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Upper Extremity Musculoskeletal Disorders
(UEMSDs)

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Ergonomics, Accessible Technology and Upper Extremity Musculoskeletal Disorders (UEMSDs)

Upper Extremity Musculoskeletal Disorders (UEMSDs) often accompany office work and are part of the U.S. Occupational Illness and Injury landscape in general - and the call center environment in specific. Despite many theories as to what is actually causing the problem most agree that, at least for the foreseeable future, UEMSDs are going to be a continuing question for which we must develop answers. This is particularly true of the call center environment. As will be demonstrated, it would appear that ergonomics interventions, including the access to accessible (accommodating) technology, can have a significant impact on this industry. These effects of course, are as a result in part, from lowering the aches, pains, and functional limitations of the workers. This then should translate specifically into financial impacts such as lower worker's compensation costs. It appears, however, that there are also gains to be made in the areas of increased productivity of the call center employee, lowered absenteeism, lowering the turnover rates, and even improved customer satisfaction.

An Approach Solution

Despite the gaps in hard, quality data, it is becoming an almost universally accepted construct that in order to affect the best results in combating UEMSDs, a proactive, multifactorial approach must be employed. Accordingly, it is reasonable to offer that if a call center is going to be effective in its ergonomics efforts, it will need to be proactive, *and* multifactorial in their approach. By being both proactive *and* multifactorial, (in reality, not just in Policy and Procedure), a call center should excel in moving to the "next level" in addressing UEMSDs. In

order to address this need, the question for the ergonomics practitioner then is twofold:

1. What are the causes and/or contributors to the problem?
2. What tools should be employed to combat the problem areas?

For the purposes of this paper, while it oversimplifies the issue greatly, we will focus exclusively on two categories of risk factors for developing ergonomic related injury and discomfort - the biomechanical and the psychosocial.

Biomechanical Risk Factors

The biomechanical risk factors would be those that present physical, observable and/or measurable stressors on the actual structures of the musculoskeletal system. Some generally accepted biomechanical risk factors that might be present in the call center environment include:

- Awkward postures related to phone use, workstation configuration, paper/workflow requirements, inadequate furniture adjustability, etc.
- Excessive Force/Repetition from high volume typing/mousing tasks, improper typing technique (hitting keys with excessive force), extended static contractions associated with repetitive and/or detailed computer work, head turns to view/transpose documents, etc.
- Visual Issues such as glare, inappropriate monitor distances and/or heights, low brightness and/or contrast on the monitor screen, screen oscillation, extended gaze at screen, etc.
- Individual Workstyle- Issues such as how hard the employee strikes the keys, how tightly they grip their mouse, touch typist vs. inexperienced, etc. are all examples of individual workstyle, that appear to have significant effects on risk for injury.

In addition to the standard and respected array of biomechanical training and awareness tools offered to employees, employers considering accessibility solutions can successfully influence these risk factors. While accessibility will vary from person to person, access to basic and often-available technology accommodations can improve the usability of any particular workstation. Technology enhancements such as;

- Providing an easy means of changing font size and color,
- Allowing for the altering of mouse and cursor size (and sensitivity),
- Providing training and access to system macros or other available software enhancements, and
- Providing a system of access to assistive technology products that support the IT and business requirements.

Psychosocial Factors

The second category, psychosocial factors, refers to specific factors in the work environment that are cultural, organizational or social in nature, and involves how the individual responds to those factors, given the idiosyncratic elements of their personal psychology. While the actual mechanisms, and connection between psychosocial stressors and UEMSDs are not clearly understood, there is growing consensus in the ergonomics research community that these factors seem to have a significant role in the symptoms reported by office workers in general, and call center workers in specific. Some Psycho-Social Stressors that have specifically been associated with call centers include:

- Increased job monotony, repetition and resultant boredom.
- High production standards eliciting increased need for job vigilance.
- Increased job regimentation and/or work pace.
- Low control over job factors such as processes, schedules and/or production requirements, etc.
- Little identification/connection with the end-result of the employee's contribution.
- Decreased job autonomy.
- Lowered job security and/or career development.
- Isolation and/or alienation for co-workers.^{1,2,3}

While it is oversimplifying the issue, it can be said that regardless of the actual combination of physiological and/or psychosocial factors that come together to elicit discomfort, the net result is employee discomfort. People in pain that they perceive to be caused by work cause will engage in some form of avoidance of the workplace.⁴ This "avoidance" can take a number of different forms, from lowering production while on the job, to taking occasional days off sporadically and without pattern, to full-blown worker's compensation cases of varying lengths of time, to employees simply finding other less painful employment. This scenario quickly creates a compelling argument for the use of a well-designed, genuinely multifactorial ergonomics program to combat these risk factors. By implementing a good ergonomics and accessible technology program, a call center will obviously address the biomechanical issues prevalent in their environment but will also more than likely alleviate some of the seemingly

