

Musculoskeletal disorders amongst window cleaners using both traditional methods and Long Pole Window Cleaning (LPWC) systems

During 2007/2008 a study was started to investigate the prevalence of musculoskeletal disorders among operators in the window cleaning industry. This is a summary of the main findings of that study.

Abstract

The repetitive movements and manual handling required by window cleaning operatives have long caused those in the industry to be concerned about the prevalence of musculoskeletal disorders among operatives. Recent changes to legislation regarding working at height has caused many window cleaning companies to review their use of ladders and other access equipment, and has resulted in many changing to the use of long pole window cleaning (LPWC) systems. The objective of this study was to evaluate the level of musculoskeletal symptoms experienced by window cleaners as a whole and comparing the prevalence of such symptoms between users of LPWC systems and users of conventional equipment. The study revealed a staggering level of prevalence of musculoskeletal symptoms among window cleaners, particularly with regard to upper limb disorders. However, the study seems to indicate that users of LPWC systems are no more likely to suffer from these symptoms than users of conventional equipment. An observational study revealed that some relatively simple controls could reduce the level of symptoms experienced by LPWC system users.

Introduction

The field of musculoskeletal disease is of serious concern to governments, business leaders, health professionals and health and safety practitioners. In the United Kingdom at present, it is the highest self-reported cause for absence from work, with during 2006/2007 over 1 million people reporting musculoskeletal symptoms caused or aggravated by work, leading to 10.7 million lost workdays (Jones *et al*, 2006). The term 'musculo-skeletal disorders' encompasses all complaints of muscles, bones and joints, as well as their connective tissues, such as tendons and ligaments. There are many factors that are known to contribute to the manifestation of musculoskeletal symptoms. These include work procedures that involve repetitive tasks and muscular fatigue, including load lifting, and power gripping (Pheasant, 2003; Silverstein, 1986); and neck extensions (Buckle and Devereaux, 1999; NIOSH, 1997);.

These factors have meant that the window cleaning industry has always recognised that musculoskeletal disorders were a major problem to window cleaning operatives. The manual handling of access equipment together with the repetitive movements associated with the use of conventional cleaning methods (use of an applicator and squeegee) make window cleaners prime candidates for developing musculoskeletal symptoms.

In recent years however, the window cleaning industry has been revolutionised by the use of long pole window cleaning (LPWC) system. This system has obvious benefits in reducing the risks associated with working at height, but as its use meant that other risks, such as those that give rise

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to the development of musculoskeletal disorders been reduced, or increased? The objective of this study is to establish just that – has the increased use of LPWC systems also led to a higher prevalence of musculoskeletal disorders among operators?

Literature Review

Research carried out among similar occupational activities may lead us to think that prevalence of musculoskeletal disorders would be increased by the working postures and physical demands of using LPWC systems.

One such study was carried out in Japan among workers in an orchard (Sakakibara et al, 1995). In this study, workers used long poles with baskets or nets to pick apples and pears from trees growing in orchards, with similar postures to those employed by operators of LPWC systems. Most significant perhaps was the need for significant visual demand whilst working. This meant workers were postured with necks extended for a considerable amount of the time. Sakakibara found that over 50% of pear-orchard workers experienced cervical pain. The working hours of these workers were perhaps considerably more than the average window cleaner, as they were working 8.9 hours a day for approximately 10 days. However, that was the only 10 days they were working in this seasonal aspect of their work. And so whilst their symptoms subsided reasonably shortly after their employment within the orchards, Sakakibara indicates that should this sort of posture be employed for any considerable length of time, then symptoms would become more pronounced.

A year later a similar study looked at the musculoskeletal disorders arising from the harvesting of palm fruit oil in Malaysia (Zainuddin & Haslam, 1996). Again similar postures were employed in using a sickle mounted on telescopic aluminium poles to cut fruit from palm trees. Zainuddin and Haslam found that only 25% of the time was spent in the posture concerned in this project, of reaching up with a telescopic pole, but of the 70% of workers that cut fruit from trees higher than 13m high, a staggering 98% were found to be experiencing discomfort and pain in their necks. Other areas where musculoskeletal symptoms were experienced included the hands, wrists and arms.

Other factors which are shown to have an effect on the development of musculoskeletal disorders in similar working conditions are the diameter and design of grips and grip surfaces, exposure to cold and damp weather, and the likelihood of slips and trips.

A range of musculoskeletal symptoms maybe suffered, most likely pain and discomfort in the upper limbs, shoulders, neck and back. The majority of these will be of a muscular or myalgic nature. Muscle spasms caused by muscular exhaustion, likely will cause stiff neck and myogenic headaches. These symptoms may pass quickly, but are likely to be recurrent, and may indeed be experienced many times within one working week. Myalgic conditions often effect younger populations, or those with a relatively limited exposure time to the cause of muscular exhaustion.

