said that they worked other than a "normal" work shift, 51 cases or 25.0%, reported discomfort.

The chairs and tables at which the VDU operators can usually be adjusted in height, but due to wear and tear on the equipment, or of the poor anthropometric design of the equipment, it was not always up to the task of providing adequate adjustment for individual cases.

If we look at Table 6.3, we can see that 76 said "Yes" to "Do You Wake with Discomfort?"

Table 6.3
Questions on Muscular Aches and Pains.

Characteristic	Yes	No	Total
MAP1 Reported Discomfort to Manager?			
Frequency	68	100	168
Percentage	40.5	59.5	100
MAP2 Mentioned Discomfort to Colleagues?			
Frequency	133	35	168
Percentage	79.2	20.8	100
MAP3 Wake with Discomfort?			
Frequency	76	88	164
Percentage	46.3	53.7	100
MAP4 Wake with Discomfort after Working Days?			
Frequency	67	22	89
Percentage	75.3	24.7	100
MAP5 Wake with this Discomfort after Days Off?			
Frequency	43	47	90
Percentage	47.8	52.2	100
MAP6 Discomfort Continuous Throughout Day?			
Frequency	59	103	162
Percentage	36.4	63.6	100
MAP7 Discomfort Continuous Throughout Workday?			
Frequency	23	52	75
Percentage	30.7	69.3	100
MAP10 Are You free from Pain During Your Days?			
Frequency	54	107	161
Percentage	33.5	66.5	100
MAP11 Has this Forced You to take Days Off?			
Frequency	26	127	153
Percentage	17.0	83.0	100

(Question 12). This 13.2% of the 164 cases reporting the existence of discomfort. Though respondents were instructed that if they had said "Yes" to Question 12, that they then should answer Questions 12(a) and 12(b), not all followed those instructions. Instead, from those who answered Question 12, 67 (75.3%) from 89 cases said that they woke with discomfort after working days, and 43 from 90 valid cases (47.8%) woke with this discomfort after rostered days off.

For the question, "Is This Discomfort Continuous Throughout Day?" (Question 13), 59 (34.4%) out of the 162 respondents said it was.

Again, though respondents who answered this question "Yes", were instructed to answer

Reportage of Hours Per Day That Respondents Felt Muscular Aches and Pains.

MAP8 Hours During Workdays that You Feel This Discomfort?

Hours Per Day	Frequency	Percent
<2 Hrs	47	31.8
2-4 Hrs	43	29.1
4-6 Hrs	24	16.2
6-8 Hrs	14	9.5
8 Hrs>	20	13.5
	-----	-----
Total	148	100.0

Mean 2.439 Std.Dev. 1.376

MAP9 Hours on Days Off that You Feel This Discomfort?

Hours Per Day	Frequency	Percent
<2 Hrs	78	54.9
2-4 Hrs	33	23.2
4-6 Hrs	12	8.5
6-8 Hrs	4	2.8
8 Hrs>	15	10.6
	-----	-----
Total	142	100.0

Mean 1.908 Std.Dev. 1.304

Question 13(a) "Is This Discomfort Continuous Throughout Only Days That You Work?" 23 (30.7%) replied that it was, out of the 75 who answered this question (see Table 6.3).

The amount of hours during work days that the 148 respondents felt discomfort averaged 2.4 hours per day, and of the 142 who reported that they felt discomfort on days off, the presence of discomfort averaged 1.9 hours per day (see Table 6.4).

When asked "Are You free from Pain During Your Days Off?" (Question 14), 54 (33.5%) of the 161 cases said that they were not.

In an analysis of the frequency rate of responding for SVRT1 by each of the other severity measures, trichotomized to match our three-stage clinical model into Stage 1, Stage 2 and Stage 3, it was found that there was a predominance of reporting that pain had stayed the same in its level of discomfort. The range was from 37.7% for the left hand, to 62.3% for the middle back, to 86.8% for the buttocks.

The figures exhibited in Figure 6.3, show the distribution of the severity of injuries by body area. Comparative frequencies for Stage 1, show a generally equal distribution of incidence of Stage 1 level discomfort amongst the listed body areas.

While the incidence for Stage 1 injuries varies from only 30 to 40 cases by body area, Stage 2 injuries fluctuate more in their frequency of incidence, with the greatest number of Stage 2 injuries being reported for the neck area (62 cases), followed by the shoulders (54) and the right arm (53). There is a marked drop in the reporting of Stage 2 level discomfort for the buttock and thigh regions.

The pattern of incidence for the Stage 3 level of discomfort is again different, and though incidence of reporting is still at its highest for the neck and shoulder regions, there is a noticeable trend that a proportionally greater number of Stage 3 were reported for the right arm (15), wrist (16) and hand (14), as compared to the left arm (5), wrist (4) and hand (4).

6.3 T-Test Analysis of the Effectiveness of Intervention Strategies.

To analyze the effectiveness of the various cited treatments, a range of two tailed t-tests set at the $p = 0.05$ significance level were carried out in SPSS/PC+ (Norusis, 1990).

These t-tests were carried out using the various treatment variables against both the discomfort variable and the severity variable. For example, a t-test was carried out for those who had reported that they had or had not undertaken new activities or strategies to reduce discomfort, against their reporting of the severity of their muscular aches and pains.

This severity (SVRT1) variable is a measure of the respondents reporting of their aches and pains (in other words, the presence of "discomfort"). The severity variable was generated by a forced choice question of either that the respondents discomfort had 1 "become more severe"; had 2 "stayed the same"; or had 3 "become less severe". This severity measure was used as a continuous variable in the analysis.

Where t-tests were conducted on the range of "trigger", such as questions, such as "Have You

Undertaken New Activities or Strategies to Reduce Discomfort?" (Question 22), follow-up t-tests were also conducted on the variables which were generated by the coding of the open-ended replies. This analysis tested the effectiveness of the use of one particular strategy or activity by comparing it to all the other particular forms of strategies or activities, against the reportage of a decrease or increase in the severity of discomfort measure (SVRT1). The aim of these t-tests was to assess if any of the intervention strategies could be shown to be more effective than any other potential intervention strategy.

The first battery of t-tests was carried out for the questions on muscular aches and pains. They demonstrated no significant differences in the level of reported severity of muscular aches and pains on a number of measures, which included those items asking whether this discomfort had forced them to take days off work, if they woke with discomfort after working days, and if they woke with discomfort after days free (see Table 6.5).

Only for the question, "Is The Discomfort Continuous Throughout Only Days That You Work?" (Question 13(a)), was there a significant difference ($t = -2.16$, $df = 31$, $p < 0.05$). Those who reported continual discomfort had a significantly higher level of severity in comparison to those who discomfort was intermittent.

The t-test for the replies for "Have You Undertaken New Activities or Strategies to Reduce Discomfort?" (Question 22), showed that there was no significant difference between subjects who reported adopting a new activity and those who had not, in relation to the level of the reporting of the severity level of their discomfort (see Table 6.5).

A battery of t-tests were conducted for Question 22(a), "What Are These New Activities?" (NWACT). These NWACT variables covered the specific implementation of some new and specific strategy aimed at reducing discomfort. The t-tests produced the following results (see Table 6.6).

There was no significant difference for having adopted any of the listed strategies or activities, against the reportage of the increase or decrease in the severity of muscular aches and pains.

Table 6.5

T-Tests Results for Major Demographic Variables on the Severity Measure.

Characteristic	No	Yes	Significance
MAP3 Wake with Discomfort			
Mean	1.838	1.845	n.s.
Std.Dev.	0.683	0.611	
MAP4 Wake with Discomfort after Working Days			
Mean	1.800	2.000	n.s.
Std.Dev.	0.689	0.535	
MAP5 Wake with this Discomfort after Days Off			
Mean	1.833	1.847	n.s.
Std.Dev.	0.730	0.595	
MAP6 Discomfort Continuous Throughout Day			
Mean	1.772	1.889	n.s.
Std.Dev.	0.682	0.621	
MAP7 Discomfort Continuous Throughout Workday			
Mean	1.545	1.940	p < 0.05
Std.Dev.	0.596	0.652	
ACT1 New Activities			
Mean	1.807	1.950	n.s.
Std.Dev.	0.692	0.450	
ACT3 Given up some Activities			
Mean	1.854	1.827	n.s.
Std.Dev.	0.727	0.622	
HLTPR1 Visited a Health Professional			
Mean	1.825	1.836	n.s.
Std.Dev.	0.722	0.489	

These listed options include changing the ergonomic design of the workstation, having adopted an exercise regime, using physical therapy, changing the work regime, or having had medical treatment.

T-tests were not carried out for the options "recreation", having adopted some form of "homework" strategy, "occupational therapy" and "medical treatment", because none of the respondents replied that they had ever adopted these strategies.

The t-test for the data generated by the question "Have You Reduced, or Given Up Some Daily Routines or Activities, Because of Your Discomfort?" (Question 23), against the SVRT1 variable, showed no significant difference in the level of the severity of discomfort between

T-test Results for the New Activities Variable on the Severity Measure.

