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International review of the literature relating to the benefits of limbering up exercises at work

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International review of the literature relating to the benefits of limbering up exercises at work

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This study aimed to look at limbering up exercises as a means of reducing work-related musculoskeletal disorders (WRMSDs). The potential benefits of limbering up exercises in the workplace were studied through:

• A review of the literature in English and Japanese, reporting cases where the benefits of limbering up exercises related to work have been investigated;

• An assessment of the problem of WRMSDs in UK industry through a data analysis;

• A workshop and visits to various organisations in Japan to gather the latest research concerning limbering up programmes in the workplace;

• A consultation exercise, making available to British industry the results of the project and gathering feedback regarding limbering up exercises in the workplace;

• A gap analysis looking at how the findings of the literature review meet the needs of industry based on the data analysis and feedback to the consultation document.

The gap analysis indicated that there is not enough quantitative and reliable scientific evidence to make recommendations to industry about implementing limbering up exercises in workplaces as a means of reducing WRMSDs. It was noted, however, that the benefits of general physical (cardio-vascular) exercise as a means of reducing absenteeism from work is better documented and could be recommended. While this would help to meet the HSE's aims of reducing absenteeism from work, it is not clear whether this reduction in absentee rates could be associated with any reduction in WRMSDs.

A more rigorous programme of well designed research would be required in order to definitively answer the remaining questions regarding the benefits of limbering up exercises.

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EXECUTIVE SUMMARY

This study aimed to look at the potential benefits of introducing limbering up exercises in the workplace through:

- A review of the literature, published in English and Japanese, reporting cases where the potential benefits of limbering up exercises related to work have been investigated;
- An assessment of the problem of WRMSDs in UK industry through an analysis of data;
- A workshop and visits to various organisations in Japan to gather the latest research concerning limbering up programmes in the workplace;
- A consultation exercise, making available to British industry the results of the project and gathering feedback regarding limbering up exercises in the workplace;
- A gap analysis looking at how the findings of the literature review meet the needs of industry based on the data analysis and feedback to the consultation document.

Literature review

The literature review revealed more literature in the English language than the Japanese language on the subject of limbering up for work. Although there was more work in the English language than was expected, given the much greater number of journals and books published in English it is probably fair to say that the subject is given proportionately more attention in the Japanese scientific literature.

The data available do indicate benefits associated with limbering up exercises, but the benefits found were often small or hard to attribute to the exercises themselves with any certainty. While there is evidence of benefits from exercise across the board, the evidence in support of general fitness and rehabilitation exercises is more prevalent and more conclusive than that for exercise as a warm up before strenuous work or as a countermeasure to sedentary work. The Japanese literature contains a lot of information about exercising as a means of preventing lower back pain (LBP).

Five categories of article were identified in the literature in English, based upon the general goal of the study. In each of the five categories, however, there appears to be room for improvement in research methods that would enable more conclusive data to be obtained.

Five different categories of article were identified in the Japanese literature. The Japanese research presents stronger evidence for exercise and stretching as a means for reducing LBP. However, there is still a lack of quantitative evidence in this area and further, more empirically rigorous research is recommended.

Data analysis of UK needs

An analysis of British MSD data was conducted using information gathered mainly from statistics provided by the HSE. The purpose of this study was to describe the data in a manner that was compatible with the findings of the literature review carried out in the first stage of this project.

The data were used to identify the areas where most effort should be focused to reduce musculoskeletal and associated disorders. The data analysis looked at types of disorder; cost to industry of MSDs; and the characteristics of sufferers.

UK-JAPAN workshop

The main reason for the trip was an international workshop on the benefits of limbering up that had been organised by Waseda University in Tokyo. However, there were also opportunities to visit Toyota and Matsushita factories, the National Institute of Industrial Health and the Ministry of Health, Labour and Welfare.

While it appeared that companies such as Toyota have a detailed and well-thought out exercise plan, they were unfortunately unwilling to share the proprietary research that lead to their opinion that limbering up exercises have benefits in terms of employee health and reduction of MSDs.

Consultation with industry

A summary of the results of the literature review and data analysis was sent to members of industry who had earlier expressed an interest in the project. This summary document solicited feedback regarding the results of the project and any comments based on practical experience of limbering up in the workplace.

Feedback generally agreed with the findings of the data analysis and literature review. Respondents mostly agreed that limbering up exercises before work should have a beneficial effect on the incidence of WRMSDs, despite the fact that little evidence exists to support this assertion.

Respondents commented on the need for guidance with regard to MSDs and the need to provide some support to help them achieve buy-in from both managers and the workforce when trying to implement workplace exercise programmes.

Gap analysis

The aim of the gap analysis was to look at the results of the literature review, data analysis and consultation with industry and compare the needs of industry with the findings of research in order to examine any gaps indicating research that needs to be done.

Following the literature review it became clear that there are many gaps in research, the most important being a distinct lack of statistically significant evidence for the benefits of limbering up exercises in the workplace.

Conclusions

The literature review concludes that there is strong, reliable evidence for work benefits from general health and fitness exercises and from exercises performed as part of a rehabilitation programme. There is (mostly anecdotal) evidence for benefits from limbering up or stretching exercises (not associated with cardio-vascular fitness) performed before or during work, but it is not sufficiently strong to make a case for recommending such exercises to industry. The best evidence for specific benefits associated with WRMSDs comes from exercises designed to strengthen the back.

While there is enough evidence to recommend health and fitness programmes, there is not enough at the moment to recommend limbering up programmes. The evidence of benefits of limbering up exercises is not specific or reliable enough, and more research will be necessary to find out which limbering up exercises produce which kinds of benefits and to what magnitude.

It is also clear that regular physical exercise is an excellent way to reduce absenteeism at work and improve the all-round health and fitness of employees – back strengthening exercises would be one way of reducing MSDs mainly affecting the back.

It is recommended that future work include contacting respondents who expressed the desire to help the project by providing data from existing programmes; looking at the influence of psychosocial factors upon WRMSDs; and, considering a longitudinal study into the effects of limbering up exercises on WRMSDs at some point in the future.

1. INTRODUCTION

Background

Work-related musculoskeletal disorders (WRMSDs) are said to be responsible for about 12.3 million days of absence from work annually (HSE, 2004). Their impact on the health of the workforce and the economy is clearly highly significant. Whilst ergonomic interventions that act on the environment such as workplace and task redesign have lead to many improvements in terms of correcting bad posture, poor lifting techniques and so on, little work has been done looking at ergonomic interventions that act on the body of the individual, for example preventing WRMSDs through limbering up or stretching exercises.

There is a general impression that limbering up exercises may be beneficial in preventing work related musculoskeletal disorders (WRMSDs), but there is also the impression that there is not a great deal of evidence to back up that idea. Even in Japan, where limbering up exercises are frequently part of the working day, the idea that the benefits are demonstrable is not widespread.

This work has been performed in response to a research topic published by the HSE in its Competition of Ideas, 2002. The overall aim was to provide the HSE with the latest information so that it can respond to enquiries from industry about the usefulness, or not, of limbering up exercises for work. The text of the topic is quoted below:

> **"Issue MD1**
> It is often suggested that 'limbering up' (including warm up and stretching) may be beneficial in the prevention of work-related musculoskeletal disorders. What real world evidence is there that such approaches to the prevention of musculoskeletal disorders are actually used? Is there any evidence that they are effective?"

The work that was proposed in response to this topic aims to find out what evidence of effectiveness exists and to find out how closely that evidence matches the needs of UK industry.

A report for the HSE by Graveling et al. (2003) suggested that little evidence was available in the English language that limbering up exercises are beneficial. This project aimed to extend the findings of that report by looking for more articles in English and also by including articles written in Japanese.

Aims

This project aims to investigate the potential usefulness of limbering up exercises at work in addressing the UK's problem of musculoskeletal disorders in the workforce. The approach is to review the data that are available on the efficacy of such exercises, compare that efficacy data with the needs of UK industry and propose a way forward to make best use of the demonstrable benefits.

This study aimed to look at the potential benefits of introducing limbering up exercises in the workplace through:

- A review of the literature, published in English and Japanese, reporting cases where the potential benefits of limbering up exercises related to work have been investigated;
- An assessment of the problem of WRMSDs in UK industry through an analysis of data;
- A workshop and visits to various organisations in Japan to gather the latest research concerning limbering up programmes in the workplace;
- A consultation exercise, making available to British industry the results of the project and gathering feedback regarding limbering up exercises in the workplace;

- A gap analysis looking at how the findings of the literature review meet the needs of industry based on the data analysis and feedback to the consultation document.

It is thought that this approach will result in a good overview of the status of limbering up exercises with regard to WRMSDs and the needs of UK industry that these exercises should tackle if they are put into practice.

Types of exercise

This report refers to several types of exercise which are defined below. The definitions are not based on the sorts of movements that are performed, because many movements are common to more than one category. Types of exercises are differentiated primarily by the purpose of the exercise and, consequently, the amount, frequency and timing of the exercises performed.

Limbering up exercises

This refers to short, light to moderate exercises, which may include warming up and/or stretching, performed every day and often throughout the day (e.g. before each shift) in order to loosen up or prepare the body for work. This kind of exercise is necessarily performed before or during sedentary work, such as typing, or more physical work such as manual handling. The exercises themselves may be the same as for health and fitness, but can be differentiated in that the amount of physical work is limited to that which is sufficient to warm up muscles, tendons and joints.

Exercises for general health and fitness

Exercises intended to increase general health and fitness are not necessarily performed every day nor are they necessarily performed before work. They refer to exercises done for longer periods of time (e.g. jogging for an hour, swimming, lifting weights) one to several times a week. These kinds of exercises should result in an improvement in the cardio-vascular fitness of the exerciser. The exercises themselves may be the same as for limbering up, but the amount of physical work will be greater such that muscles are worked harder and heart rate is increased to the level required to produce a improvement in overall fitness.

Exercises for rehabilitation

These exercises are defined as those performed to specifically target and improve a problem area in the body. This might for example involve back strengthening exercises to reduce back pain or to recover from a medical problem such as a slipped disk. These types of exercises are typically performed more regularly than exercises for general health and fitness, and for longer periods of time than limbering up exercises.

Exercising to reduce fatigue

Some reference is made in this report to exercises performed in order to reduce fatigue. These exercises are similar to limbering up exercises but with less emphasis on stretching muscles and more emphasis on movement to warm up the body and moderately increase blood flow and heart rate.

2. LITERATURE REVIEW

A literature review was performed in order to bring together the currently published findings regarding the benefits of limbering up at work. The review took in 78 papers, 43 in English, and 35 in Japanese.

Studies addressing warming-up prior to doing sport were excluded as it was thought that they address subtly different goals. Whereas the main aim of warming-up before sport is to increase the upper limit of the performance envelope with the intention of pushing the body to its limit; limbering-up before work is intended to expand the performance envelope so that there is less chance of the work that is done falling outside of it and thus causing the body harm.

Each piece of research was analysed and summarised using the same criteria to facilitate comparisons between the two groups of research. This involved looking at:

- The goal(s) of the study;
- The experimental design used;
- The types of exercises used, and the frequency with which they were performed;
- The quality and reliability of the experimental design (statistics, control groups, bias);
- The findings and overall value of the work.

2.1. ENGLISH LANGUAGE RESEARCH OVERVIEW

It was initially thought that little research had been produced by the English-speaking research community that would be relevant to limbering up exercises. To a certain degree this was true, as there were not many articles available with a direct bearing on the concept of doing limbering up exercises before carrying out a task. However, many articles were found that had some degree of relevance to limbering up and whose findings were of use to this study.

It was found useful to divide these articles into 5 broad categories. These categories are not based on agreed definitions, but are pragmatic groupings based on the general goals of the exercise programmes:

- Category 1 – Preparing to do a sedentary task (e.g. office work);
- Category 2 – Preparing to do a heavy task (e.g. yard work, lifting);
- Category 3 – Recovering from injury;
- Category 4 – Conditioning/strength/fitness improvements;
- Category 5 – Other.

A statistical breakdown of the documents by programme goal can be found in Appendix A, and is summarised in the pie chart in **Figure 1** below. The following paragraphs offer a summary of the main findings under each of these areas.

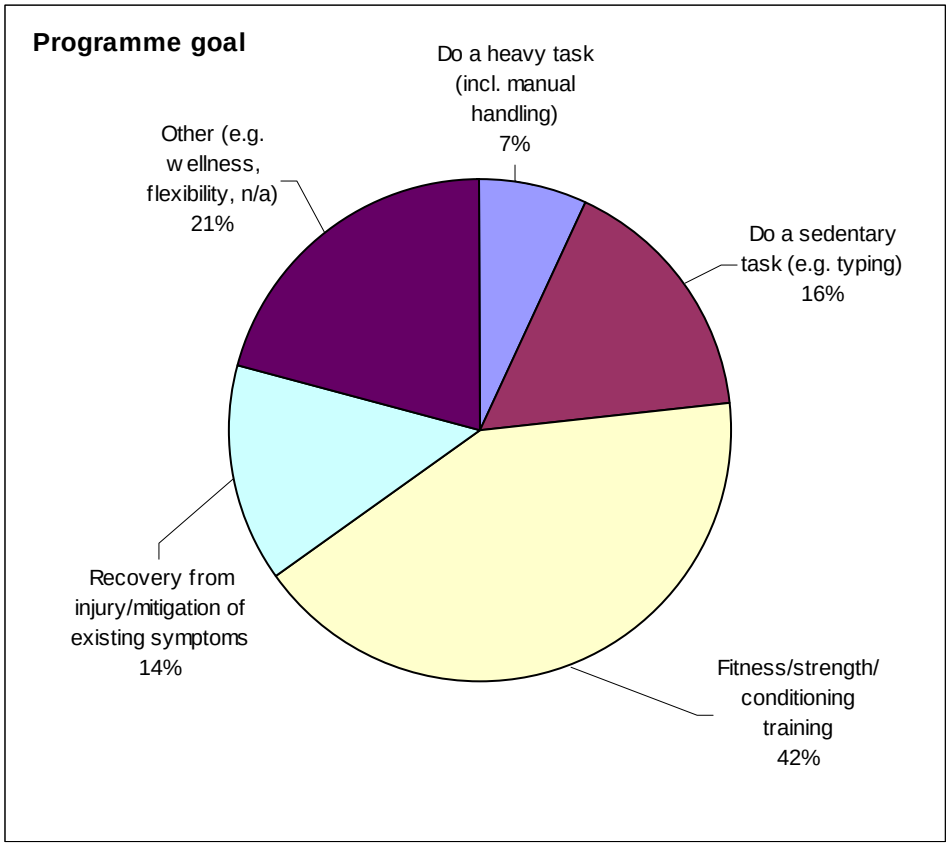

Figure 1 Pie chart showing a breakdown of research in English by programme goal

Category 1 – Preparing to do a sedentary task

Limbering up before doing a sedentary task is more widely reported in the literature than limbering up before doing a heavy (manual handling) task.

Benefits for this type of exercise have been either absent or insufficiently supported by the statistics. Lesin (1994) describes a piece of software that prompts its users to do exercises at the appropriate time but provides no statistically significant evidence of any benefit. Moore (1998) produced a well-controlled and thorough study but the short time span (8 weeks) was not enough for convincing evidence of improvement in MSD occurrence, although the exercisers were reported as being more flexible and happier. Silverstein (1988) introduced an exercise programme to limit upper limb discomfort for one year, but the differences observed were not statistically significant.

An older study by Laporte (1966) looked at the effect of a "gymnastic pause" upon female postal workers. While there is some evidence that the women taking part in these exercises became more alert than those who merely rested statically, Laporte's claims that these exercises would reduce muscle pain are unsupported.