¹ NORMAN, K., TOOMINGAS, A., NILSSON, T., HAGBERG, M., WIGAEUS TORNQVIST, E., *Demands on the Human in a Complex Working Environment - Psychosocial Conditions at One Call Centre in Sweden*, Humans in a Complex Environment: Proceedings of the 34th Congress of the Nordic Ergonomics Society, Kolmarden, Sweden, 1-3 October 2002, Edited by D. Caldenfors, J. Eklund and L. Kiviloog. Division of Industrial Ergonomics, Linköping University, Linköping, Sweden, Volume II, 2002

² ISIC, A., DORMANN, C., ZAPF, D., *Stressors and Resources of Call Centre Jobs* Zeitschrift für Arbeitswissenschaft, 1999 Volume: 53 Issue: 3 Pages: 202-208

³ FERREIRA, M., SALDIVA, P.H.N., *Computer-Telephone Interactive Tasks: Predictors of Musculoskeletal Disorders According to Work Analysis and Workers' Perception*, Applied Ergonomics, 2002 Volume: 33 Issue: 2 Pages: 147-153

⁴ Due to the fact that the state of the science in ergonomics is not complete enough to specify hard cause/effect relationships, nor specific dose-response information for risk factors for developing MSDs, the word "causes" is used in this paper to denote the phrase "causes and/or contributes to". In essence-The actual cause(s) cannot be elucidated and isolated, and thus the term is not technically accurate *per se*. It is used euphemistically for a group of factors coming together to elicit a given anomaly.

ancillary psychosocial issues that can exacerbate the overall problem(s) leading to absenteeism and turnover issues.

In the call center, the “bad news” is that most of the risk factors are generally present, and not all of them are easily dealt with due to the nature of the work.⁵ The list of psychosocial variables above outlines a few good examples. In the biomechanical realm, the repetition involved is another. For example, the actual number of keystrokes, and/or mousing movements are dictated by the volume of customer calls at any given time. While this number can be managed through the use of productivity leveraging accessible technology solutions such as macro keypads, abbreviation expansion software, self-adjudicating program applets, etc., the net result will still be a work load that varies with business and staffing demands. Additionally, the customer relations aspect of the job, combined with the volume-driven workload, contributes to increased stress.

There is some research that would suggest that this compilation of risk factors appears to in fact have significant effects that are specific to the call center worker. Toomingas, et al looked at the musculoskeletal health status of 57 operators at one call center in northern Sweden for 10 months, and compared it to a reference group of 1226 professional computer users in other occupations. While the call center operators were much younger than the reference group, 86% of female and 68% of the male call center operators reported symptoms, compared to 72% and 50%, respectively, in the reference group. The neck and shoulder regions were most frequently affected.⁶ In another report, Ho et al indicate that in their call center study group the “...incidence of workers' compensation claims between 1 July 1997 and 28 February 1999 were 171 per 1000 employees while the regional average was 101.”⁷

The “good news” is that there can be a plan to work through these issues.

Successful Program Elements

The US Occupational Safety and Health Administration (OSHA) has outlined what they consider to be crucial parts of any good safety program, and specifically, part of any good ergonomics program. Among these are:

1. Management Leadership
2. Employee Participation
3. Job Hazard Analysis and Control

⁵ MENZLER-TROTT, E., *Ergonomics Problems in Call Centres*, Computer Fachwissen für Betriebs- und Personalrate, 1998 Volume: 7 Issue: 12 Pages: 10-16

⁶ TOOMINGAS, A., NILSSON, T., HAGBERG, M., NORMAN, K., TORNQVIST, E.W., *Symptoms and Clinical Findings from the Musculoskeletal System among Operators at a Call Center in Sweden - a 10 Month Follow-up Study*, WWDU 2002 - World Wide Work. Proceedings of the 6th International Scientific Conference on Work with Display Units, Edited by H. Luczak, A.E. Cakir and G. Cakir. ERGONOMIC Institut für Arbeits- und Sozialforschung, Forschungsgesellschaft mbH, Berlin., 2002

⁷ HO, W., MARSHALL, E., CROSBIE, J., *The Extent of Keying, Mouse Use and Writing by Customer Service Officers in One Call Centre*, Ergonomics for Life: At Work, Home and Leisure. Proceedings of the 36th Annual Conference of the Ergonomics Society of Australia, Adelaide, South Australia, 8-11 October 2000, Edited by V. Blewett. Ergonomics Society of Australia, Downer, ACT, Australia

4. Reporting of Injuries/Medical Management
5. Training
6. Proper Recordkeeping/Regular Evaluation of the Program Citation⁸

The reason for this is not that OSHA has come up some sort of Magical Formula, but rather, it simply outlines all of the components that have brought about changes in the most successful ergonomics programs.