Characteristic	No	Yes	Significance
NWACT1 Exercise regime			
Mean	1.877	1.722	n.s
Std.Dev.	0.718	0.627	
NWACT2 Physical therapy			
Mean	1.829	1.720	n.s.
Std.Dev.	0.650	0.729	
NWACT3 Relaxation therapy			
Mean	1.180	1.875	n.s.
Std.Dev.	0.685	0.641	
NWACT4 Occupational therapy			
Mean	1.815	1.600	n.s.
Std.Dev.	0.686	0.584	
NWACT5 Changing work regime			
Mean	1.774	0.663	n.s.
Std.Dev.	0.663	0.702	
NWACT6 Changing ergonomic design			
Mean	1.775	2.067	n.s.
Std.Dev.	0.659	0.799	
NWACT7 Recreation			
Mean	1.812	0.000*	
Std.Dev.	0.681	0.000	
NWACT8 Homework			
Mean	1.812	0.000*	
Std.Dev.	0.681	0.000	
NWACT9 Occupational work			
Mean	1.807	2.000*	
Std.Dev.	0.690	0.000	
NWACT10 Medical treatment			
Mean	1.806	1.000*	
Std.Dev.	0.698	0.000	

*One or more samples has no variance.

those respondents who replied that they had or had not reduced some activity.

T-tests using the group of variables generated by the open-ended question which measured responses to whether they had reduced or given up some specific daily routines or activities (Question 23(a)), were carried out. The respondents replies to having reduced or given up any specific activities, were compared to having reduced some other form of daily routine or activity, and tested against the SVRT1 variable. There were no significant differences for any of the listed variables, which included having given up or reduced some exercise regime, some

form of recreation strategy, and some aspect of their occupational work.

Table 6.7

T-test Results for the Reduced Activities Variable on the Severity Measure.

Characteristic	No	Yes	Significance
RDCED1 Exercise regime			
Mean	1.862	1.800	n.s.
Std.Dev.	0.743	0.798	
RDCED2 Recreation			
Mean	1.944	1.762	n.s.
Std.Dev.	0.802	0.700	
RDCED3 Homework			
Mean	1.750	1.947	n.s.
Std.Dev.	0.639	0.848	
RDCED4 Occupational work			
Mean	1.893	1.727	n.s.
Std.Dev.	0.786	0.647	
RDCED5			
Mean	1.864	1.500	n.s.
Std.Dev.	0.751	0.707	

A t-test for the two conditions of the HLTPR1 variable, had or had not "Visited a Health Professional" (Question 24), against the SVRT1 variable of reporting an increase or decrease in the level of the severity of discomfort, showed no significant difference for these two conditions (see Table 6.5).

These "health professional" (HTPRO) variables were generated by the responses to the open-ended question on what type of medical treatment the respondents had received (Question 24(a)). The HTPRO variables concerned themselves with specific reported treatments provided by a health professional, and were carried out in comparison to any other form of treatment. Again, these t-tests were carried out against the measured reported increase or decrease in the severity of muscular aches and pains. The tests produced the results presented in Table 6.8.

In brief, these results show that there was no significant difference in the reporting of the level of the severity of discomfort due taking medical advice on any of the treatment options. This list of treatment options was very comprehensive, and included effecting a general exercise

T-test Results for the Health Professional Treatment Variable on the Severity Measure.

Characteristic	No	Yes	Significance
HTPRO1 Physical therapy			
Mean	1.762	1.837	n.s.
Std.Dev.	0.768	0.722	
HTPRO2 Relaxation therapy			
Mean	1.841	1.571	n.s.
Std.Dev.	0.741	0.535	
HTPRO3 Occupational therapy			
Mean	1.819	2.000*	
Std.Dev.	0.733	0.000	
HTPRO4 Changing work regime			
Mean	1.793	2.125	n.s.
Std.Dev.	0.734	0.641	
HTPRO5 Changing ergonomic design			
Mean	1.813	2.000	n.s.
Std.Dev.	0.729	0.816	
HTPRO6 Medication			
Mean	1.863	1.600	n.s.
Std.Dev.	0.707	0.828	
HTPRO7 Generally resting			
Mean	1.824	1.750	n.s.
Std.Dev.	0.724	0.957	
HTPRO8 Generally exercising			
Mean	1.854	1.333	n.s.
Std.Dev.	0.732	0.516	
HTPRO9 Surgery			
Mean	1.821	0.000*	
Std.Dev.	0.729	0.000	
HTPRO10 Athletic support			
Mean	1.835	1.500	n.s.
Std.Dev.	0.734	0.577	
HTPRO11 Heat treatment			
Mean	1.833	2.000	n.s.
Std.Dev.	0.079	1.000	

*One or more samples has no variance.

regime, the specific use of physical therapy, changing the work regime using professional advice, changing the ergonomic design because of professional medical advice, and taking some form of medication.

A t-test could not be carried out using the "occupational therapy" option variable due to the small number (1), who answered this question. Nor could a t-test be carried out for surgery,

Table 6.9

T-test Results for the Best Help Variables on the Severity Measure.

Characteristic	No	Yes	Significance
BSHLP1 Physical therapy			
Mean	1.760	1.887	n.s.
Std.Dev.	0.716	0.754	
BSHLP2 Relaxation therapy			
Mean	1.861	2.000*	
Std.Dev.	0.740	0.000	
BSHLP3 Occupational therapy			
Mean	1.820	0.000*	
Std.Dev.	0.732	0.000	
BSHLP4 Changing work regime			
Mean	1.776	2.077	n.s.
Std.Dev.	0.723	0.760	
BSHLP5 Changing ergonomic design			
Mean	1.823	1.750	n.s.
Std.Dev.	0.727	0.957	
BSHLP6 Medication			
Mean	1.831	1.667	n.s.
Std.Dev.	0.713	1.033	
BSHLP7 Generally Resting			
Mean	1.844	1.667	n.s.
Std.Dev.	0.745	0.651	
BSHLP8 Generally exercising			
Mean	1.842	1.692	n.s.
Std.Dev.	0.767	0.480	
BSHLP9 Surgery			
Mean	1.820	0.000*	
Std.Dev.	0.723	0.000	
BSHLP10 Heat treatment			
Mean	1.841	1.571	n.s.
Std.Dev.	0.728	0.787	
BSHLP11 Acupuncture			
Mean	1.814	2.000	n.s.
Std.Dev.	0.728	1.000	
BSHLP12 Herbal medicine			
Mean	1.820	0.000*	
Std.Dev.	0.723	0.000	
BSHLP13 Massage			
Mean	1.778	2.250	n.s.
Std.Dev.	0.725	0.707	
BSHLP14 Athletic support			
Mean	1.818	0.000*	
Std.Dev.	0.736	0.000	

as no respondents replied that they had used this form of treatment (see Table 6.8).

T-tests of the "best help" (BSHLP) variables, which interpreted the respondents answers of what specific treatment they thought best helped them (Question 24(c)), against any particular form of treatment, was compared to the reportage of increase or decrease in severity (SVRT1). They showed the following trends. Firstly, the number of subjects who had used relaxation therapy (2), was too small a number to analyze and that no subjects reported using occupational therapy, herbal medicine, or an athletic support.

Secondly, that there was no significant difference between those who reported using any of the other forms of treatment. These treatment approaches included specifically using physical therapy, changing their work regime, taking medication, who generally exercised, had had heat treatment, or had had acupuncture. These t-tests were carried out using the specific treatment types against the use of any other particular treatment strategy (see Table 6.9).

T-tests were carried out for the ergonomic (ERG) variables questions (Question 25 (a-j)), which were directed at specific ergonomic aspects of the workstation, and the reporting of severity of discomfort. Two conditions existed for each of the ERG variables, either that the respondent had replied affirmative or negative to each of the questions.

T-tests for the ERG variables by the severity measure SVRT1, showed that there was no significant difference in the reporting of the severity of muscular aches and pains on any of the 11 ergonomic questions (see Table 6.10).

Too few replies were generated by the Ergonomic open-ended question 26(a), to allow for analysis. There were certain trends however, and they included that VDU and keyboard operators did not consider their work stations as being ergonomically adequate. Work space and the positioning of the VDU were also judged areas of contention.

6.4 Analysis of Occupation Category through ANOVA.

To examine the aetiology of reported OOS, a range of occupation category based oneway analysis of variance tests (ANOVA) were carried out to compare both the reported presence of discomfort and the increase or decrease of the level of severity of any discomfort, for each

Table 6.10
T-test Results for the Ergonomic Variables on the Severity Measure.