Amongst the most comprehensive studies reviewed were those by Lee et al. (1991, 1992). These studies both addressed over a hundred different types of exercises that had been recommended for VDT operators, and assessed them on a number of criteria. While no attempt was made to prove whether or not the exercises were likely to mitigate future MSDs, a number of interesting points were made: -

- Some exercises were found to be overly conspicuous and embarrassing for workers to perform at their desks;
- Many of the exercises were contraindicated for persons with certain health problems such that they should not be performed by those suffering from WRMSDs;
- Some exercises were found to exacerbate biomechanical stresses common to VDT work. For example, certain finger exercises involve contracting the same muscles that are used when typing;
- There were safety risks associated with some exercises, especially those in which an office chair (with castors) is used to support ones weight.

These findings do not bode well for limbering up as a means of reducing upper limb discomfort. It may be the case, as Lee et al. (1991, 1992) imply, that some exercises are beneficial while others may be detrimental. A more rigorous study looking at these exercises in isolation may discover which exercises help and which hinder the mitigation of WRMSDs. Certainly, it will be important to address issues of actual participation and commitment by subjects in any future study, as well as such factors as previous level of fitness.

Category 2 – Preparing to do a heavy task

One of the initial triggers for this study was a report by Graveling et al. (2003) where a literature review was performed looking at the benefits of limbering up prior to doing a manual handling task. Their review did not find any scientific evidence for a beneficial effect of warming up prior to commencing a manual handling task.

Two studies (Allers, 1989; Nurminen et al., 2002) were found looking at limbering up prior to heavy or strenuous work, such as laundry work and lumber yard work. These scenarios are slightly different to the sedentary task warm-ups and have more in common with the mechanisms associated with warming-up before doing sports.

Allers (1989) reports the case of a lumber yard where a stretching programme was introduced before work and throughout the day as required. Large reductions in injuries and compensation claims were observed, although the specific exercises used were not reported and the only measure of success was days absent from work. The article seemed generally rather anecdotal and designed to promote the author's own stretching programme.

A more empirically founded study looked at a worksite exercise programme for laundry women (Nurminen et al., 2002). Although stretching was involved, this was not strictly a limbering up study as the exercise was not done daily before work. The study was unsuccessful in showing that exercise either improves work ability or decreases the number of days sick leave.

These studies both point to the need for more targeted, empirical research to be carried out regarding limbering up/stretching programmes.

Category 3 – Recovery from an injury

A number of studies address exercises to promote rehabilitation from work-related ULDs. Three studies were found relating to recovery from carpal tunnel syndrome. 5 minutes of hand exercises involving wrist extension and flexion, along with light isometric exercises using a hand exerciser, was found by Hansford et al. (1986) to increase blood flow after a 1.5 hour shift in which blood flow decreased.

Kellet et al. (1991) investigated the introduction of a regular and varied exercise programme performed to music for back pain sufferers. It was found that this programme reduced days off work attributable to back pain by over 50% compared to 1.5 years previously.

The problem with most of these kinds of studies is that, while highly empirical, their subjects are usually already suffering from some kind of WRMSD. Therefore, it is difficult to tell whether the exercises that work for them will also be of some preventive benefit for non-sufferers. One exception is Seradge et al. (1995), who found that a minute of finger exercises reduced intratunnel pressure for 15 minutes. The subjects in this study were drawn from various occupations, such as typists, golfers, trigger operator in a factory, and so on. They noticed improvements in both sufferers and non-sufferers, which is a good sign. However, they did not specify which types of exercise were most beneficial.

Category 4 – Conditioning/Strength/Fitness Programmes

A large number of articles address worksite fitness programmes. These vary in form from just providing a gym (e.g., Shephard, 1992) to giving subjects individually tailored exercise programmes (Cady et al., 1985). The majority of these studies are from the USA and focus on the economic benefits and medical savings to be gained from a healthy workforce.

An excellent review by Dishman et al. (1998) notes that typical worksite interventions have yet to demonstrate a statistically significant increase in physical activity or fitness. They go on to note that studies with the most exemplary experimental designs are least likely to record statistically significant effects of exercise, while those claiming the most benefit are the most anecdotal.

The fact that many of these studies combine strength training, cardiovascular fitness, health education, and diet in a general “wellness” programme means that it is hard to attribute any of the findings to a specific cause. While we can expect general fitness improvement to result in fewer days off sick, physical exercise is also a major cause of injury and care should be taken to avoid any exercises that might exacerbate the biomechanical strains of the job.

Category 5 – Other articles

Many of the other articles, whilst not specifically addressing stretching or physical exercise, are able to make useful contributions to the debate.

Biering-Sorensen (1984) conducted a longitudinal study looking at flexibility as a predictor of future back pain. It was found that lack of flexibility was a much better indicator of previous back pain than predictor of future problems. Biering-Sorensen found that men with hypermobile backs were actually more likely to suffer from future back pain. These findings may have implications for stretching as a method of reducing back pain. The authors suggested that building isometric back strength would be a better method of reducing future back problems.

The findings of Battie et al. (1990) concur with Biering-Sorensen in that flexibility is associated more with previous than future back pain. However, it is noted that participation in workplace stretching programmes do seem to reduce future back pain, even though increased spinal flexibility is not associated with this reduction. It may be that workers derive some other benefit from the stretching programme, perhaps a similar one to that observed by Laporte (1966) such as increased alertness and well-being, or some form of the Hawthorne effect (Mayo, 1933).

2.2. JAPANESE LANGUAGE RESEARCH OVERVIEW

Whereas the literature in English concentrates more on doing exercises and stretching in order to warm-up and prepare the body for the physical activities involved in doing work, the literature in Japanese is more concerned with doing exercises to strengthen and maintain the flexibility of the body in order to prevent and/or alleviate symptoms of LBP. This represents a subtle difference in emphasis between the two bodies of research.

This difference in emphasis means that the five categories applied to the literature in English is less useful here. An alternative system, also based on programme goal, has been developed for the Japanese literature as follows (letters rather than numbers have been used, in order to reduce confusion between the two types of categories):

- Category A – Prevention of lower back pain;
- Category B – Management of (existing) lower back pain;
- Category C – Exercising for general fitness;
- Category D – Exercising to reduce feelings of fatigue;
- Category E – Other.

A statistical breakdown of the documents by programme goal can be found in Appendix A and is summarised in the pie chart in **Figure 2** below. The following paragraphs offer a summary of the main findings under each of these areas.

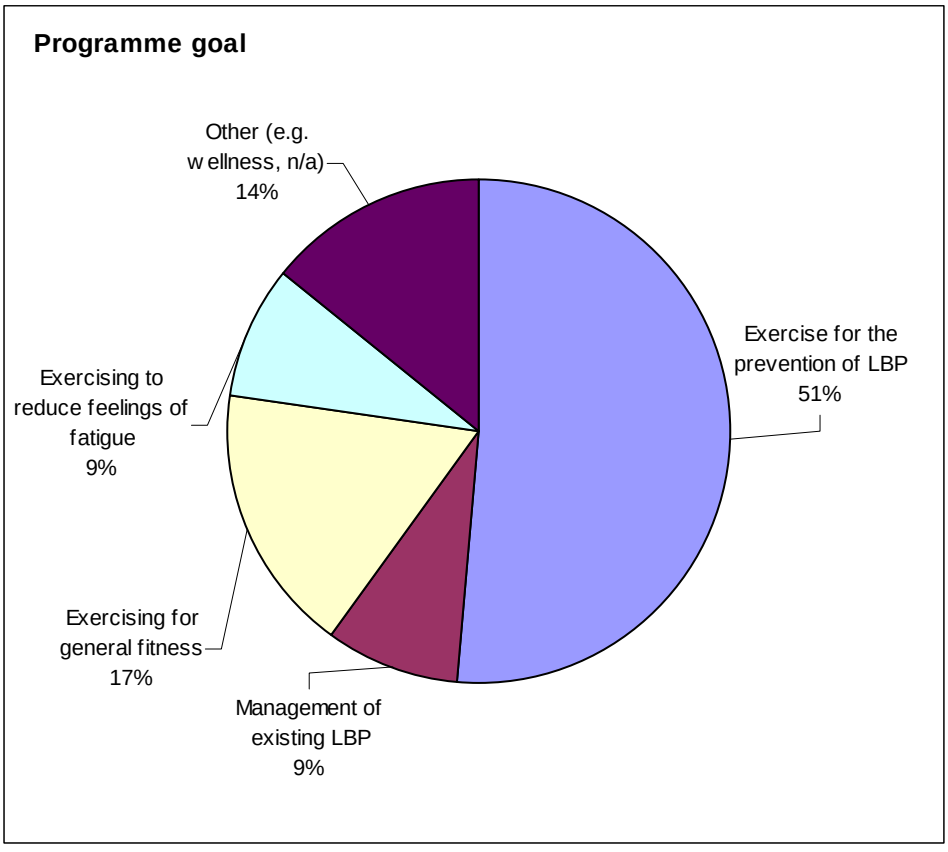

Figure 2 Pie chart showing a breakdown of Japanese research by programme goal

Category A – Prevention of lower back pain

Of the 35 documents in Japanese that were reviewed, more than half focus on exercise as a means of preventing LBP. This reflects its importance and diffusion in workplaces.

A comprehensive and systematic approach to LBP prevention is most typically described in the report from Toyota Motor Corp. (Koide, 1995) focusing on harmony between man and work. The study looked at the introduction of warm-up exercises for office and factory workers. However no explicit benefits are claimed from workplace exercise alone, and no quantitative effect of stretching is described.

It is surprising that while many of these studies claim a benefit for preventing LBP, there is little statistically significant evidence using analyses such as correlations between doing the exercises and subsequent back pain or flexibility, for example. The evidence is largely based on less days being taken sick or less reported LBP. While this kind of evidence is a useful indicator of the success of the exercises, care must be taken to ensure that these effects are not psychological or result from an increased reluctance to report LBP in the knowledge that steps are being taken to reduce it.

Many of these studies, while focusing on reducing LBP also emphasise positive secondary effects such as reduced fatigue, and improved motivation and general health. A case reported by Watanabe (1999) in which conventional Japanese workplace gymnastics, most commonly known as "radio gymnastics", were replaced with a Chinese form of exercise known as "Qigong", found a remarkable improvement with cases of LBP dropping from 57% to 34%. Qigong is similar to Tai Chi, and involves learning how to improve health via pursuit of harmony between mind and body. This holistic approach to healthcare is becoming increasingly popular in Japan.

Category B – Management of (existing) lower back pain

Whilst some of the studies addressing LBP prevention also make mention of management of LBP in existing sufferers, there appear to be relatively few studies specifically targeting this area.

A study by Ota (1992) found that recurrence of LBP could be reduced through the use of individual exercise prescriptions, following consultation with a medical expert. The importance of individual exercise prescriptions for existing sufferers is mirrored by other studies in both English and Japanese.

Category C – Exercising for general fitness

On the whole, there is a trend towards exercises at work sites being seen as only part of a company's efforts to improve their workers' health in a holistic way. The Japan Industrial Safety and Health Association (JISHA) have started a movement called THP (total health promotion) in line with this current trend. As a result, the number of papers focusing solely on limbering up exercises in workplaces is on the decline.

Unfortunately the holistic approaches of these studies make it difficult to isolate any effects of limbering up exercises, and do not tend to investigate or present any improvements in a scientific or empirical manner.

Category D – Exercising to reduce feelings of fatigue

Three of the Japanese studies' primary emphasis is on the effect of exercise on feelings of fatigue and tiredness. In addition to this, some of the studies about LBP prevention (e.g. Takagi, 1985) also mention reduction of fatigue as a side benefit. The English-language study by Laporte (1966) also mentions this.

Matsuura (1989) describes the introduction of exercises to refresh the workers at a bank. While claims are made for recovery from mental and physical fatigue, the report does not attempt to grasp how these improvements were gained or to evaluate any resulting benefits. An evaluation of the effects of these exercises upon LBP is not addressed either.

Category E – Other

The other papers, while not directly addressing the impact of exercise still have some contribution to make to the area. Two studies address the reductions in LBP that can be made by improvements to working posture. There is also a study addressing the effect of a poster campaign advising about exercises for LBP, and a survey looking at the levels of discomfort associated with LBP.

An interesting study by Ikeda (1988) addresses the possibility that a long and uncomfortable (due to congestion) commute to work can contribute to LBP. Little detail is given, but it is stated that a little exercise helped to effectively mitigate this factor.

One area in which the Japanese research is lacking is in the cost-benefit analyses of limbering up exercises. No papers are found dealing squarely with that sort of analysis. In light of the holistic approach mentioned in category C, there are cases where it is hard to extract benefits brought directly from limbering up exercises. There may be a tendency in Japan that no quantitative expectations are defined before the introduction of limbering up exercise programs. This is apparently based on the wisdom that such programmes are certain to produce benefits or improvement of health for those engaged in the practice, at only a small increase in expense to the company.

2.3. CONCLUSION

Although there is evidence of benefits from limbering up exercises, and from exercises in support of general fitness, there is not enough evidence at this point in time to say confidently that limbering up exercises do reduce work-related MSDs. There are variations in the amount of evidence for each category that was looked at.

Exercises producing general physical fitness (categories 4 and C) have the strongest evidence of a benefit in terms of reduced absenteeism and medical costs. This is coherent with the aims of the HSE, so in practical terms it is worth doing these exercises, although the literature does not specify whether or not the benefit is achieved through a reduction of work-related MSDs.

Exercises as a countermeasure to sedentary tasks (category 1) have some positive supporting evidence. The weakness in the data is that there is no clear indication of which exercises have the most benefits. Likewise, it seems that exercises aimed at preventing LBP (category A) have met with some success in Japan, although there is a lack of statistically significant quantitative evidence to support this.

Exercises as part of rehabilitation from existing medical conditions (categories 3 and B) are supported by evidence.

The weakest evidence was found in the case of limbering up before strenuous physical work (category 2).

The current evidence suggests that the most promising use of exercises to reduce absenteeism and promote well-being at work would be through general conditioning and physical fitness exercises. The evidence also supports exercises as part of rehabilitation.

Although the evidence reviewed relating to warming up before strenuous work or sedentary work is not conclusive, there is an almost universal opinion that it should be beneficial. The evidence is stronger for physiological benefits than for actual, practical reductions in MSDs, or absenteeism. There is also some evidence for additional secondary benefits such as reduced fatigue (category D). In light of this, it has been concluded by Human Engineering that the scarcity of evidence for practical benefits may lie in the difficulty of experimental design rather than the lack of the effect being looked for.

The evidence from the Japanese literature is stronger, with regard to exercise leading to reduced lower back pain (category A). However, in common with most of the literature in this field, empirically derived quantitative evidence for these benefits is lacking. It is suggested that these findings be researched further in order to identify how these exercises help to reduce LBP, and whether it is the stretching or strength building aspects of the exercise that are most beneficial.

The overall conclusion of the literature review is that if the use of exercises for rehabilitation and general fitness were to be increased then it would contribute to a reduction in absenteeism and be of benefit to the well-being of workers. More research would be required to make such a conclusion about limbering up specifically before work but such research may, if carefully designed and conducted, demonstrate that benefit.

3. ASSESSMENT OF UK NEEDS

An analysis of British MSD data was conducted using information gathered mainly from statistics provided by the HSE. The purpose of this study was to describe the data in a manner that was compatible with the findings of the literature review carried out in stage one of this project.

The data were used to identify the areas where most effort should be focused to reduce musculoskeletal and associated disorders. Consultation with industry will allow the findings of this study to be cross-checked with those working in the field.

3.1. TYPES OF PROBLEM

The data analysis looked at three aspects of the data:

- Types of disorder:
  - Prevalence;
  - Severity;
  - Trends.