These myalgic conditions can be further exasperated by continual cervical extensions. It has been stated that bending the neck backwards, compresses nerves and blood vessels passing through the cervical region against the cervical vertebrae, again causing headaches. If the conditions causing cervical extension are allowed to continue, it may cause permanent neurological damage, and decreasing blood flow through vertebral and carotid vessels feeding the brain, leading in

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combination to vertigo, tinnitus, deafness, blackouts, visual disturbance and numbness in the arms (Toole & Tucher, 1960)

Symptoms probable to be reported because of gripping problems are likely to be those often associated with carpal tunnel syndrome (Pheasant, 2003). These symptoms would initially include numbness or tingling in the area around the median nerve, but may spread to include much of the hand and forearm, with severe and continual pain indicating an advanced case.

Study Design and population

The study was primarily based on a questionnaire mailed to various window cleaners. The window cleaners involved were of a mixed group of ages and backgrounds, from different locations around the United Kingdom, with varying lengths of service as window cleaners, and who used various combinations of window cleaning equipment (conventional and LPWC systems).

The questionnaire was developed based on the standardised Nordic Questionnaire, with questions regarding pain and symptoms experienced over certain times in specific body regions, along with asking the respondents their age, gender, years window cleaning, hand dominance and percentage time using LPWC systems. This part of the study allowed users of both types window cleaning equipment to be compared against each other with regard to musculoskeletal symptoms reported.

Another part of the study was observational. Here a LPWC operator was observed using the system as standard and scored according to probable risks for musculoskeletal symptoms using the University of Surrey's QEC system, and then again using some modifications recommended by the Health and Safety Laboratory in a previous study (Monnington, 2003). The modifications included the use of a grip area on the poles and a harness to support the weight of the pole in operation.

Results

The anthropometric and demographic characteristics of the respondents to the questionnaire are summarized in Table 1. A total of 39 useable questionnaires were returned. Unfortunately, all the respondents were male, despite efforts to contact female window cleaning operatives; this largely reflects the demographic of the industry.

Very few (5.13%) of 16-24 year olds responded to the questionnaire, whilst considerable more 25-40 and 41-70 year olds did. This could be a reflection of the aging process and the acknowledgement it brings of one's mortality and fragility.

The vast majority (58.97%) of the respondents had been window cleaning for over ten years, and could therefore be termed as career window cleaners, as opposed to those who enter the industry temporarily as a 'stop-gap' between occupations. This suited the purpose of the research well.

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For the purpose of the research, all those that responded, who used the water fed pole system for more than 41% of the time were recorded as LPWC system users, whilst those that used the system less than 40% of the time were recorded as users of conventional equipment. In reality, the majority of window cleaners use either system in varying proportions, but the actual percentage of usage will often depend on the type of work being carried out (e.g. commercial, domestic, internal, external). For this study this equates to 58.98% of respondents being LPWC system users, and 41.02% as users of conventional equipment.

Table - anthropometric and demographic characteristics of respondents

Variable	Percentage (%)
Age	
16-24	5.13
25-40	43.95
41-70	51.28
Period Window Cleaning	
0-3 years	12.82
4-10 years	28.21
10yrs +	58.97
% time using LPWC	
0-20%	15.38
21-40%	25.64
41-60%	0
61-80%	23.08
81-100%	35.90
Left-handed	
	17.95
Right handed	
	82.05

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One of the most staggering statistics to come from this research is that 89.74% of the respondents had experienced some symptoms of musculoskeletal disorders during the past 12 months, highlighting that which was already mentioned that all window cleaners, irrespective of the equipment they use are susceptible to musculoskeletal disorders. Of the respondents, 30.77 % had had their work disrupted by MSD symptoms in the past 12 months and 28.20% had experienced some musculoskeletal symptoms in the 7 days previous to filling in the questionnaire.

As table 2 shows, the most common anatomical regions that respondents experienced symptoms in was the shoulders, neck and hand/wrists. As anticipated this shows a high prevalence of work-related upper limb disorders in the industry. Interestingly in nearly all of the anatomical regions highlighted by the questionnaire, a greater proportion of users of conventional equipment experienced symptoms than the proportion of users of LPWC systems. The notable exceptions to this were the wrist/hands and both the upper and lower back regions.

Table - Prevalence of musculoskeletal disorders in window cleaners

Anatomical Region	Respondents who suffered symptoms (%)	Respondents whose work was disrupted in past yr (%)	Respondents who had felt MSD symptoms in previous 7 days (%)	% of pole users who experienced symptoms	% of conventional users that experienced symptoms
Neck	66.6	15.38	17.95	65.21	68.75
Shoulder	76.92	15.38	7.67	69.56	87.50
Elbow	30.77	5.13	7.69	26.09	31.25
Hand/wrist	58.97	5.13	12.82	65.21	50.00
Upper back	30.77	2.56	7.69	39.13	18.75
Lower back	56.41	12.82	17.95	56.52	50.00
Hip/thighs	7.69	0	0	13.04	0.00
Knees	15.38	2.56	0	13.04	18.75
Feet	0	0	0	0	0

The results of the observational study can be seen in table 3. This table shows the unmodified pole system as the control on the top row, with the enhanced grip surface below, and the harness below that. The lower the score, the lower the risk of musculoskeletal disorders. The greatest improvement is seen with the use of a harness, which shows reduced risk for the back, shoulder/arm and wrist/hand regions. The use of a grip surface did reduce risk in the wrist/hand region slightly.