Characteristic	No	Yes	Significance
ERG1 Adjustable Seat			
Mean	1.063	1.000*	
Std.Dev.	0.245	0.000	
ERG2 Comfortable Back Support			
Mean	1.271	1.091	n.s.
Std.Dev.	0.449	0.294	
ERG3 Comfortable Seat			
Mean	1.042	1.000*	
Std.Dev.	0.202	0.000	
ERG4 Footrest			
Mean	1.479	1.318	n.s.
Std.Dev.	0.505	0.477	
ERG5 Movable Keyboard			
Mean	1.021	1.045	n.s.
Std.Dev.	0.144	0.213	
ERG6 Adjustable Table			
Mean	1.396	1.227	n.s.
Std.Dev.	0.494	0.429	
ERG7 Wristrest			
Mean	1.833	1.773	n.s.
Std.Dev.	0.377	0.429	
ERG8 Mouse			
Mean	1.813	1.773	n.s.
Std.Dev.	0.394	0.429	
ERG9 Adequate Worksurface			
Mean	1.229	1.091	n.s.
Std.Dev.	0.425	0.294	
ERG10 Comfortable Workstation			
Mean	1.277	1.000*	
Std.Dev.	0.452	0.000	
ERG11 Good Workstation			
Mean	1.422	1.333	n.s.
Std.Dev.	0.499	0.483	

*One or more samples has no variance.

of the occupation groups. This ANOVA testing was aimed at revealing possible links between OOS and particular occupation categories.

The tests described here computes critical F with the Scheffe adjustment, which "is the most conservative and most flexible of the popular methods" (Tabachnick & Fidell, 1989, p.53), for

computing critical F for a comparison of means.

The ANOVA of the differences in rates of responding between the various occupational groups by discomfort demonstrated two aspects of the sampled VDU and keyboard operators.

Firstly, that though there were significant differences in the rates of reporting of discomfort ($F(5,560) = 5.656, p < 0.05$), and secondly, the ANOVA for occupational groups by severity of discomfort showed that no two groups are significantly different in the levels of the reported severity of muscular aches and pains ($F(5,155) = 1.7455, n.s.$).

6.5 Correlations of Severity of Incidence of Discomfort By Body Area.

Table 6.11

Means and Number of Valid Cases for the Reported Severity of Muscular Aches and Pains by Body Areas.

Characteristic	Mean	Std.Dev.	Cases
SVRT2 Neck	3.62	1.774	122
SVRT3 Shoulders	3.906	1.852	117
SVRT4 Right Arm	3.705	1.833	95
SVRT5 Left Arm	3.000	1.714	82
SVRT6 Right Wrist	3.516	1.905	91
SVRT7 Left Wrist	2.645	1.710	76
SVRT8 Right Hand	3.451	1.784	91
SVRT9 Left Hand	2.740	1.764	73
SVRT10 Middle Back	3.211	1.567	71
SVRT11 Lower Back	3.541	1.745	74
SVRT12 Buttocks	1.575	1.259	40
SVRT13 Thighs	1.810	1.581	42

The severity of incidence of discomfort by body location was assessed in SPSS/PC+ (Norusis, 1990), with the CORRELATION command used to run a series of correlations.

The results for the SVRT2 to SVRT13 variables, each of which relates to a particular body area, were assessed using the respondents rating of the severity of discomfort on a 7-point Likert-type scale (see Table 6.11 for mean levels of OOS discomfort).

These correlations are not intended to demonstrate any causality of reporting of the incidence of muscular discomfort, rather, that there is statistical evidence to link the reporting of

Table 6.12

Correlations of the Reported Level of Severity of Muscular Aches and Pains by Specific Body Areas

Correlations						
	SVRT2	SVRT3	SVRT4	SVRT5	SVRT6	SVRT7
SVRT2	1.00					
SVRT3	0.54+	1.00				
SVRT4	0.24	0.34	1.00			
SVRT5	0.11	0.16	0.27	1.00		
SVRT6	0.05	0.08	0.71+	0.23	1.00	
SVRT7	0.20	0.31	0.31	0.60+	0.31	1.00
SVRT8	-0.06	-0.22	0.32	0.17	0.48*	0.20
SVRT9	0.04	0.05	-0.03	0.41*	0.04	0.47*
SVRT10	-0.50	-0.07	-0.02	-0.16	-0.10	-0.22
SVRT11	0.19	0.05	-0.05	-0.20	-0.20	-0.13
SVRT12	0.16	0.13	0.19	0.11	0.18	0.26
SVRT13	0.24	0.30	0.18	0.16	0.02	0.25

N of cases: 36
1-tailed Significance: * -0.01 + -0.001

Table 6.13

Further Correlations of the Reported Level of Severity of Muscular Aches and Pains Using Specific Body Areas.

Correlations						
	SVRT8	SVRT9	SVRT10	SVRT11	SVRT12	SVR13
SVRT8	1.00					
SVRT9	0.50+	1.00				
SVRT10	-0.16	-0.06	1.00			
SVRT11	-0.17	-0.01	0.60+	1.00		
SVRT12	-0.12	-0.18	-0.07	0.07	1.00	
SVRT13	-0.30	-0.15	0.02	0.15	0.67+	1.00

N of cases: 36
1-tailed Significance: * -0.01 + -0.001

discomfort in body areas, with the reporting of discomfort in other areas. They are also based

on just the respondents (n=36), who replied that they felt discomfort in one or more areas of their bodies.

The correlation results show that the severity of incidence of muscular aches and pains in one region could be linked with associated incidence of reported pain in other areas; 8 out of 66 correlations were significant.

The correlation matrices demonstrate in particular, that:

1. An increase in the reported severity of discomfort located in the neck (SVRT2) was associated with reported increase in discomfort in the shoulders (SVRT3).
2. An increase in the severity of discomfort in the right arm (SVRT4) with an associated increase in level of discomfort in the right wrist (SVRT6).
3. An increase in the discomfort felt in the left arm (SVRT5) with an increase in the degree of discomfort in the left wrist (SVRT7).
4. An increase in the level of muscular aches and pains in the right hand (SVRT8) with the level of discomfort reported in the right wrist (SVRT6).
5. An increase in the severity of discomfort reported for the left hand (SVRT9) being associated with increases in the amount of discomfort felt in both the left arm (SVRT5) and the left wrist (SVRT7).
6. An increase in the level of muscular aches and pains in the right hand (SVRT8) being linked with an increase in the severity of discomfort felt in the left hand (SVRT9).
7. The amount of discomfort in the middle back (SVRT10) being associated with the severity of discomfort felt in the lower back (SVRT11).

8. The degree of discomfort felt in the buttocks (SVRT12) being associated with an increase in the level of discomfort reported for the thighs (SVRT13) (see Tables 6.12 and 6.13).

CHAPTER 7

DISCUSSION

7.1 Limitations of the Questionnaire Form of Survey Analysis.

Before discussing the quantitative results of this study directly, it is necessary to discuss in some detail the aspects of the survey method used to generate the data. It has to be recognized that there are several underlying problems to using a questionnaire, such as employed in this study, to analyze muscular aches and pains.

The first of these problems is that the general limitations of the questionnaire surveying technique, applies to standardised questionnaire as much as it does to non-standardized questionnaires. What has to be accepted is that the experience of the person who fills out the questionnaire may affect the results (Pennebaker, 1982). For example, recent or more serious musculoskeletal disorders that the respondents have suffered, are prone to be remembered better than older and less serious ones.

There is also the potential effects of the environment and "filling out" situation on the results, and have been shown to pose problems for the researcher using the questionnaire approach to data collecting (Bringham, 1975; Sinclair, 1975).

It is evident that a questionnaire of the type employed in this study is applicable purely for a cross-sectional study of the newspaper industry, because of the specialization of the intent of researching the INL sample, with all the concomitant limitations that come with this. The most important methodological aspect of such a limitation, is the resulting effect on the reliability and validity of the results produced.

To test the content validity of this questionnaire, subjects could have filled and refilled questionnaires and the subjects' responses to the questionnaires would have been compared with their clinical history. Obviously within the context of this research this was not possible.

Reliability tests with the test-retest method of preliminary versions of the general questionnaire

could be also have been carried out, but again with out the testing of the actual clinical veracity of the measure items, this would have been of debatable use.

Indeed, the reliability and validity of this questionnaire has not been investigated, but instead relies on the construct validity of the questionnaire forms it is derived from. For example, in the use of the body areas approach to the severity questions, this study relied on the validity and reliability reports of the developers of the Standardized Nordic Questionnaire, with its body areas approach (Kuorinka et al., 1987).

Another limitation of the questionnaire method, is that,

"The ways in which questionnaires are administered and individual questions phrased can strongly influence the proportion of subjects who report a complaint." (Starr, Thompson, & Shute, 1982, p.700).

The effect of administration has on questionnaire has been noted in other research (Anderson et al., 1987; Kuorinka et al., 1987).

In this study it was left up to the divisional managers and occupational health nurses of each of the different divisions to ensure that the questionnaires were in fact distributed and collected. Though the initial distribution had the support of the various unions involved in this study, and follow-up letters were also sent out, there still exists the possibility that the results were somehow affected by this process.