- Cost to industry:
  - Days lost;
  - Quality of work;
  - Compensation.

- Characteristics of sufferers:
  - Age;
  - Gender;
  - Industry;
  - Occupation;
  - Socio-economic status;
  - Region.

3.2. SOURCES OF INFORMATION

The data consulted was mostly drawn from HSE sources. This was thought to be the most comprehensive and reliable source of data on MSDs available. Many of the other sources that were found were, on closer inspection, secondary sources derived from the HSE data.

Another small source of independent data was "Health statistics – key data on health 2002 (data 1970-2001)", a report for the European Community by EuroStat (2002).

The sources of HSE information used to perform most of the analyses were the self-reported work-related ill health (SWI) surveys from 1995, 1998/99 and 2001/02 conducted by the HSE.

Other sources of information such as the Occupational Physicians Reporting Activity (OPRA); Musculoskeletal Occupational Surveillance Scheme (MOSS); and Industrial Injuries Scheme (IIS) are occasionally referred to although less use is made of these statistics due to limitations of their validity and usefulness. For this same reason little reference is made to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) data.

3.3. TYPES OF DISORDER

Most common

The estimated 2001/02 prevalence rates of self-reported work-related musculoskeletal disorders mainly affecting the upper limbs or neck, lower limbs and back are shown in **Figure 3** below.

The rate for males is statistically significantly higher than for females for musculoskeletal disorders overall and for those affecting the back and lower limbs. The data do not show a significant difference in the rate for upper limb and neck disorders between males and females.

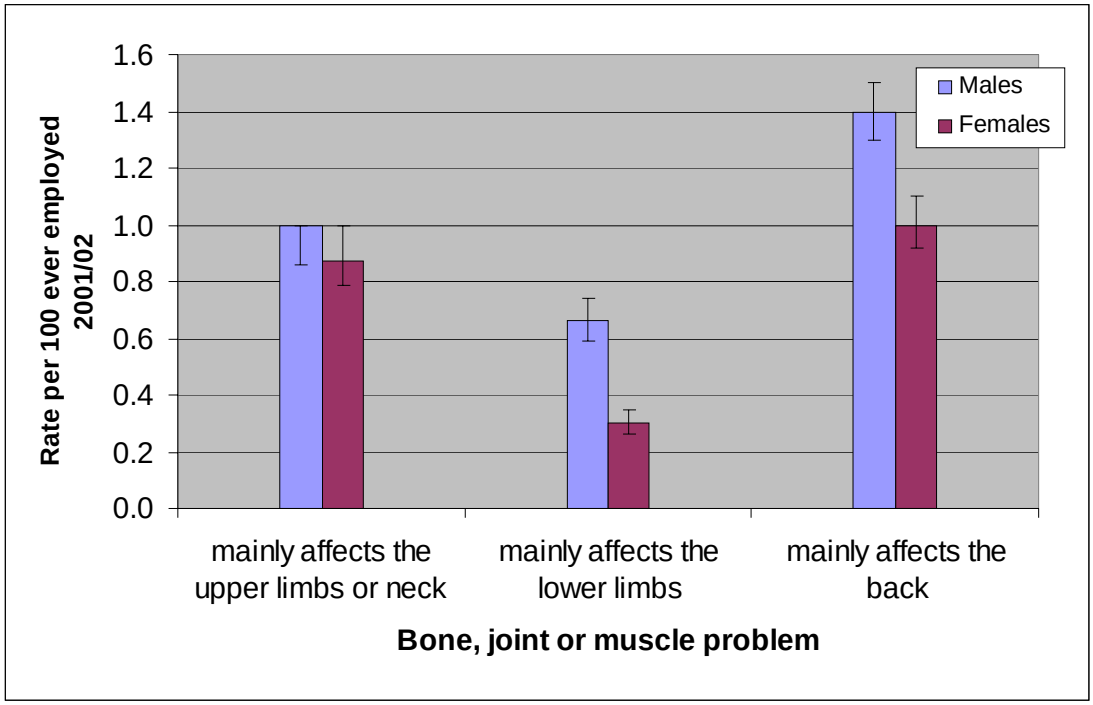

Figure 3 Estimated 2001/02 prevalence rates (%) of self-reported musculoskeletal disorders caused or made worse by work, by gender, for people currently or previously employed

(Source: SWI 01/02)

Most severe

Another way of assessing severity of conditions is by comparing the days lost due to MSDs. Estimates from SWI 01/02 suggest that approximately 12.3 million days were lost due to work-related MSDs in 2001/02. This equates to approximately 19.4 days per case of WRMSD.

More specifically, again according to SWI 01/02, approximately 4 million days were lost in Britain in 2001/02 due to WRMSDs mainly affecting the upper limbs and neck, an average of 17.8 days per case. However, 5.7 million days were lost in Britain due to WRMSDs mainly affecting the back, an average of 18.9 days per case.

The data suggest that WRMSDs mainly affecting the back are marginally more prevalent than those mainly affecting the upper limbs and neck. However, the topic of limbering up to prevent back pain seems underrepresented in the English-language ergonomics literature in comparison to WRULDs, so more work may be needed in this area. The Japanese journals did contain much more information on limbering up exercises to prevent lower back pain.

Current trends

General information is available from EuroStat, the European Communities' statistical office. Their recent report "Health Statistics – Key Data on Health 2002" cites the results of the Third European Survey on Working Conditions (ESWC) in which 1500 people from each member state (500 in Luxembourg) were questioned about their jobs.

The results of two of the questions are shown in **Figure 4** below. The participants were asked to what extent painful/tiring positions and handling heavy loads was part of their job. As **Figure 4** shows, these factors are both on the rise, which suggests that Europe's workers may be under increasing physical strain at work that could lead to the development of MSDs. Alternatively the rise in the EU figures could reflect greater awareness, rather than actual rises in physical strain. It is worth noting that this survey asked workers directly about their working conditions, whereas the other sources quoted in this report draw on statistics reported by physicians.

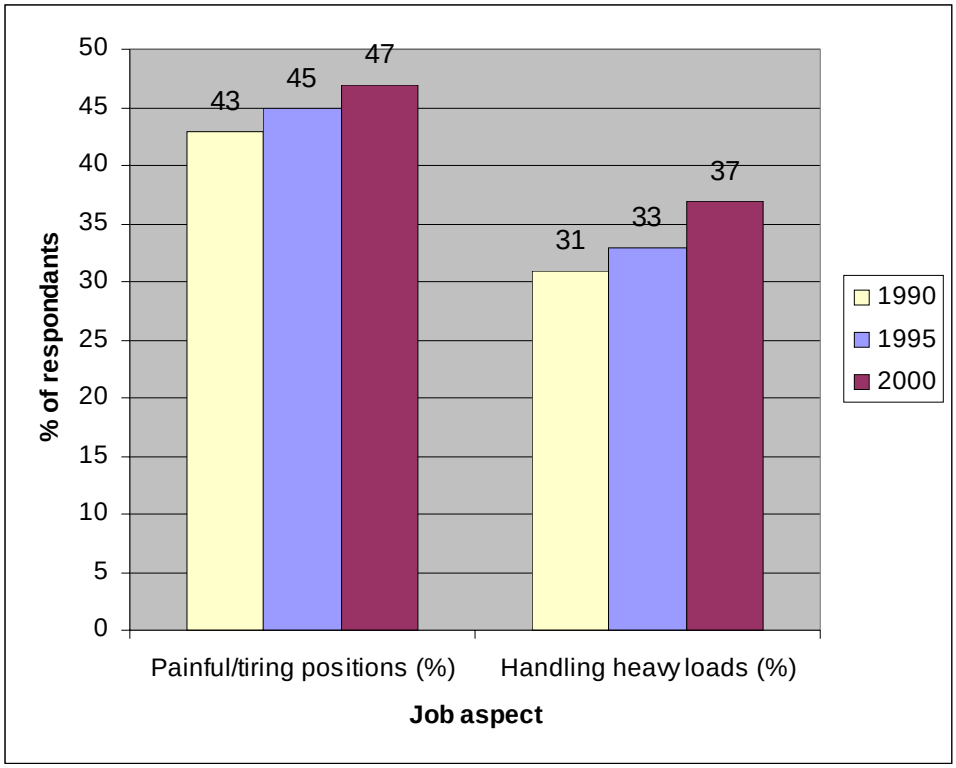

Figure 4 Results of ESWC questionnaire on working conditions

(Source: EuroStat, 2002)

Recent trends in MSDs are shown by the graph below in **Figure 5**. Restricting SWI 95 and SWI 01/02 data sets to people who worked in the last 12 months and making a number of adjustments for inconsistencies between the three surveys shows that the estimated prevalence rate of self-reported work-related musculoskeletal disorders for Great Britain fell between 1995 and 1998/99 but then rose in 2001/02. Although the rate in 2001/02 was still lower than for 1995. All these differences were statistically significant.

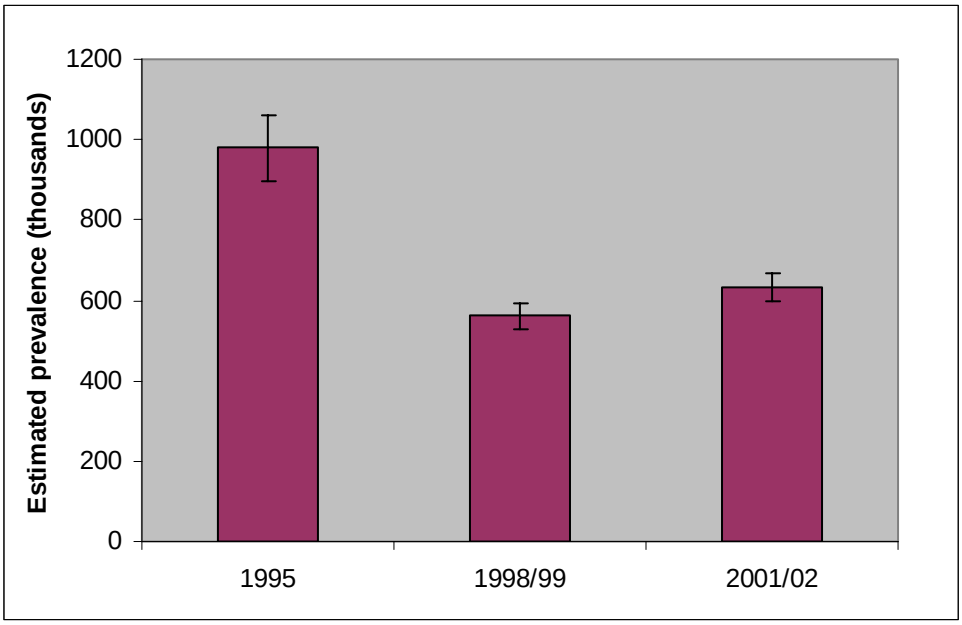

Figure 5 Estimated prevalence rates for MSDs in 1995, 1998/99 and 2001/02 (Source: SWI95, SWI98/99, SWI 01/02)

3.4. COST TO INDUSTRY

Days lost

According to SWI 01/02 the number of days lost due to MSDs in 2001/02 was estimated at 12.3 million. More detail on days lost can be found in section 3.3.

Quality/quantity of work

Results from the latest SWI survey indicate that in 2001/02 an estimated prevalence of 1,126,000 people in Great Britain were suffering from a musculoskeletal disorder caused or made worse by their current or past work. This equates to 2.6% of the population currently or previously in work.

A report by the Health and Safety Executive (1999) suggests that MSDs mainly affecting the upper limbs or neck which were caused or made worse by work, cost industry between £208 million and £221 million at 1995/96 prices. However these results are based on several assumptions and are therefore only broadly indicative.

It is likely that the job performance of those suffering from WRMSDs will suffer. This conclusion is supported by various studies such as Oztug and Buckle (2004). Although it is not easy to estimate the financial impact of those attending work but operating at a reduced level of efficiency, any attempt to ameliorate this problem should be welcomed by industry.

Work such as Oztug and Buckle (2004) should be combined with productivity data to investigate further the effects of WRMSDs on the productivity of sufferers who are not absent from work.

Compensation

According to a report by Peebles et al. (2003), manual handling was responsible for 10% of compensation claims made by a group of trade unions including ASLEF and ISTC. Of all claims, the main injuries claimed for were (unspecified) pain (9.6%) and strains/sprains (9%). The size of the claims ranged from £75 to £250,000, the average for manual handling being £4,325.

These types of injury suggest physical causation and, while some of these problems may be reduced by better manual handling training, anecdotal evidence from the literature review suggests that limbering up before lifting and regular strengthening exercises may also prove to be useful. However, these findings need to be backed up with empirically derived statistically significant evidence.

3.5. CHARACTERISTICS OF SUFFERERS

Age and gender

The estimated incidence of work-related musculoskeletal disorders from SWI 01/02 was higher for males than for females – an estimated 137,000 males and 103,000 females. However, for people working in the last 12 months the incidence rates for males and females were of a similar order, at 0.78% and 0.73% respectively. For males, none of the four age groups (16-34 years, 35-44 years, 45-54 years and 55+ years) had a rate which was statistically significantly higher than the overall male rate. For females, the rate for those aged 45-54 years, at 1.0%, was statistically significantly higher than the rate for all females[1]. These statistics are summarised in **Figure 6**.

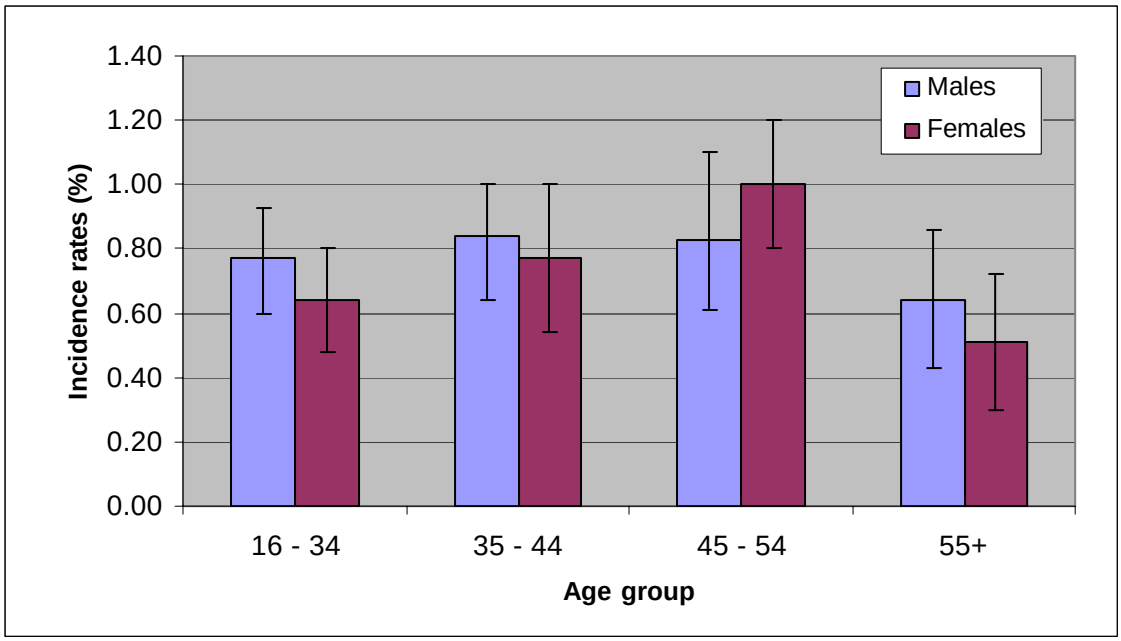

Figure 6 Estimated 2001/02 incidence rates (%) of self-reported musculoskeletal disorders caused or made worse by work, by age and gender, for people employed in the last 12 months
(Source: SWI 01/02)

Musculoskeletal conditions affecting the hand/wrist/arm (excluding Raynaud's/HAV/VWF) were the most commonly reported new cases to the MOSS and OPRA schemes, with almost 50% more cases reported for females than males in the five-year period 1998-2002. Males were reported to have more conditions affecting the lumbar spine/trunk and lower limbs (hip/knee/leg, ankle/foot) than females in this period but generally fewer conditions affecting the neck/thoracic spine

Rheumatologists see a wider age range of people than occupational physicians as the latter almost exclusively see people who have not yet retired. For MOSS and OPRA combined, 80% of new cases of musculoskeletal disorders seen by specialists in the three-year period 2000 to 2002 were between the ages of 25 and 54. The age group most commonly seen by rheumatologists was 45-54, whilst the 35-44 year age group was the most commonly seen by occupational physicians.