Table - Results of the QEC observational study

Anatomical Region	Respondents who suffered symptoms (%)	Respondents whose work was disrupted in past yr (%)	Respondents who had felt MSD symptoms in previous 7 days (%)	% of pole users who experienced symptoms	% of conventional users that experienced symptoms
Neck	66.6	15.38	17.95	65.21	68.75
Shoulder	76.92	15.38	7.67	69.56	87.50

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Elbow	30.77	5.13	7.69	26.09	31.25
Hand/wrist	58.97	5.13	12.82	65.21	50.00
Upper back	30.77	2.56	7.69	39.13	18.75
Lower back	56.41	12.82	17.95	56.52	50.00
Hip/thighs	7.69	0	0	13.04	0.00
Knees	15.38	2.56	0	13.04	18.75
Feet	0	0	0	0	0

Discussion

The finding of this study should certainly underscore to the window cleaning industry the prevalence of musculoskeletal symptoms within window cleaning operatives and therefore that the likelihood of later developing musculoskeletal disorders is extremely high. It is staggering to note that 89.74% of respondents to the questionnaire had experienced some musculoskeletal symptoms during the past year and 30.77% had had their working lives affected by these symptoms during the same period. This prevalence rate is considerably higher than in the working population in general, which runs at 1.8% of those who've worked in the past 12 months (HSE, 2008), and is higher even against the skilled trades occupations, which includes comparative industries such as skilled agricultural and construction trades, where approximately 9% of those in those occupations self-reported musculoskeletal disorders. (HSE, 2008).

From the results of the questionnaire it is obvious that the main cause for concern is that these musculoskeletal symptoms will develop into upper limb disorders, primarily disorders of the neck, shoulder, wrist/hands and the lower back. As was mentioned earlier, there are many factors which can lead to the development of the type of symptoms experienced by the respondents of the study. The development of symptoms may be influenced by working practices, the organization of the work and the individual characteristics of those involved. Research suggests that personal factors such as age, hand dominance, height, weight and smoking do not have a direct function in the development of musculoskeletal symptoms. (Malchaire et al., 2001)

It seems likely that working postures and techniques contribute significantly to the development of musculoskeletal strain. For users of conventional window cleaning equipment, there is the need to grip an applicator or squeegee whilst at the same time as twisting the arm, wrist and shoulders. This is done repeatedly with high frequency, perhaps ten's of times a minute. As visual demand is high, and it is not always possible to keep the working area at shoulder or eye level, often the neck is twisted or extended to maintain a clear vision of the work. Very similar strains are required of the user of LPWC systems. The pole itself must be gripped firmly. Often this is wet and cold, and at present, no pole manufacturer designs a grip area onto their poles (this is most probably because users of the LPWC system use various parts of the lower section of the poles).

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Recommended Actions

Certainly the industry needs to seriously consider how to reduce the prevalence of musculoskeletal symptoms among window cleaning operatives, whether they are users of conventional or LPWC systems. Symptoms will often develop as a result of muscle fatigue from heavy or repetitive work. Therefore changes need to be considered to how work is carried out, and schedules are set. There is a need to consider job rotation, to allow rest between work periods, and to allow for frequent breaks from heavy and repetitive tasks during the working day. Managers and supervisors need to be aware of these risks when considering risk assessments for tasks and make sure suitable and sufficient controls are in place.

Part of the controls would be to make sure that staff are trained in the use of whatever tools they are being asked to use, to be made aware how forceful and repetitive postures and rapid hand movements can affect the body, and how to counter these problems.

Another area worthy of consideration is that of building design. Many incidences of musculoskeletal injuries can be attributed to slips, trips and falls (Hester, 2006). It is still the case that many designers, whilst endeavouring to increase building security, have put in many obstacles that can hinder window cleaning operatives, using either conventional or LPWC systems. Wide, thorny shrub borders and high walls and banks can be very difficult for window cleaners to negotiate, especially if they are concentrating on moving ladders or poles, which demand that vision is focused upwards.

Specifically looking at the design of poles and their use, the observational study highlighted that both the use of harnesses and grip surfaces could reduce the risk to operators. LPWC system manufacturers should consider these and similar methods of controlling the risk of developing musculoskeletal symptoms.

Conclusion

For many years the window cleaning industry has been aware of the safety implications of its activities. Window cleaning scrapers have been designed to make them safer to use and to change blades; special signs have been designed to warn of slip and trip hazards; and of course the hazards of working at height have been addressed by the introduction of LPWC systems. However, sometimes the **health** aspects of health and safety have been neglected. It has not been made clear from this research that the move to LPWC systems has actually increased the likelihood of operators developing musculoskeletal disorders, but what has been made clear is that the prevalence of these conditions among window cleaners is unacceptable, and the industry must take steps to reduce them as soon as possible.