This indeed may partially account for the discrepancies in the responses for some of the questionnaire items. An example of this was seen for the reporting of "Yes" to "Do You Wake with Discomfort?" (Question 12) and the fact that though respondents were instructed to then answer Questions 12(a) and 12(b), not all followed those instructions. Such individual "interpretations" of the questionnaire instructions may have been reduced if another distribution programme had been used.

Indeed, as a counter-argument to the efforts made to increase the response rate to the

questionnaire, it has been asserted that in stressing the importance of "the VDU effect on Occupational Overuse Syndrome", the research risks introducing a systematic bias.

"Many of the issues related to the effects of VDTs on workers can be extremely emotional, touching on such sensitive areas as health and job security. Since subjects may therefore feel that they have a vested interest in the outcome of research, it is critical to minimize their opportunities for systematic bias." (Starr et al., 1982, p.700).

Even the fact that the research had union support, can be seen to have increased this risk. For example, that the research has taken a sample of VDU and keyboard operators responses, which are disproportionately representative of workers whose attitudes had been biased by the such a factor as the very difficult labour situation that exists between the newspaper unions and INL management (vis a vis, staff redundancies) at the time of the questionnaire administration.

However, perhaps the greatest problem of using a questionnaire at all for this type of research is the dichotomy that although by definition, pain is a subjective experience which is,

"... the integrated expression of afferent neurophysiological mechanisms and affective-emotional phenomena susceptible to modulation by environmental and cultural, including sociopolitical factors." (Cohen et al., 1992, p. 433).

This study has primarily relied on a medical model in the development of the questionnaire. Such a position has support (Starr et al., 1982).

7.2 The Implications of the Use of a Medical Concept of Pain.

What Cohen et al.s' 1992 work alerts one to, is the difficulty of using such terms as "muscular aches and pains" or "discomfort" - both in the medical and the survey arena. In their article they describe how that it is only in recent years that chronic pain has come to be appreciated by medical workers in the field as a syndrome, that is, a medical problem in its own right, not

merely a symptom of injury or disease, and distinct in many ways from acute pain (Cohen et al., 1992). The lack of recognition of the problem of chronic pain in overuse injuries has been cited as being based to a greater degree on the fact that the medical profession itself has continually found itself in difficulty, when it comes to successfully dealing with patients (Bammer & Blignault, 1987). This is true both for in relation to the problems of the initial diagnosis of an overuse injury, and in the case of patients in whom after repeated assessments over time no disease-based diagnosis could be found.

This failure illustrated the difficulty the general medical fraternity has had with the dissemination of changes in knowledge, as it reflected the persistence of "hard-wired" concepts of the biology of pain in the face of more "elastic" approaches to pain.

Such an elastic approach to pain has been presented by Melzack and Wall (1965) in their theory of the stimulus of the gate-control for pain. This social theory has,

"... underpinned greater neuroanatomical and neurophysiological understanding of the known influences of somatic and "emotional" factors in the expression of pain, by nominating the dorsal horns of the spinal cord as their focus of convergence." (Cohen et al., 1992, p. 433).

In their 1992 article, Cohen et al. presented a detailed chronic pain paradigm, which identifies three contributing factors to the actual reporting of pain: nociceptive, neuropathic and psychogenic. These factors were investigated as being interrelated, rather than exclusive to each other.

The nociceptive level is that of tissue disease or damage, and an area of medical epistemology served well by biomedical or disease-illness model. Nociception, however, strictly refers to the signalling of the actual existence of tissue damage, or the possible threat of tissue damage, and can reflect a change in performance.

The concept of a neuropathic level of pain, acknowledges that between the soma and the psyche is interposed the nervous system. Such an neurophysiological system is itself an

"elastic" structure, the function of which may change in response to the degree of afferent barrage (Melzack & Wall, 1965). The question of the neuropathic level of pain is pertinent when ones wishes to explain such phenomena as the pain of phantom limbs, or the painful peripheral neuropathies and reflex states that exist with such conditions as sympathetically-maintained pain (Roberts, 1966), both of which do not "clinically" exist.

The psychogenic level acknowledges that the behavioral expression of pain, including suffering, affective disturbance, real and imagined loss, and depends on the interaction of the organism with its past experience, culture and environment (Fordyce, 1988).

So though the accurate definition of pain relies on clinical contexts and clinical tests such as touch-pinprick, and two-point discrimination on vibration intensity for its diagnosis, we are still left in a dilemma when we consider how ineffectual such approaches have been in detecting overuse injury. The social theory presented gives a better understanding of where the root of the problem is in the implementation of such an approach.

The support that clinical testing offered the present study is that it often includes examining the history of patients complaining of persistent pain (Bammer & Martin, 1988). The questionnaire is in fact sampling such individual histories.

But any real defence of the present study and its use of a questionnaire, lies in the fact that it has to be said that despite the obvious problem of using such pain labels as "muscular aches and pains" and "discomfort", very little research has been devoted to examining the effect of psychological and perceptual factors related to the reporting of physical symptoms (Pennebaker, 1982), so no guides exist in this area of research.

7.3 Assessing the Results of the Study.

Four objectives were set for the study. They were listed in the section on the orientation of the study, but to briefly reiterate them, they were:

1. Develop an understanding of the aetiology of OOS within INL.

2. Investigate a theory of a three-stage clinical model.
3. Assess the severity and reversibility, as well as causal and mediating factors associated with the prevalence, for OOS injuries.
4. Assess the effectiveness of existing treatments.

Each of these points will be evaluated in the following sections.

7.3.1 The Aetiology of OOS Within The Independent Newspapers Limited Sample.

To go beyond the conceptual and methodological considerations of the questionnaire as a measurement tool, we can consider the aetiological "picture" of overuse injuries with our INL sample.

As mentioned earlier, clinical histories typically reveal that most patients experienced difficulties throughout their body, but that the more extreme conditions were confined to particular affected limbs, such as the arm and wrist, and that this pain tended to persist over time and to spread in extent (Cohen et al., 1992). The level of pain was not associated with position sense, stereognosis and temperature appreciation, which were not affected (Bammer & Martin, 1990).

The typical description of OOS symptomology was that pain was normally experienced locally at first, but later diffusely in the neck, pectoral girdle and arms. The pain itself was of a deep, burning, electrical quality, accompanied by cramp, and loss of muscle strength. Many subjects did show clinical signs suggestive of presumed local sympathetic dysfunction, discrete swelling of the hand, unilateral cold sweating, and often blue discoloration of the effected area. The pain had occurred in the context of keyboard operation or in repetitive process work. A variety of treatment strategies, underpinned by conventional disease models, had been unsuccessful. These treatments were psychosocial, work place orientated, physical and pharmacological. Many subjects had undergone carpal tunnel release surgery, though it has been reported that the experience of clinicians is that often overuse relapse and complications

occur after such an operation (OSH, 1992), and such problems often force the overuse injury sufferer out of the workplace.

In describing the aetiology of OOS within the INL sample, we can see several trends emerge, which are in contradiction to these findings. The distribution of discomfort by sex, shows that although there is a predominance of women in the work place, their rate of incidence for OOS symptoms is not greater than that for men, with just as many males as females answering that they felt some discomfort. The literature on overuse injuries typically indicates that the reporting of injuries is disproportionate in favour of women (Champion, Cornell, Browne, Garrick, & Herbert, 1986).

The age range was from under 20 to retirement age, but where incidence of reporting of muscular aches and pains would have been expected to increase with age, particularly in relation to back injuries (Hildebrandt, 1987), the reporting of discomfort decreased as the respondents age increased. The highest reportage of discomfort was for respondents under 20 years of age, with only one quarter of subjects 41 years or older reporting feelings of discomfort.

There was a predominance of the right hand being the dominant hand and the correlations showed that an increase in the level of muscular aches and pains in the right hand could be linked with a corresponding increase in the severity of discomfort felt in the left hand. With wishing only to say that shows some form of causal link in the reportage of pain between the hands, it seems perfectly logical that there should be such an increase. It would demonstrate that the effect of overuse is not centred in the right hand regions of the body - though we may make a case that it is at its most severe in these regions.

In line with such an argument, it is interesting that although the incidence of discomfort for right handed and left handed respondents did not, percentage wise, differ greatly, the incidence of reporting of discomfort was particularly high for the right arm, the right hand and wrist. This falls in line with the generally accepted concept, that with the design of the keyboard, there is a greater emphasis placed on right handed functions than left handed ones (Bammer, 1987). The clear reason for this is the placement of the "cursor" and number keys on the right

hand side of the keyboard.

The placement of these keys on the right hand side of the keyboard, had been conceptually linked with the increased risk that such a set up places the right hand, wrist and arm in, to the development of OOS symptoms. The correlations further reinforce this picture, by showing a picture of increased severity of discomfort in the right arm being associated with increase in level of discomfort in the right wrist, and that an increase in the level of muscular aches and pains in the right hand can be linked with the level of discomfort reported in the right wrist.

Importantly, even though the keyboard demands more exertion on the part of the right hand, the correlations also showed that an increase in the discomfort felt in the left arm could be linked with an increase in the degree of discomfort in the left wrist, and that any increase in the severity of discomfort reported for the left hand can also be connected with increases in the amount of discomfort felt in both the left arm and the left wrist.