[1] *The estimated rate for females in the 55+ age group consisted of fewer than 30 sample cases.*

According to SWI 01/02, overall prevalence rates of work-related musculoskeletal disorders mainly affecting the upper limbs or neck for males and females currently or previously employed were of a similar order in 2001/02, at 1.0% and 0.87% respectively. For both males and females, the age groups carrying the highest rates were the oldest working age group (55 to 64 years for males, 55 to 59 years for females), at around 1.6%, and the 45 to 54 year age group, at around 1.3% of people currently or previously employed. Their rates were statistically significantly higher than the overall rates for the relevant gender. These data are summarised in **Figure 7**.

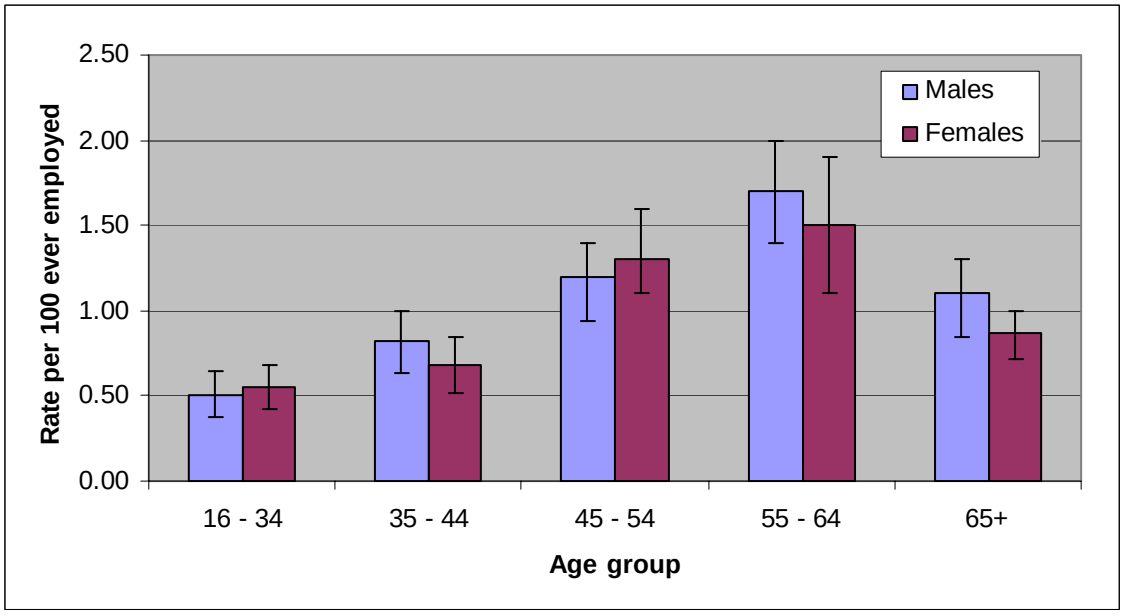

Figure 7 Estimated 2001/02 prevalence rates (%) of self-reported musculoskeletal disorders mainly affecting the upper limbs or neck, caused or made worse by work, by age and gender, for people currently or previously employed

(Source: SWI 01/02)

Some incidence information is also available from other sources. The estimated number of new cases of work-related musculoskeletal disorders affecting the upper limbs, reported to OPRA and MOSS in 2002, was 3149 for males and 2009 for females. For both males and females the most frequently reported diagnostic site was hand/wrist/arm (excluding Raynaud's/HAV/VWF) with females reporting an estimated 1428 cases and males reporting an estimated 1128 cases in 2002. For males, this was closely followed by Raynaud's/HAV/VWF, with an estimated 1119 cases.

For males, the percentage of new cases of work-related musculoskeletal disorders affecting the upper limbs reported to OPRA in 2000-2002 was highest in the 35-44 and 45-54 age groups. For females, the 35-44 year age group carried the highest percentage of new cases. For MOSS, the percentage for both males and females was highest in the 45-54 age group in the same period.

SWI 01/02 estimated that 298,000 males currently or previously employed suffered from a work-related musculoskeletal disorder mainly affecting the back in 2001/02, compared with an estimated 223,000 females. Males carried a statistically significantly higher prevalence rate of musculoskeletal disorders mainly affecting the back than females – an estimated 1.4% and 1.0% respectively. The oldest working age group (55 to 64 years for males and 55 to 59 years for females) carried the highest prevalence rate for both males and females. Their respective rates of 2.0% and 1.6% were statistically significantly higher than the overall rate for the relevant gender. For males the rate of 1.7% for both the 35-44 year and 45-54 year age groups was also statistically significantly higher than the rate for all males. The rate of 1.5% for females aged 45-54 was also statistically significantly higher than the rate for all females. This data is summarised in **Figure 8**.

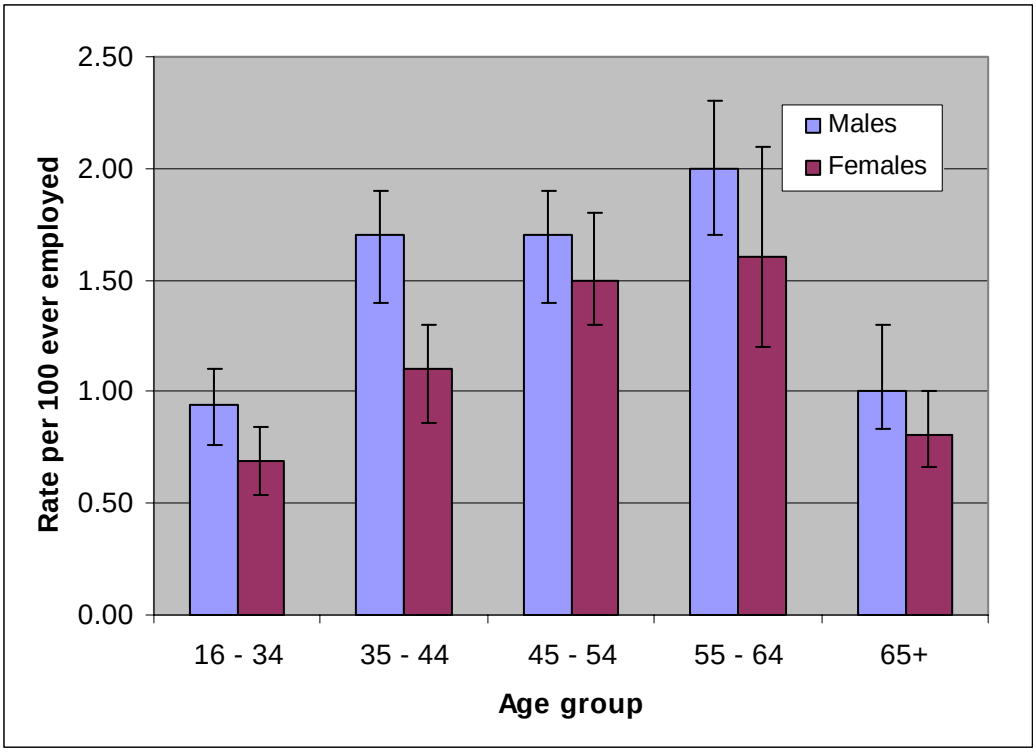

Figure 8 Estimated 2001/02 prevalence rates (%) of self-reported musculoskeletal disorders mainly affecting the back, caused or made worse by work, by age and gender, for people currently or previously employed

(Source: SWI 01/02)

The number of estimated new cases of work-related musculoskeletal disorders affecting the spine or back reported to OPRA and MOSS in 2002 was 876 for males and 1148 for females. In the five-year period 1998-2002 males were reported to have more problems with the lumbar spine/trunk than females, but generally fewer conditions affecting the neck/thoracic spine.

For both males and females, the percentage of estimated new cases of work-related musculoskeletal disorders affecting the spine/back reported to MOSS and OPRA in the three-year period 2000-2002 was highest in the 35-44 year age group.

It is widely reported that women are more likely to suffer from carpal tunnel syndrome than men (Arthritis Research Campaign, 2003). However, data could not be found to support this assertion.

Figure 8 suggests that, generally, men are more at risk from MSDs and back disorders. However, these differences may well be due to the fact that men are more likely to do heavier, physical jobs and have tended to do more years of work than women (who are traditionally more likely to take responsibility for child care).

It is suggested that there is little to be gained from differentiating between the sexes in terms of MSDs as gender is only an issue in so far as men and women tend to do different jobs. It will be more beneficial to address specific occupations and industries.

Industry

Data sources show large differences in the prevalence of MSDs between different industries. However, the causes of this are not clear. It may be the case that some industries involve tasks that are more likely to lead to MSDs, take less care to look after their employees' health or fail to provide adequate training. Alternatively, it may be that some industries are more inclined than others to report illnesses, have better access to occupational physicians or have more of a "compensation culture" or union presence.

Several sources of data exist comparing MSD prevalence amongst industry, however there are some gaps in the data and all industries may not be addressed in all analyses.

Analysis of the average rates of new assessments under the Industrial Injuries Scheme in 2000-2002 by industry shows that the extraction, energy and water supply industries had the highest rate of assessed cases with 12 cases per 100,000 employees. Manufacturing had the second highest rate, with 4 cases per 100,000 employees. From April 2002 onwards, the IIS figures include assessments where the claimant has been found to be suffering, but where there has been no loss of faculty.

The Labour Force Survey only provides industry details about the current or the most recent job (if currently not working) in the last 8 years. Therefore SWI 01/02 industry prevalence rates were restricted to the current or most recent job in that time period and illnesses associated with these jobs. Incidence rates were restricted to people employed in the last 12 months. For people who worked in the last 8 years, the industries carrying the highest prevalence rates of MSDs in the SWI 01/02 survey included agriculture, hunting, forestry and fishing (3.8%), construction (3.6%), health and social work (2.8%) and manufacturing (2.3%). In terms of incidence, public administration and defence carried an above average rate, affecting an estimated 1.1% of people who worked in the last 12 months.

Incidence data are also available from the MOSS scheme. Because the rates based on OPRA data will be affected by the coverage of occupational physicians, comparisons between different industries have been based on rates from MOSS alone. Where the number of actual cases reported by rheumatologists to MOSS in the years 2000-2002 is sufficiently large, mining and quarrying carried the highest estimated average annual incidence rate of 40 per 100,000 workers. However, the marked contraction of the coal mining industry over recent years has exaggerated the rate of mining and quarrying compared with other industries, and hence this estimate should be treated with caution. The industries with the next highest rates were manufacture of wearing apparel: dressing and dyeing of fur and manufacture of other transport equipment, with respective estimated rates of 34 and 25 per 100,000 workers.

SWI 01/02 industry prevalence rates of work-related musculoskeletal disorders mainly affecting the upper limbs or neck were restricted to the current or most recent job in the last 8 years and illnesses associated with these jobs. Where there were sufficiently large sample numbers to provide reliable estimates, the industries carrying the highest prevalence rates were manufacturing (1.0%), construction (1.0%) and health and social work (0.93%). All three rates were statistically significantly higher than the rate for all industries.

Again SWI 01/02 industry prevalence rates are restricted to the current or most recent job in the last 8 years and illnesses associated with these jobs. Where sample numbers are sufficiently large to provide reliable estimates, the industries carrying the highest prevalence rates of musculoskeletal disorders mainly affecting the back in SWI 01/02, were construction (1.8% of people working in the last 8 years) and health and social work (1.6%). With an estimated annual incidence rate of 3 per 100 000 workers, these industries were also amongst the highest rates of work-related musculoskeletal disorders affecting the spine or back reported to MOSS in the three-year period 2000-2002.

In summary, the same types of industry tend to appear consistently throughout the data, and any interventions intending to target specific industries most affected by MSDs would be advised to look at:

- Construction industries;
- Agriculture, hunting, forestry and fishing industries;
- Manufacturing industries;
- Health and social work.

Occupation

SWI 01/02 also provides information on the prevalence and incidence of work-related musculoskeletal disorders by occupation. SWI 01/02 occupational prevalence rates relate to the current or most recent job in the last 8 years and illnesses associated with these jobs. Incidence rates are restricted to people employed in the last 12 months. Two broad occupation groups carried the highest prevalence rates of musculoskeletal disorders for people employed in the last 8 years in the SWI 01/02 survey: skilled trades occupations and process, plant and machine operatives. Each had overall estimated prevalence rates of over 3%. Within the first of these groups the occupation skilled construction and building trades carried a rate of over 5%. Other occupations with raised rates included protective service occupations; health and social welfare associate professionals; elementary trades, plant and storage related occupations; and caring personal service occupations. In terms of incidence, at an estimated 1% of people who worked in the last 12 months, skilled trades occupations (such as in construction) carried an above average rate in the SWI 01/02 survey.

As the rates based on OPRA data will be affected by the coverage of occupational physicians, comparisons between different occupations have been based on rates from MOSS alone. Where the number of actual cases reported by rheumatologists was sufficiently large, metal plate workers, shipwrights and riveters carried the highest average annual incidence rate of upper limb disorders, with 327 per 100,000 workers per year in 2000-2002. This was followed by grinding machine setters and setter operators; typists and word processor operators and computer operators; and data processing operators and other office machine operators; with respective estimated rates of 89, 71, and 66 per 100,000 workers.

SWI 01/02 occupational prevalence rates of work-related musculoskeletal disorders mainly affecting the upper limbs or neck were restricted to the current or most recent job in the last 8 years and illnesses associated with these jobs. Where the sample numbers are large enough to provide reliable estimates, occupations with above average prevalence rates in this survey were skilled construction and building trades (1.8% of people working in the last 8 years), textiles, printing and other skilled trades (between 1.0% and 2.3%) and process, plant and machine operatives (1.2%).
SWI 01/02 occupational prevalence rates of musculoskeletal disorders mainly affecting the back relate to the current or most recent job in the last 8 years and illnesses associated with these jobs. Where sample numbers were sufficiently large to provide reliable estimates, occupations with above average prevalence rates in this survey were health and social welfare associate professionals (2.6% of people employed in the last 8 years), skilled construction and building trades (2.3%), process, plant and machine operatives (1.6%), caring personal service occupations (1.4%) and transport and mobile machine drivers and operatives (1.4%). All five rates were statistically significantly higher than the rate across all occupations.

For cases of work-related musculoskeletal disorders affecting the spine or back reported to MOSS in the three-year period 2000-2002, the occupation with the highest average annual incidence rate per 100 000 workers (with sufficiently large actual numbers), was assemblers/lineworkers (vehicles/other metal goods), with an estimated annual rate of 18 per 100,000 workers.

In summary, WRULD and general MSD prevention measures should especially target:

- Skilled trades;
- Process plant and machinery.

Measures specific to upper limb and neck disorders should be targeted at:

- Skilled construction and building trades;
- Textiles, printing and other skilled trades;
- Process, plant and machine operatives.