As previously mentioned, there are a few generally accepted biomechanical risk factors for developing an ergonomic injury. The usual list of factors include posture, force, repetition and no rest as being items contributing to MSDs. To the extent that a majority of practitioners exclude an accessible technology review, many safety and production enhancement opportunities are never fully realized. Even if all of these issues are addressed at a particular worksite, only one part of the multifactorial issue is being dealt with.

The Role of Accessible Technology

As a rule, most ergonomics professionals would agree that this general approach will bring about the largest, and most sustainable decreases in ergonomic illness and injury. Current innovation that includes using the non-traditional accessible technology solutions described as part of the program steps detailed is allowing for a direct return on investment (ROI) analysis of hardware and training acquisitions. The nature of engineering and IT solutions that boost productivity while minimizing call center workload (keystroking and mousing burden) allows for a measured and conclusive ROI response while addressing the broader issues of UEMSD's.

The Relationship Between Psychosocial And Biomechanical

When one looks at each of the psychosocial stressors associated with the call center environment as cited above, one of two threads seem to permeate most of them in one form or another. The first is the employee perception that their employer is indifferent to their concerns. The common refrain is that "the company doesn't care." The second is that the employee's sense of personhood and/or value to the company is perceived to be less than what they think it should be. Anecdotally, the ergonomist that does any work in a call center can attest that these are common, well entrenched perceptions. This perception surfaces for a number of reasons, and it is not the purpose of this paper to either confirm or deny the reality of the perception; nor is it the purpose of this paper to make a judgment as to whether this should be the case. It is fair to say, however, that this is in fact part of the psychosocial equation in the call center environment as shown by both

⁸ OSHA Standard 1910.900 - Ergonomics Standard Regulatory Text, Final Ergonomics Program Standard, www.osha.gov, November 2000

anecdotal evidence, and again, the growing consensus in the ergonomic research community.

The fact is, that the actual connections between psychosocial and biomechanical mechanisms and UEMSDs have yet to be made in the research, but assuming that these hard connections are eventually established as fact, there is a second area that may prove to be even more conflicting - What does a company or supervisor do about them? Historically the components as outlined by OSHA and other programs have had their context set around musculoskeletal biomechanics. Conventional wisdom held that these programs worked specifically because they facilitated the lowering of biomechanical risk factors-*ie.*, forces, repetitions and awkward postures. More recently, however, the question has been raised- "Are the improvements in injury rates due to lowering biomechanical stressors, or is it possible that something else is helping to lower the symptoms reported?" This question is highlighted and explored by some work done by Michael Feuerstein. In his study/paper, "Predicting Clinical Outcomes and Lost Time from Work in Occupational Upper Extremity Disorders", Dr. Feuerstein developed a screening tool designed to examine which individuals might be more likely to experience prolonged recovery. One of his findings was that some of the major predictors for longer-term disabilities were in fact psychosocial factors.⁹ Stated another way, psychosocial factors played a significant role in the length of time of disability for MSD cases in his study.

This type of research applies to call centers in a very poignant way. Rightly or wrongly, call centers have been referred to as the "modern sweat shop". Again- Rightly or wrongly - the employee's perception of management indifference, lack of job control, and the like is extremely common. Reports of musculoskeletal injury and discomfort are also very common in the call center environment. Employee absenteeism, and specifically employee turnover, as is the focus of this paper, is high. By employing the first four components of a program - Management Leadership, Employee Participation, and Job Hazard Analysis & Control (inclusive of accessible technology solutions), there is a very strong tide against MSDs that forms. It is proposed that the benefits may not be realized entirely because of alleviating biomechanical risk factors, but rather also through psychosocial benefits as well. It is also proposed that these benefits can have an oblique effect on other issues such as absenteeism and high employee turnover.

Ultimately, because of the infancy of the research in this area, there is no way to discern which variables are affecting a given outcome. Despite this, it would be a valid statement that if the incidence, and/or severity of musculoskeletal discomforts are reduced, then the program was in fact a success as it genuinely brought added value to company's bottom line.

⁹ Feuerstein, M., Huang, G.D., Haufler, A.J., and Miller, J.K. *Development of a Screen for Predicting Clinical Outcomes in Patients with Work-Related Upper Extremity Disorders*. Journal of Occupational and Environmental Medicine, Volume 42, Number 7, July 2000

Summary

In summary, the disorders associated with ergonomics continue to be a part of the occupational illness and injury landscape in the U.S. and abroad. As the call center industry grows, the ergonomic risk factors specific to that industry will also tend to grow. By abating these risk factors through person specific biomechanical intervention, appropriate use of individual and system wide accessible technology components, and addressing psychosocial concerns, the industry and its employees will benefit greatly by lowering injury, and increasing productivity in a manner that has direct and measurable ROI benefits.



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