The distribution of daily use presents an interesting picture of a "bulge" in the rate of response to reporting discomfort, when compared to the amount of daily use. Thus, while we might have safely predicted that those who worked the least amount of daily hours on VDU would also be those who reported the lowest levels of muscular aches and pains, and in fact they did report low levels of discomfort, it was those who worked more than 8 hours per day on a VDU, who reported the lowest rate of discomfort.

The highest level of reported discomfort was for those working with a VDU from between 6 to 8 hours daily, and this was followed by those respondents who reported that they used a VDU for between 4 and 6 hours a day. This was unexpected.

This same reversal of expectations was noted after the analysis of how long the respondents had been using VDU equipment against their reporting of muscular aches and pains. Instead of those who had worked on VDU from between 2 and 5 years showing the highest levels of reported discomfort, it was those people who had been working with a VDU for less than a year, who had reported the most discomfort.

The results of the analysis of whether respondents worked a "normal" work shift or not showed that the majority of respondents did work a "normal" shift, but also had a higher reporting level of discomfort than those who had replied that they worked a "non-normal" work shift. Unfortunately due to the complexities of the varying shift systems operating at INL, it makes little sense to attempt to interpret this result any further.

It can be said that the OOS that will typically develop will localize in the arms, and in particular the right arm, the neck and shoulder, the lower and middle back, and to a lesser extent in the thighs and buttocks. Of these localized areas, the most severe types of symptoms will be in the neck and shoulder, and then the arms. This supports findings of other studies, that have shown that large numbers of VDT users experience pain in the back, neck, shoulders, arms, wrist, and hands (Bammer, 1897; DOH, 1980; Elias, Cail, Tisserand, & Christmann, 1982).

However, the distribution of injuries sees no real areas of concentration. The stereotypical OOS sufferer has been characterized through a number of clinical observations which created a remarkably homogeneous profile.

It has been reported that the best predictor for OOS symptoms is the sex of the worker (Kiesler & Finholt, 1988), with their being a predominance of OOS reporting amongst female workers (Champion et al., 1986; Onishi, Nomura, & Sakai, 1973; Wigley, 1990). There is no particular age group especially effected by OOS, and the ages of sufferers ranges from 20 to 50 years old, but there is support for a cumulative keyboard "use" effect (Kiesler & Finholt, 1988; Slovak & Trevers, 1988). The incidence of OOS has been reported in a range of occupations, but as stated earlier, those seen as "most at risk" work either as manual process worker in industry or as office employees using keyboards (Meekosha & Jakubowicz, 1986; Wigley, 1990). Symptoms develop progressively over periods from some months to more than five years, with bilateral affection in about one quarter of cases (Cohen *et al*, 1992).

With our INL sample, the highest rates of incidence are not reserved for female workers, nor those respondents who have spent over 5 years on VDU and work the maximum number of hours per day on the machines. Instead, it is more likely that if you are young male or

female, new to the job, and work a moderate number of hours per day on a VDU, you will in effect be "most at risk" from developing OOS.

One of the possible explanations of the divergence of our results and these expectations, especially towards the question of female rates of incidence, is that these early studies relied on samples which may be considerably anthropometrically different from the INL sample. As an example in point, the Onishi et al, (1973) study used Japanese subjects, with the obvious differences that such a population would have in level of body weight, gripping strength and back strength, in comparison to the INL sample of European subjects. As further support for such a supposition, Kilbom et al. (1986) reported that with their sample of Scandinavian women, static muscle strength and static endurance, were not related to overuse injury symptomology.

The results did support the conclusion that the implementation of formal or informal strategies to "cure" OOS, will prove ineffective (Cohen et al., 1992) - even if in the case of several respondents they themselves report improvement. This statement can be made with the full understanding, that as already discussed, the questionnaire has only measured reported statements and not clinical observations. The irony however is, that within the same questionnaire a respondent can report improvement when there is little evidence of improvement. This is a valuable observation to consider in this issue, and raises the issue of a placebo effect.

7.3.2 The Usefulness of a Theory of a Three-Stage Clinical Model.

Though the model used in this study is "clinical" in perspective, the results support its use in a survey context.

In the Results section, Table 6.9 shows the distribution of the severity of injuries by body area. The relation of the incidence of injuries by staging is not to be seen as a simple "progression" of the frequency of injury from one stage to the next.

That is, the level of comparative frequencies for Stage 1, Stage 2, and Stage 3 type symptomology clearly shows that a generally high incidence of reported severity of Stage 1 injuries in a particular body area will be not be matched by an equally high distribution of incidence of Stage 2 level discomfort for the same body area.

Instead, while the incidence for Stage 1 injuries varies from only 30 to 40 cases by body area, the distribution of Stage 2 shows that it is rather that injuries tend to become concentrated in the neck area, shoulders and the right arm.

This distribution is again, not entirely representative of the pattern of incidence for the Stage 3 levels of discomfort. Though incidence of reporting is still at its highest for the neck and shoulder regions, there is a noticeable inclination that a proportionally greater number of Stage 3 were reported for the right arm, wrist and hand, especially when compared to the Stage 3 level of incidence of discomfort reported for the left arm, wrist, and hand.

This seems to indicate that the level of incidence of discomfort by any particular region is not related to a progression of the number of injuries from Stage 1 to Stage 2 to Stage 3. Rather, in our sample there is a greater likelihood of the development of more severe levels of discomfort for the neck and shoulder regions, and even more severe levels of discomfort for the right arm, wrist, and hand, which lends support to the concept of there existing differing levels of severity and reversibility of injuries - which is a central tenet of the three-stage model.

Such a conclusion, is supported by the evidence already recounted, in the discussion of the correlation results. This also ties into the types of OOS that VDU operators have already been described, as being prone to (see Table 7.1).

These results indicate that the three-stage model does have use in describing differing levels of overuse injuries, and signals that different approaches need to be taken to deal with OOS. In other words, where a respondent indicates that they have Stage 1 OOS in the hand, a strategy designed to intervene in the progression of this injury to a more severe stage, would concentrate on immediate mediation designed to reverse this symptomology. With a

Table 7.1

Syndromes that VDU operators are typically prone to. (Developed from Feldman et al, 1983, pp. 668 - 670).

<p>Aggravatory Motions.</p> <p>Repeated and sudden elbow flexion. Repeated trauma or pressure to elbow at ulnar groove. For example, with office workers who lean their elbows on their desks.</p> <p>Repeated pressure to ulnar side of forearm. For example, with office workers</p> <p>Pressure on forearm. Hypertension of wrist and forearms.</p> <p>Repetitive abduction and adduction movements of shoulder and arm. Poor posture.</p>	<p>Site of damage: Nerve syndrome.</p> <p>Elbow: Cubital tunnel syndrome.</p> <p>Forearm: Ulnar nerve injury</p> <p>Upper arm: Superficial radial nerve injury.</p> <p>Shoulder: Thoracic Outlet Syndrome.</p>
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respondent identified as suffering from Stage 3 OOS, such a mediation strategy would have less purpose (DIOR, 1984), and rather the literature would seem to indicate that the respondent may be advised to adopt a completely different strategy, such as changing their job.

Though a more sophisticated form of multivariate analysis would certainly be needed to fully assess the strengths of the model, the fact that each of the three stages has been demonstrated to be autonomous furnishes strength to the concept that each stage represents a differing evaluation of the overuse condition, and represents an image of differing levels of severity and reversibility.

7.3.3 An Assessment of the Severity and Reversibility of Overuse Injuries.

These actual levels of severity and reversibility "actualized" through the three-stage clinical

model, were also gauged.

Using cross tabulation runs, the degree of reported discomfort was measured. 168 of all the respondents indicated that they experienced feelings of discomfort. Judging this by body location, the results indicated that the frequency of muscular aches and pains was generally low, with the most common location of muscular aches and pains found for the neck, then the shoulders, followed by the right arm, right hand and wrist respectively.

In comparison with other studies of this nature, a reported rate of physical discomfort of discomfort in the region of 27% for the total sample, has to be consider low in the light of the reports of other studies (Bammer & Blignault, 1987; Green & Briggs, 1990; Hocking, 1987; Ryan & Bampton, 1988; Slovak & Trevers, 1988).

For the total sample, although the respondents generally replied that they had sought medical advice, in evaluating those who reported discomfort "right now", it is clear that the majority of respondents reported that either their discomfort had become less severe, or remained the same. This is a clear sign that the there was very little evidence for the general "reversibility" of overuse injuries, and rather, that such injuries tended to remain at their existing level of discomfort - in spite of whether the respondent had or had not visited a health professional, or had or had not embraced some form of medical treatment for coping with OOS.

Secondly, through the correlation analysis, the result demonstrates that there is direct evidence that increases in reported severity in particular body areas can be associated with increases in such discomfort in other body areas. This analysis would lend support to the aetiology of "general" body areas, in terms of overuse injury.