Measures specific to back pain should be targeted at:

- Health and social welfare associate professionals;
- Skilled construction and building trades;
- Process, plant and machine operatives;
- Caring personal service occupations;
- Transport and mobile machine drivers and operatives.

Socio-economic factors

An analysis of the data according to socio-economic group was performed but the results were not considered particularly useful and did not highlight any findings that were not better addressed by the industrial sectors/occupation analyses.

Regional patterns in Britain

An analysis of prevalence of MSDs by region of Great Britain is shown in **Figure 9**. For people ever employed, SWI 01/02 indicates that the estimated prevalence rate of musculoskeletal disorders caused or made worse by work of 2.2% for Scotland was statistically significantly lower than that of 2.6% for England, as well as the overall rate for Great Britain. With rates of around 3%, the South West and Yorkshire and the Humber carried statistically significantly higher rates than those for England and Great Britain. In terms of incidence, the rates for England and Scotland were of a similar order (sample numbers were too small to provide an estimate for Wales) with 0.80% and 0.59% of people who worked in the last 12 months respectively. Within England, most of the government office regions carried similar incidence rates, none of which was statistically significantly higher than the rates for England or Great Britain.

However, it is thought that these findings reflect the predominant industries and occupations in these regions and therefore differences are not worth pursuing in this research.

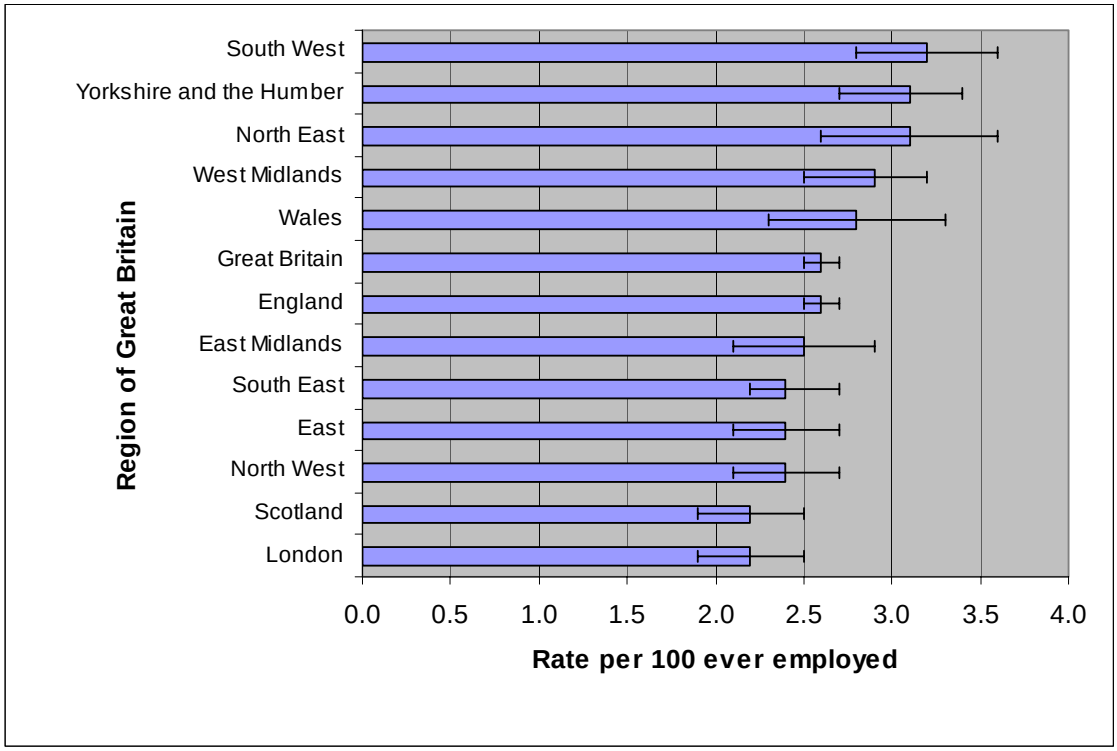

Figure 9 Estimated 2001/02 prevalence rates (%) of self-reported musculoskeletal disorders caused or made worse by work, by country and government office region within England, for people currently or previously employed

(Source: SWI 01/02)

3.6. SUMMARY AND CONCLUSION

Musculoskeletal disorders are having a serious impact on industry due to days lost at work and reduced quality of work done by workers suffering from MSDs. Knowledge of the prevalence of different types of MSDs will be especially useful for designing any future limbering up or exercising programmes.

Although these problems peak in middle age, preventative measures should be taken early as it may be too late by middle age. There is also some evidence that MSDs mainly affecting the back frequently start at a younger age.

Some industries are more prone to MSDs than others and should be targeted, the main ones being:

- Construction industries;
- Agriculture, hunting, forestry and fishing industries;
- Manufacturing industries;
- Health and social work.

The HSE (HSE, 2004) currently lists construction; agriculture; the health service; stress; musculoskeletal disorders; falls from heights; slips and trips; and work-related transport as its priority areas. These areas coincide with many of the industries shown above, and their associated risks.

Likewise, some occupations are more prone to MSDs and should be targeted, these include:

- Skilled construction and building trades;
- Textiles, printing and other skilled trades;
- Process, plant and machine operatives;
- Health and social welfare associate professionals;
- Caring personal service occupations;
- Transport and mobile machine drivers and operatives.

The findings of the data analysis have been presented to industry as part of the consultation with UK industry. This process presented a summary of the key findings of this report and investigated current opinion regarding WRMSDs and the benefits of current limbering up programmes. Although the number of people consulted will not generate data as extensive or representative as that reviewed here, some limited cross checking of this report's findings should be possible.

The consultation process helps to assess the potential for the application of limbering up exercises to address the needs of industry regarding MSD mitigation and this is discussed in section 5.

4. JAPAN WORKSHOP

A research trip to Japan was made in order to present the findings of the project so far, and to gather information about current practices in Japan regarding limbering up exercises before work.

4.1. JAPANESE APPROACH TO HEALTH AND SAFETY

The trip offered opportunities to learn about the culture of morning exercises and the general approach to health and safety taken in Japan. It was also possible to meet some of the leading Japanese figures in the field of ergonomics.

Visits to companies - Toyota Motor Corporation and Matsushita Electronics - demonstrated that such institutions have a detailed and well-thought out exercise plan. However, they were unfortunately, although perhaps understandably, reluctant to share the proprietary research that lead to their opinion that limbering up exercises have benefits in terms of employee health and reduction of MSDs.

The Japanese seem to take a pragmatic approach to health and safety in the workplace. If they suspect a benefit from exercise they use it without waiting to establish empirical scientific evidence.

However, continuing investment by companies like Toyota indicates that there may be benefits to industry from limbering up. This doesn't mean that it is necessarily good for the workers' health, merely that the cost-benefit analysis for the company is likely to be positive. However, their cost-benefit analysis appears to be based on using the exercises to prevent musculoskeletal problems so if the company perceives a benefit then it is reasonable to infer that the individual also does.

The Japanese *kaizen*, or constant improvement, approach is useful for refining engineering solutions to perfect operations. As applied to Health and Safety, part of this approach involves acting on suggestions by employees for the improvement of working conditions which in turn ensures the buy-in of the workforce. It is unclear whether the mechanisms used in Japan would also be successful in the UK although it is worth mentioning that the HSE actively encourages and promotes such "buy-in" measures.

Although not part of the core scope of the project, a visit to Japan's Nation Institute of Industrial Health (NIIH) contained a presentation by an Australian researcher, Dr. Derek Smith. Dr. Smith told the delegation that psychosocial and managerial factors have been found to correlate very highly with absenteeism and that this correlation has been found in many studies across culturally different organisation throughout the Asia Pacific region. This is reported because it corresponds to the same overall goals as reducing absenteeism through exercises.

5. CONSULTATION WITH INDUSTRY

5.1. OBJECTIVE AND DESIGN

A summary of the results of the literature review and data analysis was sent to members of industry who had expressed an interest in the project earlier. This summary also included the opportunity for feedback regarding the results of the project and any comments based on practical experience of limbering up in the workplace.

The industry consultation can be divided into two phases; an informative phase aimed to publicize the findings from the literature review; and a survey phase which aimed to communicate the attitudes of those working with WRMSDs in industry. The backgrounds of the participant cohort was also analysed to provide a context for the opinions.

The consultation document itself can be found in Appendix B.

5.2. PARTICIPANTS

The consultation document was sent to 30 people, of which 11 responses had been received as of the deadline on 12th August 2004.

The respondents who took part in the consultation are all people who are currently working in or with industry. Their occupations could be put into one of the following categories:-

- Health and Safety – 46%;
- Occupational Health – 36%;
- Holistic Therapies – 9%;
- Physiotherapy – 9%.

The majority of participants contacted Human Engineering Limited in response to publicity generated by an HSE press release issued in November, 2003, or to the consultation document itself that was posted on the HSE website.

Over half of the respondents worked within the manufacturing sector. A breakdown of the industrial sectors represented by the respondents is as follows:-

- Manufacturing sector – 54%;
- Commercial/Government – 18%;
- Transport, storage and communication – 14%;
- Health and social work – 9%;
- Construction – 5%.

No information is available regarding the participants qualifications, number of years experience or the length of time they had been in their current role.

5.3. EVALUATION OF THE RESULTS OF THE DATA ANALYSIS

The first set of statements provided information regarding the data analysis of UK needs with regard to MSD prevention. The following paragraphs list the statements as presented to participants together with pie charts showing agreement/disagreement and any pertinent or interesting comments that were made by the respondents.

Statement 1

"Back problems are the most common form of MSD by a small margin. This is especially the case amongst males."

The first statement aims to assess the views of the participants on the evidence raised that back problems are the most common form of MSDs, especially amongst males. About three-quarters of respondents agreed with the statement, and the rest disagreed; these results are summarised in **Figure 10** below.

Comments by the respondents suggest that their responses are based primarily on the finding that men are more prone to back problems.

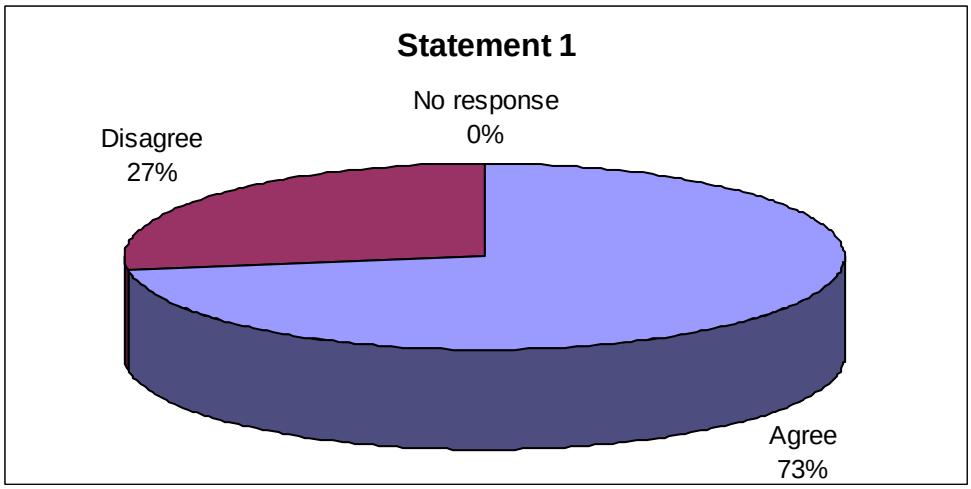

Figure 10 Responses to statement 1: "Back problems are the most common form of MSD by a small margin. This is especially the case amongst males."

Statement 2

"The number of workers reporting WRMSDs has been increasing since 1998/99."

All of the respondents agreed with this statement apart from one who did not respond. This result is summarised in **Figure 11** below.

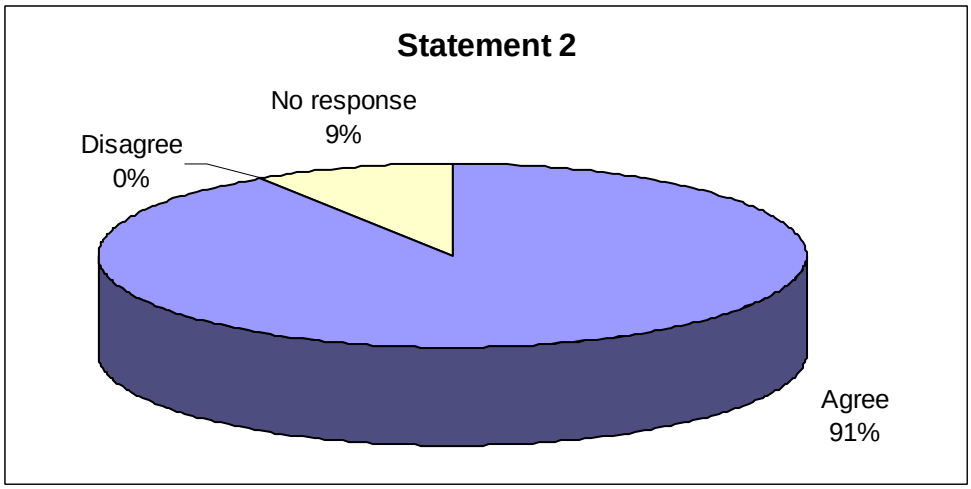

Figure 11 Responses to statement 2: "The number of workers reporting WRMSDs has been increasing since 1998/99."

Statement 3

"Developing WRMSDs becomes more likely as one gets older, and WRMSDs are most prevalent in the 55-64 age bracket."

64% agreed with the statement and 36% disagreed. Of those that disagreed, two provided reasons as follows:

- "There appears to be no relation to age in the employees that I see";
- "Seems to be across the board".

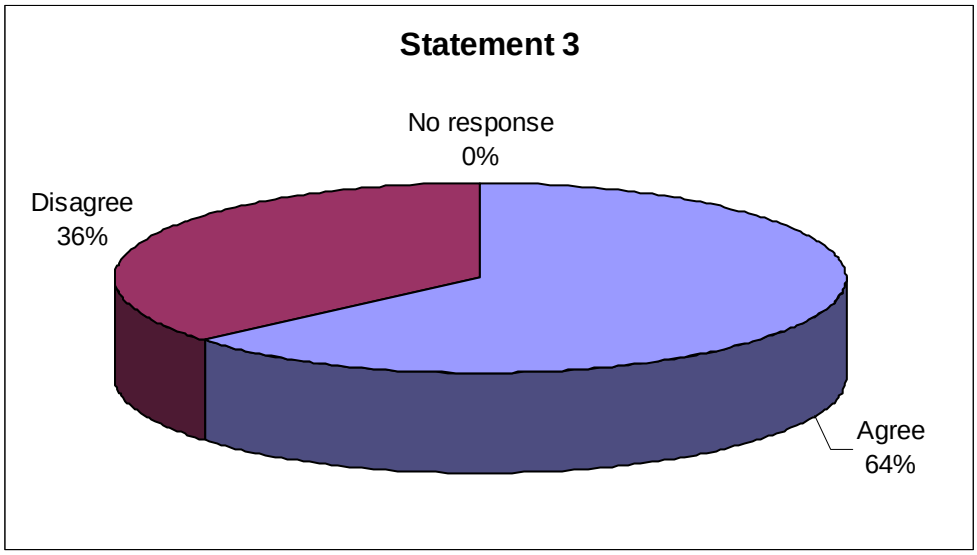

Figure 12 Responses to statement 3: "Developing WRMSDs becomes more likely as one gets older, and WRMSDs are most prevalent in the 55-64 age bracket."

Statement 4

"Those working conditions that are likely to lead to WRMSDs (e.g. holding painful, tiring positions, and handling heavy loads) are becoming more common."

Exactly half of the respondents disagreed with the statement. This contradicts the results obtained from the "Third European Survey on Working Conditions (ESWC)". Nearly all of the participants who responded in disagreement validated their answers, with comments such as:

- "Efforts made to enhance good posture while lifting – technology has moved on.";
- "Increased awareness of risk factors is reducing exposure";
- "People are more aware of aids to prevent or lessen condition".

However, the remainder were split equally, with 25% either agreeing or not responding to the statement.

The difference between these results and the ESWC survey could be due to some differences amongst the different countries of the EU where the ESWC survey was undertaken. Conditions in the UK may be improving whilst they are worsening in other EU countries. On the other hand the differences could be down to differences in perceptions and/or the occupational groups in the two samples.

A breakdown of these responses is shown in **Figure 13**.

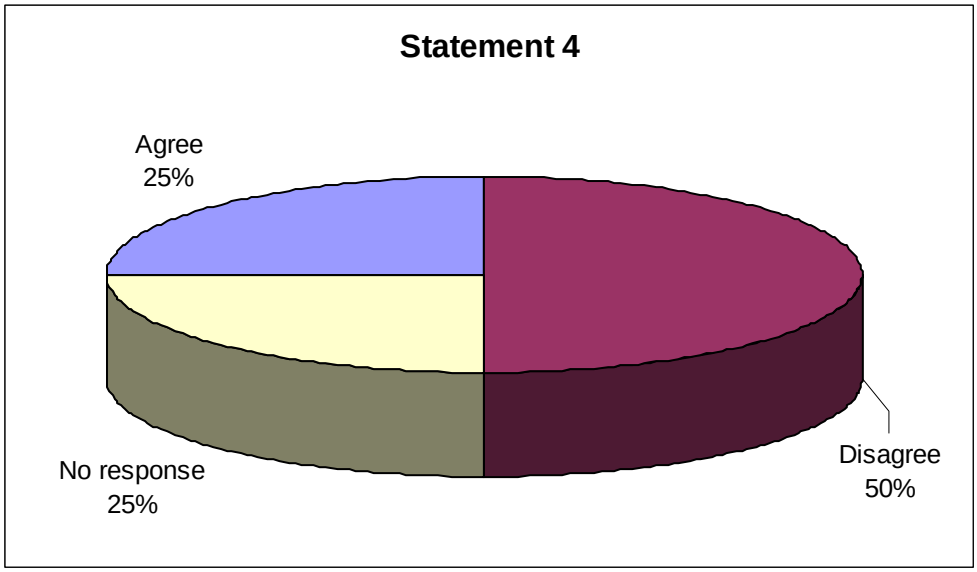

Figure 13 Responses to statement 4: "Those working conditions that are likely to lead to WRMSDs (e.g. holding painful, tiring positions, and handling heavy loads) are becoming more common."

Statements 5 and 6

Subjects were asked to provide information about the industry in which they work and the main types of occupation at their place of work.

These statements were designed to firstly gain an insight into which industries were perceived as being more at risk by those working with WRMSDs in industry and, secondly, to identify which occupations are predisposed to developing WRMSDs within these industries. The participants seemed to interpret these statements as: what is your industry and which specific roles or tasks are more likely to develop MSDs? Answers are simply duplicated in statements 5 and 6 by some respondents.

54% of respondents worked within the manufacturing industry and reported that the employees were certainly at risk of WRMSDs (if not at a higher risk than those in other sectors).

Two common themes emerged from their comments:

- The repetitive nature of some tasks within the manufacturing industry were cited as a cause of risk; mainly machine, assembly line and general production operatives;
- Manual handling is a major concern for both respondents represented the manufacturing industries and those representing workers in the transport and construction industries.

Other specific occupations and tasks identified by respondents as high risk were: finishing activities; order pickers; assemblers; packers; warehouse operatives; HGV delivery drivers; nursing staff, in particular, were considered to be at risk of WRULDs; commercial/corporate businesses and the civil service were the identified by 3 of the participants, where DSE users or office workers were at risk of WRMSDs, in particular ULDs.

5.4. EVALUATION OF RESULTS OF THE LITERATURE REVIEW

The second set of statements provided the main findings of the international review of limbering-up literature. The following paragraphs list the statements as presented to participants together with pie charts showing agreement/disagreement and any pertinent or interesting comments that were made by the respondents. For these statements subjects were asked to mark their agreement using a 5-point Likert scale ranging from "Strongly Agree" through to "Strongly Disagree", this allowed a finer analysis of the degree to which respondents agreed or disagreed with the statements.

One participant did not respond to statements 7 – 13 as they did not feel they had sufficient experience to comment. These non-responses were excluded from this section of the analysis.

Statement 7

"The strongest benefits in terms of reduced absenteeism and medical costs result from exercises for general physical fitness and strength."

60% of participants somewhat agreed with this statement, 40% were undecided; no other kinds of responses were registered. These results are summarised in **Figure 14**.

Comments by the respondents indicate that those who were undecided about the statement had little experience of workplace exercise programmes.

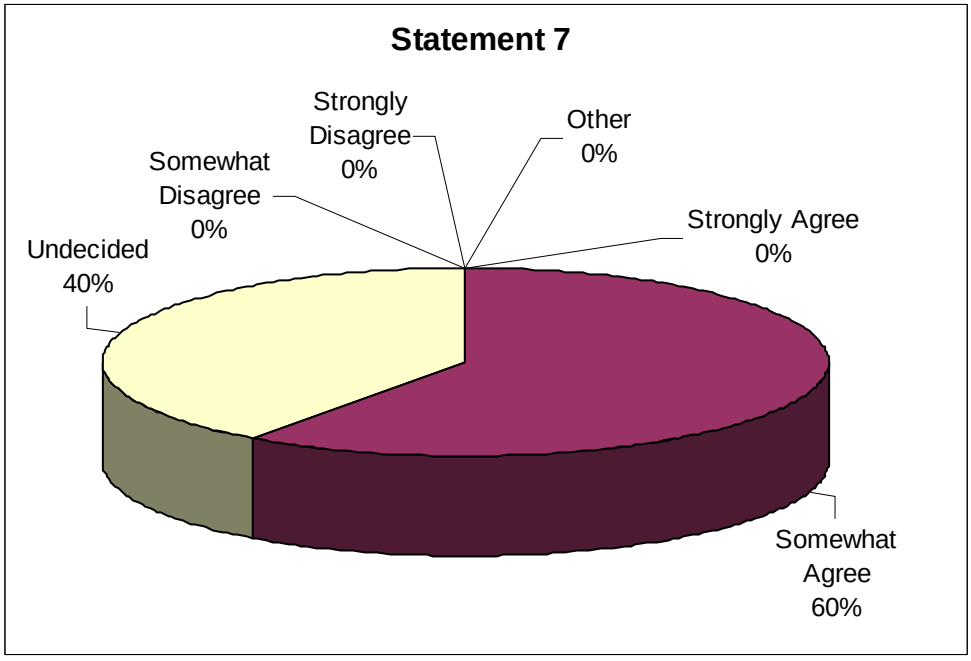

Figure 14 Responses to statement 7: "The strongest benefits in terms of reduced absenteeism and medical costs result from exercises for general physical fitness and strength."

Statement 8

"Exercises undertaken before carrying out a sedentary task such as typing have some positive benefits. Unfortunately it is not clear what types of exercises produce the greatest benefits."

60% somewhat agreed with the statement, with one respondent commenting that exercises for the neck, shoulders and upper back had been found to be beneficial. 40% remained undecided but no comments were made by any respondents that would provide indication as to why this is.

Responses are summarised in **Figure 15**.

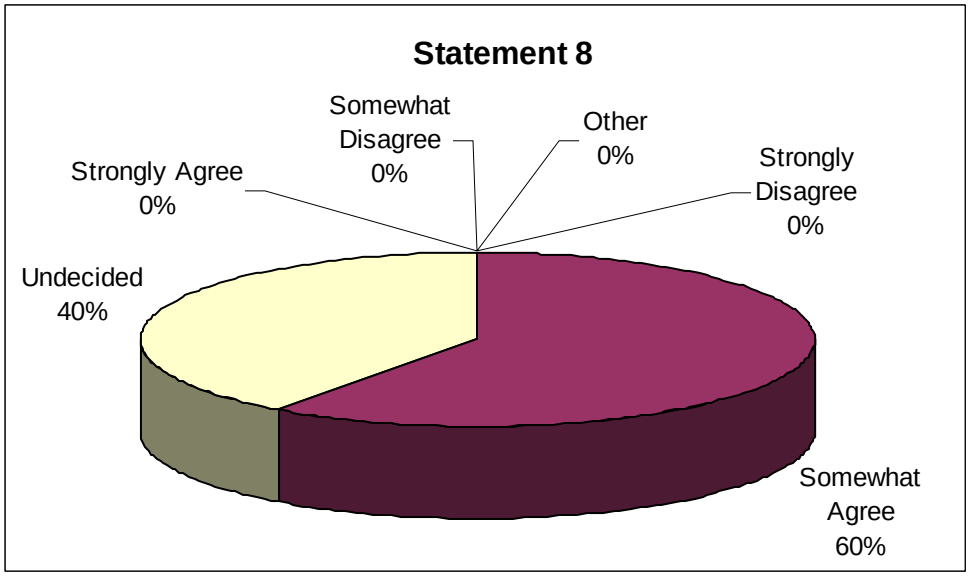

Figure 15 Responses to statement 8: "Exercises undertaken before carrying out a sedentary task such as typing have some positive benefits. Unfortunately it is not clear what types of exercises produce the greatest benefits."

Statement 9

"Exercises as part of a rehabilitation programme to recover from existing musculoskeletal disorders are beneficial and improve recovery."

Support was attained from 80% of respondents for this statement. 20% were undecided. A breakdown of these responses can be found in **Figure 16**.

Comments indicate that one respondent had found these exercises to be beneficial for subjects recovering from knee/hip replacement operations.

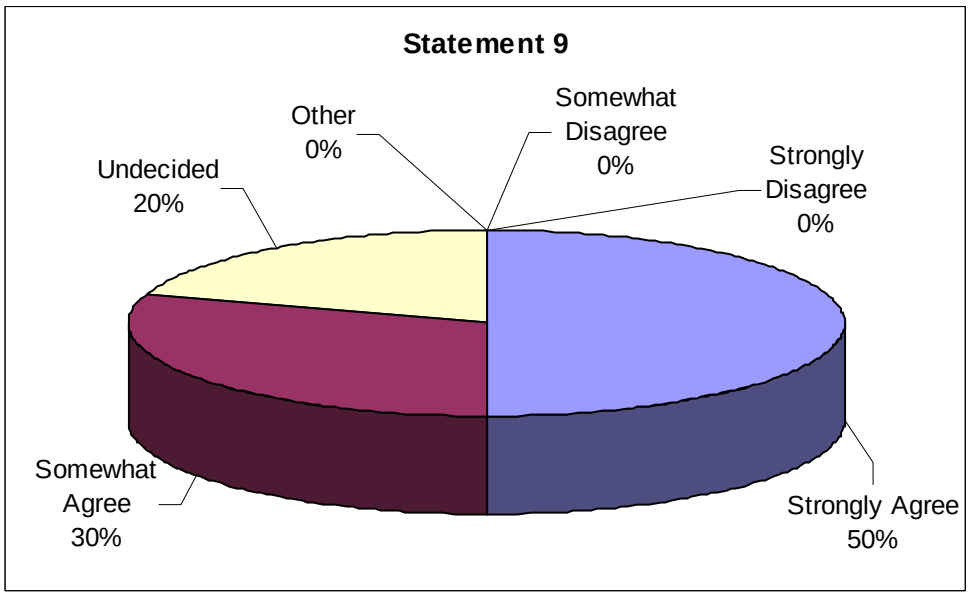

Figure 16 Responses to statement 9: "Exercises as part of a rehabilitation programme to recover from existing musculoskeletal disorders are beneficial and improve recovery."

Statement 10

"Limbering up exercises before undertaking strenuous physical work *should* help to reduce MSDs."

The majority (80%) agreed with this statement. 20% of the respondents were undecided. A breakdown of these responses can be found in **Figure 17**.

No comments were made by any respondent to indicate reasons behind their responses.

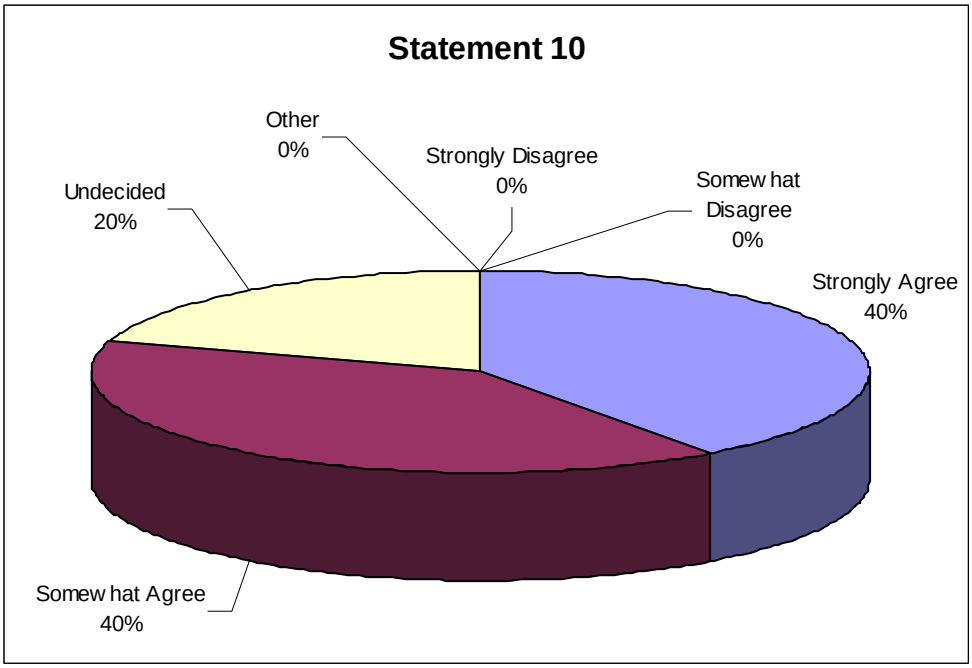

Figure 17 Responses to statement 10: "Limbering up exercises before undertaking strenuous physical work *should* help to reduce MSDs."

Statement 11

"Limbering up and exercise are better for producing general physiological benefits than actual, practical reductions in MSDs or absenteeism."

The majority (50%) of respondents were undecided as to whether this statement rang true. 40% somewhat agreed and 10% somewhat disagreed. The responses are broken down in **Figure 18**.

Comments indicate that general physiological benefits should lead to practical reductions in MSDs as a matter of course.