The correlation results show that the severity of incidence of muscular aches and pains in one region could be linked with associated incidence of reported pain in other areas. It should still be recognized that though the incidence of Stage 1 severity was generally evenly spread amongst the whole range of body areas, the results reinforce the perception of particular body areas being at risk, with those body areas being the neck, the shoulders, the right arm, the right wrist, the right, left arm, and the left wrist. The results also present a picture of the high

level of discomfort in the middle back being associated with the severity of discomfort felt in the lower back, as well as the degree of discomfort felt in the buttocks being associated with an increase in the level of discomfort reported for the thighs (see the Result section for Tables 6.10, 6.11, and 6.12).

Such an inference has importance when one considers implementing direct intervention to reduce or alleviate overuse injuries. For instance, a strategy aimed at decreasing the reported severity of discomfort located in the neck, would have some efficacy in dealing with the associated level of discomfort to be found in the shoulders. Or further, using a general view of injury, the left arm/hand/wrist and the right arm/hand/wrist could be considered single treatment "entities", rather than three separate regions of the same limb.

A discussion of the matter of the evidence for the reversibility of overuse injuries, is confounded by the fact that in our study, the use of any of the currently available treatment options were shown to ineffective in dealing with OOS symptomology. This subject is discussed in greater detail in the next section.

7.3.4 An Assessment of the Effectiveness of Existing Treatments Strategies Being Employed to Deal with Overuse Injuries.

The various analysis carried out using the "severity" variable generated results which exhibited that the treatment strategies used by this sample produced no significant difference in the level of reported severity discomfort. Instead these treatment strategies have proven to have little impact with the sample population. This is highlighted through the comparison of those subjects who reported having visited a health professional, and those who said that they had not, having no significant difference in the severity of their injuries.

This would seem to indicate that the formula remedies being suggested by medical professionals are in fact ineffective against OOS. This result, as mentioned, was not unexpected and supported by the research of Cohen et al. (1992), and underlines the purpose of the previous discussion on the failings of the present use of the concept of pain.

Such a result says that none of the adopted or utilized strategies actually proved effective in helping the respondents reduce the level of the severity of their injury. This statement is made with consideration in mind, that though our severity measure consisted of a "three-point continuum" and that the questionnaire could not possibly accurately measure the respondents actual clinical condition, the questionnaire did sample nearly 60% of the INL population, and that the questionnaire did employ an extensive and comprehensive list of treatment strategies for overuse injuries.

The picture that emerges from our analysis of the generated data is then that though some of the standard assumptions about overuse injuries are met in our sample, many others are not.

What we are left to consider then, is what techniques or strategies should be recommended or implemented for those workers, who have been identified as patently suffering from some form of overuse injury.

7.3 Future Recommendations.

The failure of the implementation of a variety of treatment strategies to alleviate OOS, has been described as having a basis in the lack of a workable model of pain within the clinical/medical arena. The question then is, if we are faced with a lack of progress in the effective treatment of OOS, what is to be done about combating the problem?

The suggestion is that if we stand by the perspective that, in the research area, VDU use is the independent variable, then it should follow that if we can manipulate that VDU use, we may produce effective strategies to deal with the development, severity and incidence of OOS.

Working on this premise, it is then not all that surprising that in general the applied regimes for combating or mediating OOS have been ineffective, because they essentially fail to improve the basic situation that those with OOS face - continually having to work at a VDU. In this light, it would seem that even such generally excepted strategies as the use of micro-pauses and ergonomic redesign of the work place, will remain ineffective if the actual level of VDU use itself is not manipulated, as in job re-design through such strategies as job

enlargement or job rotation (NOHSC, 1986). Winkle & Oxenburgh (1991) stated that the reasoning, that such a strategy would directly lead to a change away from static tasks to more dynamic tasks, and would for example, help to minimize constrained neck postures.

The introduction of job rotation and job enlargement is an active way to manipulate "real" VDU use. In the introduction I suggested that this type of research would be well aided, if it began with a job analysis. This is especially relevant here, because reporters and sub-editors - the largest group of sufferers - have the most interesting and autonomous jobs within INL. That is, it is hard to talk about job enlargement with these types of jobs, without first finding out what exactly those jobs entail.

Taking this point into consideration, these strategies still hold much promise. Job rotation is one ready way of smoothing out the load of a VDU task amongst a group of workers. It can usually be quickly introduced, and thus be an intermediate solution while engineering and work design problems are being sorted out. Job enlargement and enrichment should be even more beneficial, although more difficult to achieve. Job enlargement represents the backlash against the excessive fragmentation of work on some modern production lines. It gives each VDU or keyboard operator a much larger and meaningful piece of work. From the point of view of overuse injuries, the variety of motions and time between repetition are increased. Job enrichment gives more responsibility to the operator and adds interest to the work. Thus, it not only involves an increase in the variety of work, but is also of psychosocial benefit to the worker who becomes more involved in the operation of the organization.

The drawback to a job enrichment strategy, is that it may require a considerable upheaval in the organization and would then have to become part of the longer term solution.

The area of occupational therapy or job "re-design", as stated earlier, is suggested in many of the sources for this work. However, in the context of this sample, it proves to be a unused strategy in dealing with OOS. It is then suggested that further research into the effectiveness of such occupational therapy be implemented by INL.

This is especially noteworthy when it is considered that industrial psychologists have been

advocating just such job enlargement and enrichment strategies for at least ten years,

"... but the introduction of certain new technologies, such as computer data entry, has frequently resulted in a reversion to extreme specialisation and fragmentation of work. (DOIR, 1984, p. 10).

Other strategies which the literature would still rank as having merit (ACC, 1992; Browne et al., 1984; DOIR, 1984; DOL, 1985; SAA, 1987), but which were not directly measured by the questionnaire, are insuring that the some form of "appropriate" action is taken at the initial stages of the OOS, to insure a reversal of any early symptoms.

Such an approach would rely on work place supervisors being trained to be able to identify and modify risk factors in tasks, equipment and work environment - and then implementing the correct intervention strategy. This approach also emphasises the need within INL to encourage the recognition of health risks within the workplace by personnel and their supervisors in general, and to provide clear channels of referral for workers, so that they themselves can report persistent symptoms to an appropriate professional health expert.

As well, in designing a "work regime", general principles should be followed. These would include avoiding prolonged or repeated static or holding muscle work. That static muscle work is identifiable with fixed postures and is most commonly experienced in the shoulder muscles, and those of the forearms and hands is particularly important when the level of reported incidence of muscular aches and pains for VDU operators in these body areas is recounted. Good work place re-design should be able overcome this problem (DOIR, 1984).

Having said this, within INL certain strategies would seem to have less value. For example, though identifying and modifying the reasons that see a failure of employees reporting of early symptoms of OOS is obviously important, as it has already been mentioned, the newspaper industry in New Zealand has seen a down turn, and the closure of several newspapers (in 1992 "The Auckland Star" went out of production, and "The Christchurch Star" now is printed only three times a week on a "community notice-board" format). In such a situation where the workforce has already been rationalized, there is going to be little incentive on the part of

workers to identify themselves as being "impaired" in some way. The fear of losing ones job, would provide a major incentive for workers not to report early symptomology to supervisors or managers.

This may be one of the factors behind the figures provided by the two questions on whether the respondents had reported their muscular aches and pains to managers or fellow colleagues. Where the majority responded that they had mentioned this to colleagues, the minority reported that they had reported this same pain to their manager.

Ideally then, there should be a series of strategies, or intervention policies covering all these aspects outlined in this discussion, in every INL workplace where there is a VDU.

In the study I have concentrated on which problems are associated with the development of repetitive injuries with VDU operators working at INL, and what strategies may best be applied to reducing the incidence, and alleviating the severity of their overuse injuries. With that it is also considered that the results of this research have usefulness in a wider understanding of overuse injuries - with a particular emphasis on attempting to understand it more fully, and ultimately, effectively dealing with it in the VDU workplace.

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APPENDIX 1:
THE SLOVAK AND TREVERS QUESTIONNAIRE (1988)

NAME..... DEPARTMENT.....

Questions

- 1. How long do you spend working with a screen each week?
Circle the right percentage.
0 10 20 30 40 50 60 70 80 90 100 %
- 2. What sort of work do you mainly do? Circle the main job
word processing
data transfer
other
if other, describe here

- 4. Is there room for all your work on the surface available? Y / N
- 5. Are you able to do your work comfortably in the workstation as set up? Y / N
- 6. If no to Q5 please state problems briefly

FOR ALL OTHER QUESTIONS just circle (Y) for YES or (N) for NO as appropriate, i e:
Do you like strawberries? Y / N

VISION

- 1. Do you regularly get sore eyes? Y / N
- 2. Do you regularly get red eyes? Y / N
- 3. Do you regularly get pain behind the eyes? Y / N
- 4. Do you regularly get blurred vision? Y / N
- 5. Do you regularly get any other problems with the eyes? Y / N
- 6. If YES to any of these do you attribute any of these complaints to your work? Y / N
- 7. Have you had your eyesight checked in the last 4 years? Y / N

ILLUMINATION

- 1. Can you adjust the intensity (strength) of the image on your screen? Y / N
- 2. Is there any flicker on your screen? Y / N
- 3. If yes, can you stop it? Y / N
- 4. Are there any reflections from lights, windows, etc, on your screen? Y / N
- 5. Do these cause any problems with your work? Y / N
- 6. Is there any glare from shiny surfaces (e.g. walls, notice boards, etc) in your room which interferes with your work? Y / N
- 7. Does the lighting in your room cause glare? Y / N
- 8. Is the lighting in your room obtained from bare bulbs or bare fluorescent tubes? Y / N

OTHER

PHYSICAL

- 1. Do you regularly get neck or shoulder pain? Y / N
- 2. Do you regularly get pain in your fingers? Y / N
- 3. Do you regularly get pain in your wrists? Y / N
- 4. Do you regularly get pain in your forearms? Y / N
- 5. Do you regularly get pain in your lower back? Y / N
- 6. If YES to any of these, do you attribute any of these complaints to your work? Y / N

SEATING (for screen operation only)

- 1. Is the seat adjustable for height? Y / N
- 2. Does the seat provide comfortable back support? Y / N
- 3. Is the seat otherwise comfortable? Y / N
- 4. Do you have a footrest? Y / N

OTHER BODY SYSTEMS

- 1. Do you regularly get irritation on your face? Y / N
- 2. Do you regularly get a rash on your face? Y / N
- 3. Do you regularly get headaches? Y / N
- 4. If YES to any of these, do you attribute any of these complaints to your work? Y / N
- 5. Do you have any other symptoms which you feel may be related to your work? If YES, state below

SCREEN AND TABLE

- 1. Is the keyboard separately movable from the screen? Y / N
- 2. Is your table adjustable for height? Y / N
- 3. Do you have a lectern? Y / N

.....
.....

APPENDIX 2: ADDITIONAL CLINICAL INFORMATION ON RSI

"The clinical syndromes presenting within the range of RSI include the following:

Neck and Shoulder Girdles

The deep cervical and levator scapulae/trapezius muscle groups are frequently tender and contracted on examination. Occasionally, rotator cuff or bicipital tendonitis may contribute to shoulder and upper arm syndromes.

Elbow

Lateral or medial epicondylitis is common and may be confirmed by the demonstration of tenderness over the epicondyle on pressure and of pain on resisted contraction of wrist and finger extensor and flexor muscles, respectively. Pain arising from the biceps insertion at the proximal radius is occasionally seen. Ulnar neuropathy (cubital tunnel syndrome) median nerve compression as it passes between the 2 heads of pronator teres, and posterior interosseous nerve entrapment as it passes through supinator are all well recognised.

Forearm and Wrist

Dorsal forearm and wrist pain is a common manifestation of tenosynovitis of the extensor and flexor muscles of the wrist and thumb. Flexor tenosynovitis and secondary carpal tunnel syndrome result in recurrent pain in the volar aspect of the wrist and of the palm and in paraesthesia and numbness in the thumb and fingers. Weakness and loss of manual dexterity may occur. A common cause of pain is a diffuse tenderness and pain on contracting or stretching in the extensor muscles, due to persistent overuse. This may even present as a compartment syndrome.

Thumb

Several syndromes may cause thumb pain:

- (a) de Quervain's stenosing tenovaginitis with tenderness, thickening, and crepitus of the common tendon sheath of the long abductor and the short extensor of the thumb;

- (b) Capsular strain of the carpometacarpal joint of the thumb after repetitive flexion/extension stress (for example, by the use of scissors); and
 - (c) Aggravation of osteoarthritis of the carpometacarpal joint of the thumb.
- Other ill defined disorders may add to the clinical picture; these include:
- (a) Thoracic outlet syndromes caused by compression of the neurovascular bundle at various level; and
 - (b) Reflex sympathetic dystrophy syndrome which may follow mild trauma, peripheral nerve injuries, shoulder pain disorders, and surgery to the upper extremity." (DOL, 1985, pp. 7 - 8; taken from N.S.W. DIOR, 1984, pp. 40 - 41)

APPENDIX 3:
THE INDEPENDENT NEWSPAPERS LIMITED QUESTIONNAIRE FOR
OCCUPATIONAL OVERUSE SYNDROME.

--	--	--	--

Code Number

THE INL OOS STUDY

This questionnaire is designed to investigate muscular aches and pains associated with keyboard use. The study is concerned with Occupational Overuse Syndrome (OOS, also commonly known as Repetitive Strain Injury) in keyboard operator staff in Independent Newspapers Limited.

The questionnaire has been divided into three sections:

Section One begins on page 2, and is a self reporting form for pain and discomfort.

Section Two begins on page 11, and has been designed to investigate the relationship between work related behaviours and OOS.

Section Three begins on page 19, and investigates the links between the work environment and OOS.

All participants will be given feedback on the results of the project. The questionnaire is confidential and we will not be able to trace individuals. The code number at the top of this page indicates the newspaper/division you work at, and is only there so that the Occupational Safety and Health Service can follow up in case the number of returns is small.

We do not require names, addresses, IRD or payslip numbers to be added to the questionnaire.

The questionnaire consists of a number of questions. Please answer them all as honestly as you can. No one will be able to query your answers.

Circle the number of the answer that you think is appropriate.

Thank you for your help.

Mike Smith	(Massey University)
Bert Biggs	(Massey University)
Jon Dannatt	(Massey University)
Ross Pirie	(Massey University)
Christine Stephens	(Massey University)
Frank Darby	(Occupational Safety and Health, Department of Health)
Jenny Beek	(Occupational Health Nurse, INL)

SECTION ONE.

SELF REPORTING FORM FOR PAIN AND DISCOMFORT.

For each question, choose the answer that is true for you, and circle the appropriate number. For example, with Q2,

2. What type of work do you do?

If "Reporter" is the appropriate answer, then circle "1".

Mark only one answer for each question.

If you change your mind, erase the old mark completely.

For example for Q5, if you are left handed, circle the 1.

GENERAL INFORMATION

For Office Use
Only

1. My identification number is

--	--	--

2. What type of work do you do?

- 1. Reporter
- 2. Sub-editor
- 3. Tele-ads
- 4. Display settings
- 5. Accounts or Clerical
- 6. Other (Please specify)

[]

3. Sex.

- 1. Male
- 2. Female

[]

4. Age in years.

- 1. 20 or younger
- 2. 21 to 30
- 3. 31 to 40
- 4. 41 and over

[]

5. Are you left or right handed?

- 1. Left
- 2. Right

[]

6. Estimate your Visual Display Terminal use each day.
1. Less than 2 hours
 2. 2-4 hours
 3. 4-6 hours
 4. 6-8 hours
 5. More than 8 hours []
7. How long have you been using a Visual Display Terminal?
1. Less than 1 year
 2. 1 - 2 years
 3. 2 - 5 years
 4. More than 5 years []
8. A normal pattern is 8 am to 6 pm, Monday to Friday.
Do you work a different pattern to this?
1. Yes
 2. No []

QUESTIONS ABOUT MUSCULAR ACHES AND PAIN

Circle the number of the answer that you think is appropriate. For example, with Q9,

9. Do you have any discomfort right now?

If "Yes" is the appropriate answers, then circle "1".

9. Do you have any discomfort right now?
1. Yes
 2. No []

If you answered "No" to Q9, go to Q25 on page 8.

If you answered "Yes" to Q9, carry on with Q10 to Q26 on page 9, then carry on with the questionnaire from SECTION TWO onwards.

10. Have you reported this discomfort to your manager or supervisor?
1. Yes
 2. No []
11. Have you mentioned this discomfort to your work colleagues?
1. Yes
 2. No []

12. Do you wake with discomfort?

1. Yes
2. No

[]

If you answered "Yes" to Q12

(a) Do you normally wake with this discomfort after working days?

1. Yes
2. No

[]

(b) Do you normally wake with this discomfort after your rostered days off?

1. Yes
2. No

[]

13. If you feel discomfort, is it continuous throughout the day?

1. Yes
2. No

[]

If you answered "Yes" to Q13

(a) Is this discomfort continuous throughout only days that you work?

1. Yes
2. No

[]

If you answered "No" to Q13

(a) How many hours during your working day, do you normally feel this discomfort?

1. Less than 2 hours
2. 2-4 hours
3. 4-6 hours
4. 6-8 hours
5. More than 8 hours

[]

(b) How many hours during your rostered days free, do you normally feel this discomfort?