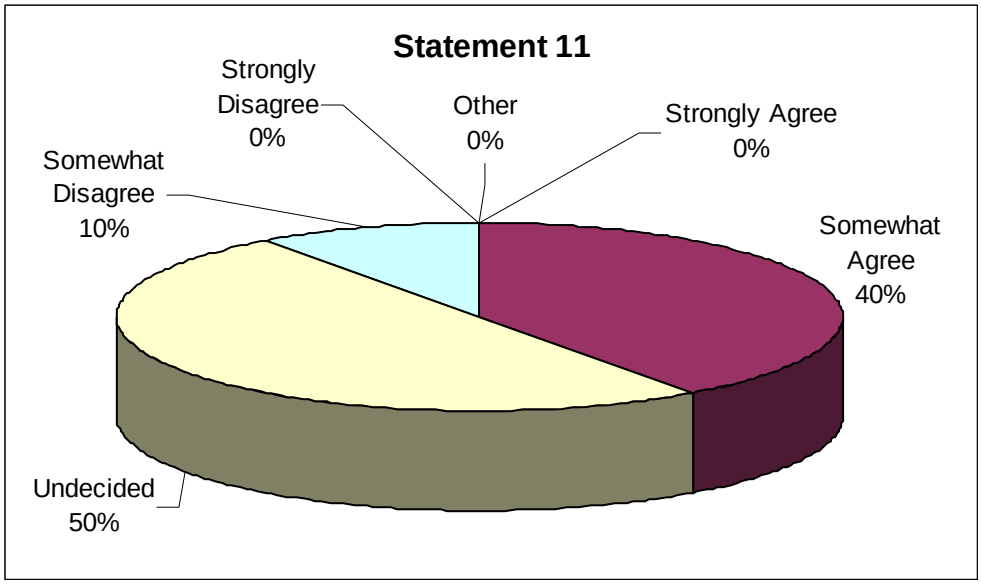

Figure 18 Responses to statement 11: "Limbering up and exercise are better for producing general physiological benefits than actual, practical reductions in MSDs or absenteeism."

Statement 12

"Exercise can have additional secondary benefits such as reduced fatigue and tiredness."

All respondents agreed with this statement, 60% of which strongly agreed and 40% agreed. These results are summarised in **Figure 19**.

Comments from the respondents identify other secondary benefits such as stress relief, relaxation, general well-being, and increased social interaction.

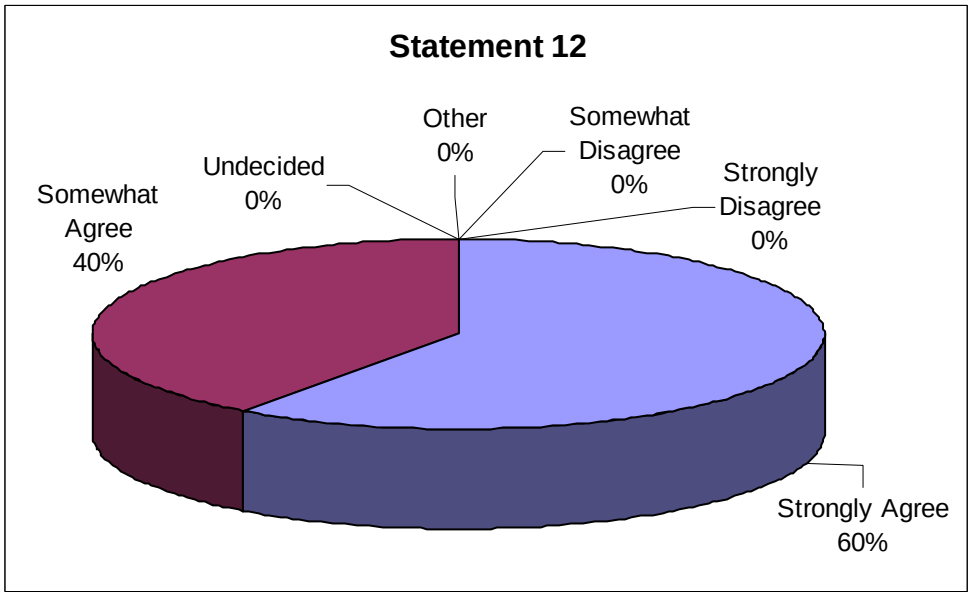

Figure 19 Responses to statement 12: "Exercise can have additional secondary benefits such as reduced fatigue and tiredness."

Statement 13
"Exercises can lead to reduced lower back pain. However, it appears that exercises building back strength rather than flexibility are most beneficial."

The majority of participants (70%) agreed with this statement. The remainder were undecided. A breakdown of the responses can be found in **Figure 20**.

Comments from one of the (undecided) participants indicate that they feel there is no independent evidence to support this statement.

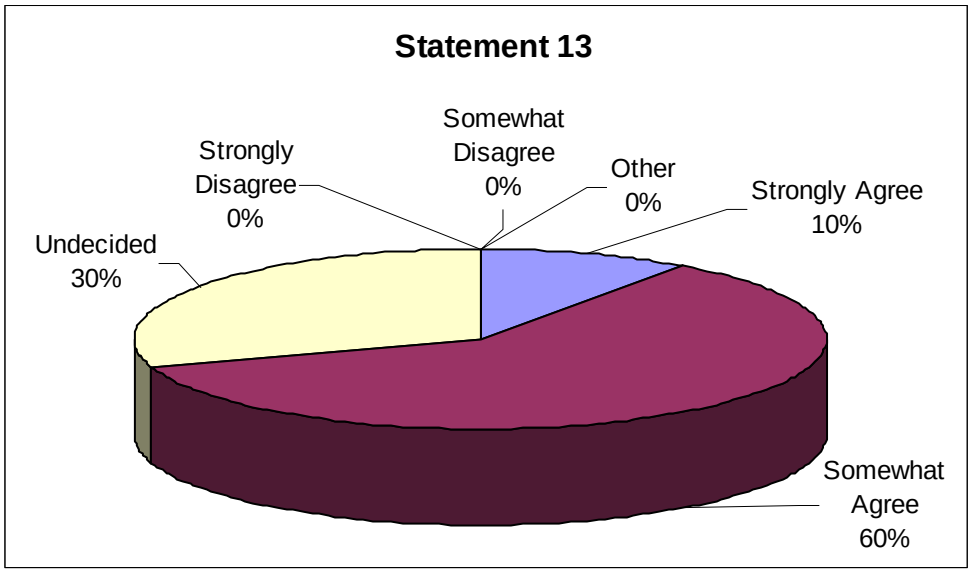

Figure 20 Responses to statement 13: "Exercises can lead to reduced lower back pain. However, it appears that exercises building back strength rather than flexibility are most beneficial."

5.5. SUPPORT FOR FUTURE WORK

Statement 14
"We would be interested in supporting this work by possibly taking part in a study implementing a workplace limbering-up programme."

81% (9 out of 11) of respondents stated that they might be interested in supporting this work by taking part in a study implementing a workplace limbering-up programme. This positive response is good should any further work be performed. The contacts made during this project may provide an opportunity to do a definitive piece of research investigating the potential benefits of limbering up more rigorously.

Statement 15
"We would be interested in supporting this work by providing data and evidence from an existing limbering up programme that we currently operate."

27% (3 out of 11) of respondents agreed to this statement. These respondents indicated that they would try to help to the best of their ability, where possible.

5.6. EXPERIENCE OF LIMBERING UP PROGRAMMES

Statement 16

"If you have some experience of limbering up, warm ups or stretching in the workplace, have you found these activities beneficial and, if so, can you identify any quantifiable benefits?"

Half of the respondents that took part in the survey have had some experience of running a limbering up, warm-up or stretching programme in the workplace or have taken part in one themselves. The benefits associated with those programmes as described by the respondents include:

- A reduction in injury rates;
- A reduction in the severity of the injury;
- A reduction in days off work;
- Good as an "energiser";
- Aches disappear;
- Greater flexibility is achieved;
- Stress levels are reduced and people are more relaxed;
- More confidence;
- Sometimes leads to positive lifestyle changes.

Comments by two of the respondents mirrored the findings of the literature review concerning participation. As previously reported, employees can feel uncomfortable performing exercises in front of their colleagues and "would prefer to do them quietly going in and out of the workplace". Those who had previously suffered with MSDs were more likely to participate in such programmes.

Statement 17

"Are the benefits of any of the exercises identified in the study so far enticing enough to make you consider instigating a limbering up programme? Why/why not?"

Around half of the participants stated that the results presented in the consultation document were positive enough to make them consider setting up a limbering up program; three of which are either actively considering, looking for or currently implementing such a programme.

The main barrier to implementing such a programme is identified as achieving buy-in by management. Reported obstacles noted by respondents include:

- Management would not allow it in work time, employees would have to come to work earlier in order to perform exercises
- Benefits need to be pushed at all levels, convincing management as well as workers
- Lack of resources (personnel, staff) to successfully instigate such a programme

Statement 18

"What kind of proof would you require in order to feel confident that starting such a limbering up programme would be beneficial?"

Respondents that remained unconvinced about the benefits of limbering up after reading the consultation document stated that the required proof would have to be specific, quantifiable and substantial. Comments included:

- MSD likelihood following an exercise programme;
- Significant evidence of a reduction in WRMSDs;
- Financial proof of efficacy, i.e. cost-benefit;
- Results of previous trials;

- Proof is not required, the important issue is to change the culture so that exercises are accepted.

These responses reflect the findings and conclusions drawn from the literature review. It was again implied that 'management' would have to be convinced however one participant again highlighted the need for the attitudes of the employee to be changed as well.

Statement 19

"In what area do you think that your organisation is most in need of guidance regarding WRMSDs and their mitigation?"

Two areas were identified as requiring guidance with regard to WRMSDs and their mitigation:

- How to persuade management of the benefits, with evidence on the advantages;
- Once management are on board, how to use their influence to convince employees;
- Clear indication of the types of exercise to be performed is also required and should be specific to tasks and occupations.

There is a feeling amongst the respondents that it is unclear as to which exercises should be performed before carrying out a sedentary task such as typing or computer operating work.

5.7. CONCLUSION

The consultation document was generally successful in that it has brought to light some of the views of those currently working on MSDs in industry.

The attitudes of management in particular but also of employees are seen as one of the main barriers to the successful implementation of a limbering-up programme.

At present there is not enough scientific evidence to support claims that workplace exercise programmes provide any kind of tangible benefit. The evidence that is available is largely anecdotal. While some respondents felt that there was sufficient evidence for them to want to implement workplace exercise programmes, this is probably due to the widespread belief that exercise and stretching is a useful means to reduce injury, particularly before doing sports.

Industry needs evidence and guidance regarding limbering up exercises in the workplace before they can put effort into promoting such kinds of programmes. Unfortunately the literature as it stands does not provide adequate evidence or guidance of a required quality. More research needs to be done or a shift in policy towards promoting other kinds of intervention that there is evidence for, such as all-round general exercise programmes.

The consultation corroborated the literature review both in agreement with its findings and addition of further anecdotal evidence. This supports the idea that exercises are beneficial to work but exactly what exercises and how they are beneficial has not yet been demonstrated. The consultation also corroborated the data analysis. Where it does differ, the difference is explained by the respondents themselves in terms of their lack of exposure to the wider data.

The responses to the latter parts of the consultation document show that there is interest in using exercise to reduce absenteeism and improve wellbeing. Whether or not it can be attributed to reduction in MSDs, industry appears to want to know if exercise really can help and is willing to take part in further work to find out.

6. GAP ANALYSIS

6.1. INTRODUCTION

The aim of the gap analysis was to look at the results of the literature review, data analysis and consultation with industry and compare the needs of industry with the findings of research in order to examine any gaps indicating research that needs to be done.

Following the literature review it became clear that there are many gaps in research, the most important being a distinct lack of statistically significant evidence for the benefits of limbering up exercises in the workplace.

The following section looks at each of the needs of industry regarding WRMSDs and how they are addressed by current research. Each heading represents a need drawn from either the data analysis or responses to the consultation document.

6.2. ADDRESSING THE NEEDS OF INDUSTRY

Tackle back injuries at work

The data analysis indicated that MSDs affecting the back are the most common type of WRMSD. Unfortunately, the English literature review did not find many pieces of research in English regarding limbering up to prevent back injury. However, the Japanese literature showed that Japan does more research regarding exercises to prevent or reduce back pain. Exercises for the back could be promoted based on this research.

It appears that back strength is more important than flexibility so these kind of exercises should be emphasised while taking care to ensure that they are done carefully and not overdone such that they may cause harm to the back.

Reduce days lost due to MSDs

The data analysis showed that 12.3 million days each year are lost due to WRMSDs. The literature review was able to identify some research that indicated a reduction in absenteeism as a result of participation in a general workplace fitness programme, but it was not possible to determine whether there was also a reduction in MSDs as a result of this programme. Some respondents to the consultation document commented that a reduction in MSDs will naturally follow on from increased exercise but this is an assumption that is unsupported by scientific evidence.

There is a gap in the research regarding the effects of limbering up exercise programmes upon absenteeism. General all-round fitness programmes (e.g. one hour of cardio-vascular exercise several times per week) are supported by improvements in absenteeism statistics, but limbering up (light stretching exercises several times a day) programmes are not. As has been mentioned previously, support for limbering up programmes is based largely on anecdotal evidence.

Improve working conditions to minimise those causing WRMSDs

The ESWC survey indicated a Europe-wide perception of a worsening in working conditions. However, responses to the consultation document disagreed with these findings.

However, there may be other reasons why conditions could be worsening despite considerable efforts to improve things:

- Competitive pressures may result in companies expecting people to work longer hours and more nightshifts;
- An increase in hot desking may result in workers not making the effort to have their workspace set up in the way that is most comfortable for them;
- An increased in service industries may lead to more sedentary and static jobs;
- Similarly, increased automation may lead to more monitoring, static tasks;
- As computer use has only become commonplace in the last 20 years or so, the long term effects (if any) of using, for example, a mouse every day would only now be emerging.

Regardless of whether working conditions are worsening, there is undoubtedly room for improvement in many industries. Industry do not have any guidance regarding the potential benefits of workplace exercises as a means to tackling MSDs so there is a gap here although unfortunately the quality of current research is not high enough to provide a definitive advice yet.

Research effect of MSDs upon quality and quantity of work

Little research could be found providing insight into the effect of MSDs upon job performance, although this research indicated that the quality or quantity of work done by people with WRMSDs is likely to suffer, no quantifiable measure of performance decrement was suggested.

It would be beneficial for future research to investigate the degree to which typical tasks are impaired by MSDs so that the impact of MSDs upon the quality and quantity of work done by a person with MSDs could be estimated.

MSD incidence and age

The data analysis showed that MSD incidence increases with age and peaks at ages 45-54. There is no evidence as to whether the MSD incidence profile changes when limbering up exercises are performed and a longitudinal study would be necessary in order to show this.

Gender and MSD type

There was some evidence that males are slightly more prone to back problems than females. Similarly, females appear to be slightly more at risk of upper limb disorders than males.

These differences are likely to be caused by the fact that men traditionally do more manual handling and physically intensive work whereas women do more desk-based work utilising the upper limbs. Therefore rather than specifically targeting males with back care programmes and females with ULD prevention programmes, industries which are more prone to back problems should be targeted with back care programmes, and industries which are more prone to upper limb disorders should be targeted with ULD prevention programmes.

Industries and occupations and MSDs

The data analysis showed that some industries and occupations are more prone to WRMSDs than others. However, there was little in the literature review about specific exercises for different types of job and pro-limbering up research seemed to be focused on pushing the universal benefits of exercise for all industries and occupations rather than identifying which exercises were best for each.

There is clearly a need to target industries with industry specific workouts and more research will be needed in order to support this goal. At the workshop in Japan a presentation was given by Mukai Construction Ltd. about their occupational health programme, which involved group stretching exercises every day. These exercises included massaging the shoulders, which are used intensively in construction work. Although this programme has not been subject to scientific testing of the actual benefits, it is a good example of the type of scheme that might be encouraged as targeting specific muscle groups used in that occupation.

Research support for anecdotal evidence

Most research and the majority of respondents to the consultation document agree that limbering up before work can lead to genuine reductions in WRMSDs, however there is no statistically significant scientific evidence to support this assertion and the evidence that this is based on is largely anecdotal – even in Japan where limbering up is a part of daily life for millions of individuals.

The need for such data was born out by most of the responses to statement 18 in the consultation document. The HSE's need for evidence-based policy also requires such data before it could recommend the use of exercises on the basis of evidence.

There is an important gap here, and it is essential that more scientific evidence is gathered regarding limbering up before these kinds of exercises can be recommended. This may require a large scale longitudinal study looking at various types of exercises and occupations.

In order to overcome the most apparent gaps in the data, eventual future work studying the benefits of exercises for work should be careful to:

- Establish a baseline of MSD incidence before deploying an exercise regime;
- Survey participants to be able to account for possible confounding effects of physical activity outside of work;
- Introduce and manage the exercises in a way that does not make the participants feel embarrassed or conspicuous;
- Monitor participation and continue long enough for effects to become apparent;
- Ensure statistical validity by using a control group and a large enough sample to make valid small differences between groups;
- Take care to derive quantitative statistically significant evidence, to support the anecdotal and indirect evidence such as reduced absenteeism;
- Demonstrate independence especially when researchers are testing exercise regimes developed by themselves.

Guidance for implementing exercise programmes

Respondents to the consultation document expressed the need for guidance to assist with the implementation of exercise programmes in the workplace. This would include:

- How to achieve buy-in from the managers;

- Convincing the workforce to participate in such programmes;
- Which exercises are more appropriate for which types of occupation;
- The resources that are necessary to implement such programmes.

Based on the evidence in this report it can only be advised that general fitness programmes are beneficial, more evidence will be required before advising about limbering up and stretching programmes.

6.3. OVERALL CONCLUSION

In conclusion, there is (mostly anecdotal) evidence for benefits from limbering up or stretching exercises (not associated with cardio-vascular fitness) performed before or during work, but it is not sufficiently strong to make a case for recommending such exercises to industry.

The evidence of benefits of limbering up exercises is not specific or reliable enough, and more research will be necessary to find out which limbering up exercises produce which kinds of benefits and to what magnitude. The best evidence for specific benefits associated with WRMSDs comes from strengthening exercises designed to strengthen the back (not a limbering up exercise).

There is strong, reliable evidence for work benefits from general health and fitness exercises. It is clear that regular physical exercise is an excellent way to reduce absenteeism at work and improve the all-round health and fitness of employees – back strengthening exercises would be one way of reducing MSDs mainly affecting the back.

There is also evidence that exercises performed as part of a rehabilitation programme do provide benefit to those required to do them.

6.4. RECOMMENDATIONS FOR FUTURE WORK

A good place to begin would be to get in touch with respondents to the consultation document who had indicated that they would be happy to make data regarding their exercise programmes available to the HSE. These could then be examined to see if any statistically significant benefits can be found.

If it is thought that this data is sufficiently promising, then a large scale longitudinal study should be put in place looking at long term benefits of various exercises in various industries. This study should be designed in accordance with the principles set out in the paragraph headed “Research support for anecdotal evidence” in section 6.2.

Additionally, psychosocial factors and their effects on MSDs and absence from work were raised as a potential avenue of research by one of the researchers we met in Japan. This idea that working conditions and psychosocial factors such as feelings of alienation and job dissatisfaction have a tangible effect on WRMSDs is currently being studied by researchers at the NIIH in Japan. Further research in this area by a UK institution could provide valuable insight into ways to improve WRMSD rates by improvements to work culture. Although unpublished at the time of writing, the forthcoming HSE research report, “The role of work stress and psychological factors in the development of musculoskeletal disorders” (Deveraux et al., 2004), may provide some insight in this regard.

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9. APPENDICES

9.1. APPENDIX A

BREAKDOWN OF RESEARCH BY PROGRAMME GOAL

Table 1 Breakdown of the types of research that have been done in English

Category	*Programme Goal*	*No.*	*%*
1	Do a heavy task (incl. man handling)	3	7%
2	Do a Sedentary task (e.g. typing)	7	16%
3	Fitness/Strength/Conditioning training	18	42%
4	Recovery from injury/mitigation of existing symptoms	6	14%
5	Other (e.g. wellness, flexibility, n/a)	9	21%
	GRAND TOTAL	**43**	**100%**

Table 2 Breakdown of the types of research that have been done in Japanese

Category	*Programme Goal*	*No.*	*%*
A	Exercise for the prevention of LBP	18	51%
B	Management of existing LBP	3	9%
C	Exercising for general fitness	6	17%
D	Exercising to reduce feelings of fatigue	3	9%
E	Other (e.g. wellness, n/a)	5	14%
	GRAND TOTAL	**35**	**100%**

9.2. APPENDIX B

CONSULTATION DOCUMENT SUPPLIED TO INDUSTRY

See next page.

LIMBERING UP TO PREVENT MUSCULOSKELETAL DISORDERS

UK INDUSTRY CONSULTATION

HUMAN ENGINEERING LIMITED ON BEHALF OF
THE HEALTH & SAFETY EXECUTIVE

Introduction

Results from the latest survey of self-reported work-related illness (SWI 01/02) indicate that in 2001/02 an estimated 1,126,000 people in Great Britain suffered from a musculoskeletal disorder (MSD) which, in their opinion, was caused or made worse by their current or past work.

The cost to industry of MSDs is significant. SWI 01/02 estimated that 12.3 million working days (full-day equivalent) were lost in 2001/02 through MSDs caused or made worse by work. On average, each sufferer took an estimated 19 days off in that 12 month period.

Human Engineering are currently investigating the possible benefits of performing limbering up exercises before work in order to reduce the potential for developing work-related MSDs (WRMSDs). Work to date has included a literature review covering international sources, particularly from Japan where morning exercises form part of daily routine for much of the workforce. An analysis of the relevant WRMSD data has also been undertaken in order to identify the most prevalent conditions so that mitigation measures can be prioritised and targeted for maximum benefit.

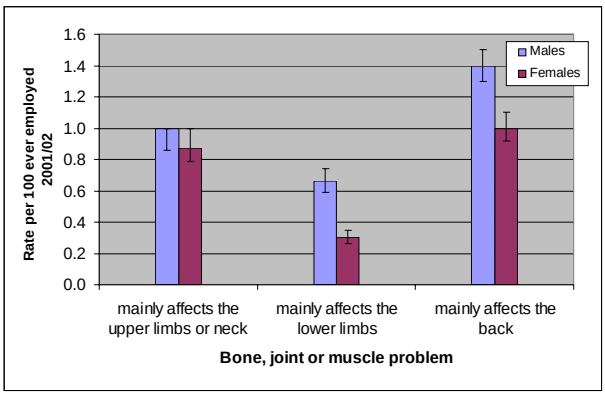
The purpose of this consultation paper is to present the current findings of the project to industry in order to obtain their feedback as to the needs of UK industry regarding WRMSDs. Throughout this paper are opportunities for you to tell us whether your experiences of WRMSDs and possibly limbering up agree with the picture presented by our review of the WRMSD literature and data.

The first part of the document describes the main findings of the data analysis showing the patterns and trends of WRMSDs in the UK. The second part shows the results of the international literature review. There is also the opportunity for you to inform us of your own experiences of limbering up programmes.

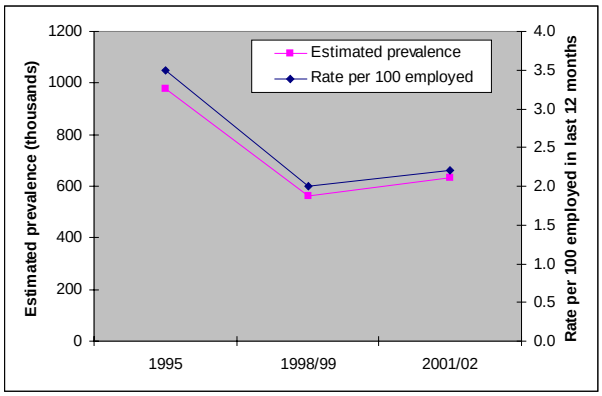
We believe that your reactions to these results will be helpful and could help to make this research more useful. Please send completed documents to Human Engineering by post or fax. Thank you.

Pattern of musculoskeletal disorders in the UK

Data suggests that WRMSDs mainly affecting the back are the most common and that, since 1998/99 WRMSDs have been gradually rising. Men are more affected by WRMSDs than women except for WRMSDs mainly affecting the upper limbs or neck, where there is no significant difference.



Estimated 2001/02 rates (%) of self-reported MSDs caused or made worse by work, by type of MSD and gender, for people ever employed



Comparison of estimated 1995, 1998/99 and 2001/02 prevalence and rates (%) of MSDs caused or made worse by work, for people working in the last 12 months in Great Britain

Conclusions from the data analysis
An analysis of HSE data relating to MSDs shows that they are having a serious impact on industry due to days lost at work.

Your reaction
Please indicate whether ***on the basis of your experience*** you agree with the statement, and any other comments you have.

1 Back problems are the most common form of MSD by a small margin. This is especially the case amongst males.

☐ Agree ☐ Disagree Comments:

2 The number of workers reporting WRMSDs has been increasing since 1998/99.

☐ Agree ☐ Disagree Comments:

3 Developing WRMSDs becomes more likely as one gets older, and WRMSDs are most prevalent in the 55-64 age bracket.

☐ Agree ☐ Disagree Comments:

4 Those working conditions that are likely to lead to WRMSDs (e.g. holding painful, tiring positions, and handling heavy loads) are becoming more common.

☐ Agree ☐ Disagree Comments:

5 Workers in some industrial sectors are more prone to MSDs than others and so these may be more productive areas in which to trial the use of limbering up programmes.

The main at-risk industries are listed on the right in approximate order of priority.

Please tell us your industry (with brief description if necessary) and whether or not you consider the people you are responsible for to be particularly at risk of WRMSDs compared to other industries:

Comments:

1. **Manufacturing**
2. **Health and social work**
3. **Construction**
4. **Agriculture, hunting, forestry and fishing**
5. **Extractive and utility supply industries**
6. **Transport, storage and communication**

6 Likewise, some occupations are more prone to MSDs.

The main at-risk occupations are listed on the right in approximate order of priority.

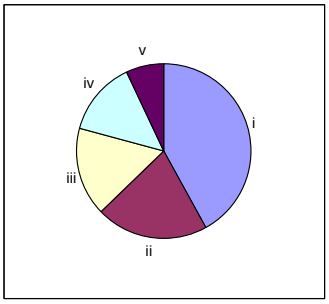
Please tell us the type of occupations offered by your company (with brief description if necessary) and which of these you consider most prone to developing WRMSDs:

Comments:

1. **Skilled construction and building trades**
2. **Protective service occupations**
3. **Health and social welfare professionals**
4. **Skilled agricultural trades**
5. **Process, plant and machine operatives**
6. **Textiles, printing and other skilled trades**

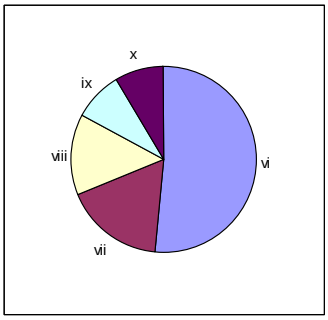
International literature review

The literature review looked at 43 documents in English and 35 documents in Japanese. The documents differed with regard to the overall goal of the research and five different goals were identified for each of the bodies of research. The pie charts below show the relative amounts of reports having each goal.



Research in English

i Exercises and training to improve all-round fitness and strength
ii Other programmes (e.g. health education, wellness, flexibility)
iii Limbering up and/or stretching before doing a sedentary task (e.g. typing) in order to reduce MSDs.
iv Exercises undertaken in order to aid recovery from injury/mitigation of existing symptoms
v Limbering up before performing a heavy task (incl. manual handling) to reduce musculoskeletal disorders (MSDs)



Research in Japanese

vi Exercises performed before work to prevent lower back pain (LBP)
vii Exercises and training to improve all-round fitness and strength
viii Other programmes (e.g. health education, wellness)
ix Exercises and stretching in order to manage and recover from existing LBP
x Exercising to reduce feelings of fatigue at work

From this review it was concluded that there is evidence that there are benefits to be had from limbering up exercises, and from exercises in support of general fitness. However, there is not enough evidence at this point in time to say confidently that limbering up exercises do reduce WRMSDs.

Findings from the literature review
The main findings of the review are listed below.

Your feedback
Please indicate how much you agree with each statement, *based on your experience.*

		Strongly disagree	Somewhat disagree	Undecided	Somewhat agree	Strongly agree
7	The strongest benefits in terms of reduced absenteeism and medical costs result from exercises for general physical fitness and strength.	☐	☐	☐	☐	☐
8	Exercises undertaken before carrying out a sedentary task such as typing have some positive benefits. Unfortunately it is not clear what types of exercises produce the greatest benefits.	☐	☐	☐	☐	☐
9	Exercises as part of a rehabilitation programme to recover from existing musculoskeletal disorders are beneficial and improve recovery.	☐	☐	☐	☐	☐
10	Limbering up exercises before undertaking strenuous physical work *should* help to reduce MSDs.	☐	☐	☐	☐	☐
11	Limbering up and exercise are better for producing general physiological benefits than actual, practical reductions in MSDs or absenteeism.	☐	☐	☐	☐	☐
12	Exercise can have additional secondary benefits such as reduced fatigue and tiredness.	☐	☐	☐	☐	☐
13	Exercises can lead to reduced lower back pain. However, it appears that exercises building back strength rather than flexibility are most beneficial.	☐	☐	☐	☐	☐

About you and your organisation

Name: Role:

Organisation:

Phone: Email:

Future work
In order to overcome the most apparent gaps in the knowledge, eventual future work studying the benefits of limbering up exercises prior to sedentary tasks and heavy tasks may be done.

If your organisation would be interested in taking part in or assisting with any future study addressing the value of limbering up as a means of reducing MSDs, please tick one of the boxes below.

14 ☐ We would be interested in supporting this work by possibly taking part in a study implementing a workplace limbering-up programme.

15 ☐ We would be interested in supporting this work by providing data and evidence from an existing limbering up programme that we currently operate.

Your experiences and opinion of limbering up programmes
Please answer the questions below.

16 If you have some experience of limbering up, warm ups or stretching in the workplace, have you found these activities beneficial and, if so, can you identify any quantifiable benefits?

17 Are the benefits of any of the exercises identified in the study so far enticing enough to make you consider instigating a limbering up programme? Why/why not?

18 What kind of proof would you require in order to feel confident that starting such a limbering up programme would be beneficial?

19 In what area do you think that your organisation is most in need of guidance regarding WRMSDs and their mitigation?

Thank you for participating in this consultation! We would be happy to receive any further comments that you might have. Please write them on a separate sheet. Send completed documents by post or by fax to:

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10. GLOSSARY

ASLEF	Associated society of locomotive engineers and firemen
BMI	Body mass index
CTS	Carpal tunnel syndrome
DWP	Department of work and pensions
ESWC	European survey of working conditions
FDA	Association of first division civil servants
HAV	Hand-arm vibration
HSE	Health and safety executive
IIS	Industrial injuries scheme
ISTC	Iron and steel trades confederation
JICOSH	Japan international committee on safety and health
JISHA	Japan industrial safety and health association
LBP	Lower back pain
LFS	Labour force survey
LLD	Lower-limb disorder
MHLW	Ministry of health labour and welfare
MOSS	Musculoskeletal occupational surveillance scheme
MSD	Musculoskeletal disorder
MU	Musicians union
NGSU	Nationwide group staff union
NIIH	National institute of industrial health
OPRA	Occupational physicians reporting activity
RIDDOR	Reporting of injuries, diseases and dangerous occurrences regulations
RSI	Repetitive strain injury
SWI	Surveys of self-reported work-related illness
THP	Total health promotion
TMC	Toyota motor corporation
TUC	Trades union council
UK	United kingdom
ULD	Upper limb disorder
VDT	Visual display terminal
VWF	Vibration white finger
WRMSD	Work-related musculoskeletal disorder
WRULD	Work-related upper-limb disorder

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