1. Less than 2 hours
2. 2-4 hours
3. 4-6 hours
4. 6-8 hours
5. More than 8 hours

[]

14. Are you free from this discomfort during your rostered days off?

1. Yes
2. No

[]

15. Has this discomfort forced you to take time off work?

- 1. Yes
- 2. No

[]

If you answered "Yes" to Q15

(a) How many days in the last year? _____

[]

17. Has this discomfort **moved** from one area of your body, to another area of your body?

- 1. Yes
- 2. No

[]

18. Has this discomfort **spread** to other areas of your body?

- 1. Yes
- 2. No

[]

19. My muscle aches and pains have generally,

- 1. become more severe
- 2. stayed the same
- 3. become less severe

[]

20. Please state the severity of the aches and pains for each part of the body you find discomfort in. Use the seven point scale given below.

For example, if you have only slight pain in the shoulders place a 1 in the box provided beside shoulders. If you have extreme pain in your right hand place a 7 in the box provided for the right hand (use only whole numbers please).

1 2 3 4 5 6 7

Slight aches
and pains

Mild aches
and pain

Severe aches
and pain

- Neck [] []
- Shoulders [] []
- Right arm [] []
- Left arm [] []
- Right wrist [] []
- Left wrist [] []
- Right hand [] []
- Left hand [] []
- Middle back [] []
- Lower back [] []
- Buttocks [] []
- Thighs [] []

21. Because of your muscle aches and pains, have you difficulty in sleeping?

- 1. Not at all
- 2. Sometimes []
- 3. Constantly

22. Have you undertaken new activities or strategies to reduce discomfort?

- 1. Yes
- 2. No []

If you answered "Yes" to Q22

(a) What are these new activities? _____

[]

23. Have you reduced, or given up some daily routines or activities, because of your discomfort?

- 1. Yes
- 2. No []

If you answered "Yes" to Q23

- (a) What are these activities? _____

_____ []

24. I have visited a health professional

1. Yes
2. No []

If you answered "Yes" to Q24

- (a) what treatment or therapy did you receive ? _____

_____ []

- (b) have you tried any other types of treatment or therapy, if so what ? _____

_____ []

- (c) what treatment or therapy best helped you relieve your feelings of muscle aches and pains?

_____ []

- (d) did any treatments make your aches and pains worse?

_____ []

QUESTIONS ABOUT YOUR WORKSTATION (ERGONOMICS)

Circle the number of the answer that you think is appropriate. For example, with Q25,

25. For your seating
- (a) is the seat adjustable for height?

If "Yes" is the appropriate answer, then circle "1".

25. For your seating

- (a) is the seat adjustable for height?

1. Yes
2. No

[]

- (b) does the seat provide comfortable back support?

1. Yes
2. No

[]

- (c) is the seat otherwise comfortable?

1. Yes
2. No

[]

- (d) do you have a footrest?

1. Yes
2. No

[]

For your screen and table

- (e) is the keyboard separately movable from the screen?

1. Yes
2. No

[]

- (f) is your table adjustable for height?

1. Yes
2. No

[]

- (g) do you have a wrist-rest?

1. Yes
2. No

[]

- (h) do you use a 'mouse'?
1. Yes
 2. No
- []

- (i) is there room for all your work on the surface available?
1. Yes
 2. No
- []

- (j) are you able to get comfortable (posture) at your workstation?
1. Yes
 2. No
- []

26. I believe the design of my workstation (ergonomics) is good
1. Yes
 2. No
- []

If you answered "No" to Q26

- (a) please state briefly its problems _____
- _____
- _____
- []

If you answered "Yes" to Q9, please carry on with the questionnaire from SECTION TWO onwards.

If you answered "No" to Q9, please carry on with the questionnaire from Q27 onwards.

27. Have you ever had neck or shoulder pain?
1. Yes
 2. No
- []

28. Have you ever had pain in your fingers?
1. Yes
 2. No
- []

29. Have you ever had pain in your wrists?
1. Yes
 2. No
- []

30. Have you ever had pain in your forearms?

- 1. Yes
- 2. No

[]

31. Have you ever had pain in your lower back?

- 1. Yes
- 2. No

[]

If you answered "Yes" to any of the previous questions.

(a) to what activities do you attribute any of these complaints_____

[]

(b) please state what treatment or therapy you took to relieve your feelings of muscle aches and pains_____

[]

(c) what treatment or therapy best worked for you_____

[]

**APPENDIX 4:
THE COVERING LETTER AND THE
FOLLOW-UP LETTERS TO THE INDEPENDENT NEWSPAPERS
LIMITED QUESTIONNAIRE.**



**MASSEY
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**FACULTY OF
SOCIAL SCIENCES**

**DEPARTMENT OF
PSYCHOLOGY**



12 May 1992

Dear INL worker,

THE INL OCCUPATIONAL OVERUSE SYNDROME (OOS) STUDY

The enclosed questionnaire has been designed to investigate OOS in INL. OOS (also known as Repetitive Strain Injury) is the phenomenon which describes the muscular aches and pains that are associated with keyboard use. Due to the occurrence of OOS in INL staff a research team has been formed with the aim of reducing this problem.

The questionnaire has been developed with the guidance and support of INL unions represented by Corrine Ambler and Penny Harding, Jenny Beek (Occupational Health Nurse), Frank Darby (Occupational Safety and Health, Department of Health), and five Massey University researchers (Mike Smith, Bert Biggs, Jon Dannatt, Christine Stephens, and Ross Pirie).

The questionnaire has three sections. Section one is a self reporting form for pain and discomfort, section two investigates the relationship between work related behaviours and OOS, and section three investigates the links between the work environment and OOS.

Participation in this study is voluntary, but it will help to discover possible therapies and build a picture which will, we hope, significantly reduce OOS occurring in the workplace. Complete anonymity is assured since no individual form can be identified and only group data will be reported. Thank you, in anticipation, for your assistance and time.

Yours sincerely,

Mike Smith
Bert Biggs
Jon Dannatt
Ross Pirie
Christine Stephens
Frank Darby
Jenny Beek

1.



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**FACULTY OF
SOCIAL SCIENCES**

**DEPARTMENT OF
PSYCHOLOGY**

Dear INL worker,

You will recall receiving a questionnaire to complete, in support of the INL Occupational Overuse Syndrome project. It is essential to the success of the project that as many of the questionnaires as possible are completed and returned.

If you have not yet completed and returned your questionnaire, we would appreciate your doing so as soon as possible.

If you do not wish to complete a questionnaire please return the forms to the designated person in your office.

Your response will remain confidential and untraceable to any individual. Thank you for your help.

Yours faithfully,

Mike Smith
Jon Dannatt
Ross Pirie
Christine Stephens

2.



**MASSEY
UNIVERSITY**

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Telephone 0-6-356 9099
Facsimile 0-6-350 5611

**FACULTY OF
SOCIAL SCIENCES**

DEPARTMENT OF
PSYCHOLOGY

Dear INL Worker,

To complete the INL Occupational Overuse Syndrome survey, it is important that as many questionnaires as possible are completed and returned. If you have not completed or returned your questionnaire, could you please do so as soon as possible?

If you have lost your form but are willing to complete the questionnaire, please ask the designated person in your office for another copy.

If you have any problems with procedures for completing the questionnaire, do not hesitate to ask for advice or for another copy if necessary.

If you do not wish to take part in the survey, please return your uncompleted form.

Thank you for your time and trouble. We hope that the results of this project will be of benefit to all VDT workers.

Yours faithfully,

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Dear INL worker,

You will recall receiving a questionnaire to complete, in support of the INL Occupational Overuse Syndrome project. It is essential to the success of the project that as many of the questionnaires as possible are completed and returned.

If you have not yet completed and returned your questionnaire, we would appreciate your doing so as soon as possible.

If you do not wish to complete a questionnaire please return the forms to the designated person in your office.

Your response will remain confidential and untraceable to any individual. Thank you for your help.

Yours faithfully,

Mike Smith
Jon Dannatt
Ross Pirie
Christine Stephens



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12 May 1992

Dear INL worker,

THE INL OCCUPATIONAL OVERUSE SYNDROME (OOS) STUDY

The enclosed questionnaire has been designed to investigate OOS in INL. OOS (also known as Repetitive Strain Injury) is the phenomenon which describes the muscular aches and pains that are associated with keyboard use. Due to the occurrence of OOS in INL staff a research team has been formed with the aim of reducing this problem.

The questionnaire has been developed with the guidance and support of INL unions represented by Corrine Ambler and Penny Harding, Jenny Beek (Occupational Health Nurse), Frank Darby (Occupational Safety and Health, Department of Health), and five Massey University researchers (Mike Smith, Bert Biggs, Jon Dannatt, Christine Stephens, and Ross Pirie).

The questionnaire has three sections. Section one is a self reporting form for pain and discomfort, section two investigates the relationship between work related behaviours and OOS, and section three investigates the links between the work environment and OOS.

Participation in this study is voluntary, but it will help to discover possible therapies and build a picture which will, we hope, significantly reduce OOS occurring in the workplace. Complete anonymity is assured since no individual form can be identified and only group data will be reported. Thank you, in anticipation, for your assistance and time.

Yours sincerely,

Mike Smith
Bert Biggs
Jon Dannatt
Ross Pirie
Christine Stephens
Frank Darby
Jenny Beek