An Atlas Ergonomics White Paper

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Office Ergonomics Trends Part III: Relationship between Attitudes, Knowledge and Discomfort

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INTRODUCTION

This is the final paper of a three part series investigating the relationship between the level of discomfort noted by office employees and the factors that may influence this discomfort. This paper focuses on one final, critical piece of the puzzle when it comes to the implementation of a successful office ergonomics program – the attitudes and knowledge of the employees.

When considering the core elements of an office ergonomics program the most common solutions that you will see companies focus on include products (i.e. furniture, accessories), stretching and breaks, and employee awareness training. As in most ergonomics processes the emphasis for a solution in the office environment is placed on engineering controls, which usually results in purchasing products. The factor that is usually emphasized the least is training employees to understand the use and reason for the solution to ensure effective implementation over a long period of time.

In a previous white paper produced by Atlas (*Product Knowledge and the Effect on Reducing Office Employee Discomfort*) a case study was discussed regarding companies that have implemented an ergonomics process that incorporated both engineering controls and extensive employee training. The results of this case study provided a compelling argument that product knowledge has a clear influence on the discomfort of employees in the office environment. Figure 1 illustrates the results from this case that demonstrate the effect of increasing the knowledge of the employees on discomfort.

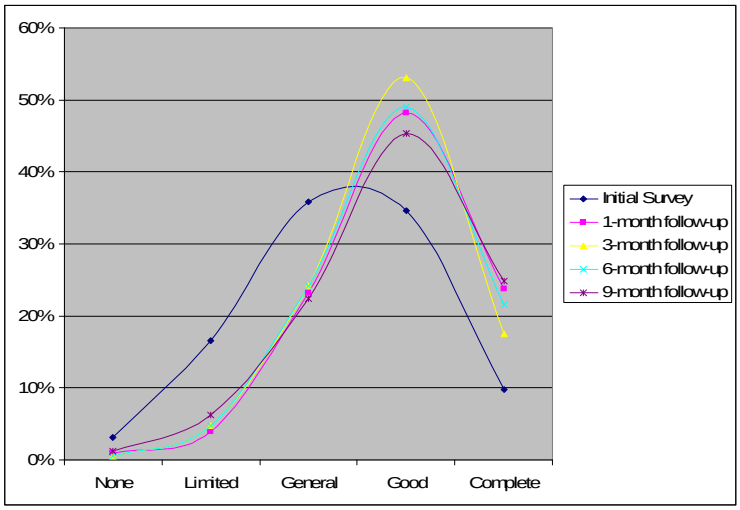

Figure 1: Impact of Training on Employee Discomfort

For the office environment, many studies have clearly shown that ergonomics awareness training has a positive effect on employee discomfort (Brisson et al, 1999; Robertson and O'Neill, 2003; Green and Briggs, 1989). Critical components of the improvements seen in the office environment due to training are changes in the behaviors of the employees and increases in their knowledge of how to properly use ergonomic products (Rizzo et al, 1997; Harrington and Walker, 2004). The results from the second paper in this series from Atlas (*Office Ergonomics Trends Part II: Relationship between Products and Discomfort*) illustrated that products can have a significant and positive impact on discomfort, but in some cases the ability to achieve this benefit is directly linked to the proper use of the product.

Given the impact that products can have on discomfort and the link that research has shown between knowledge and discomfort, an important question we need to ask is whether the general working population has the knowledge to use the solutions that are available? Further, if a person does not have sufficient knowledge of the value of the solutions provided to them, does this affect the attitude they have towards the solution and therefore their effective use of this solution? The data presented in this study provides insight into how both attitudes and knowledge are affecting the comfort of employees on a day-to-day basis.

The format of the paper is similar to the first two papers in this series, but differs in one way. In the previous papers a group of health and safety professionals were polled to determine their opinions regarding the relationships reviewed. In this paper, a question on knowledge was provided to the group but the topic of attitudes was not. The core design of this paper remains similar to the previous in this series by reviewing three questions regarding the relationship between attitudes, knowledge, and discomfort:

1. What is the expected relationship?
2. What is the actual relationship?
3. How does this impact the approach to office ergonomics?

By reviewing the data, understanding the trends, and determining the best way to develop an approach to address these trends, the objective is to help a person in charge of an office ergonomics process be better prepared to:

1. Prioritize efforts to meet the needs of high risk employees;
2. Ensure that employees have the knowledge and correct attitude to participate effectively in an ergonomics program; and
3. Justify recommendations to improve an ergonomics program with the data provided.

DATA COLLECTION

Expected Relationship

To help define the expected relationship between various factors and discomfort, Atlas distributed a survey to approximately 80 safety, health, and ergonomics professionals to determine their opinions on some office ergonomics risk scenarios that are dealt with on a day-to-day basis. The group was polled on 10 basic questions ranging from physical characteristics to product features to knowledge. A single question was posed to the group focusing on the impact of knowledge:

Does knowledge of ergonomics have an impact on work-related discomfort?

Actual Relationship

Data collection was completed using Atlas Ergonomics' web-based office ergonomics assessment software. Atlas uses an online survey to supplement an onsite assessment by gathering data related to employee risk as one of the first steps in its office ergonomics process. This survey addresses both workplace conditions and employee discomfort in an attempt to gather data relevant to ergonomic risk in the office environment. Each question within the survey was designed to assess different elements of office ergonomic risk, and has been chosen based on current research and standards.

Prior to assessing work-related and discomfort factors, an employee is asked to provide basic information to assist in classifying their demographics, and to provide guidance for the selection of appropriate solutions. Figure 2 provides an example of one of the demographic survey pages, where information such as gender, age, height, and weight are collected.

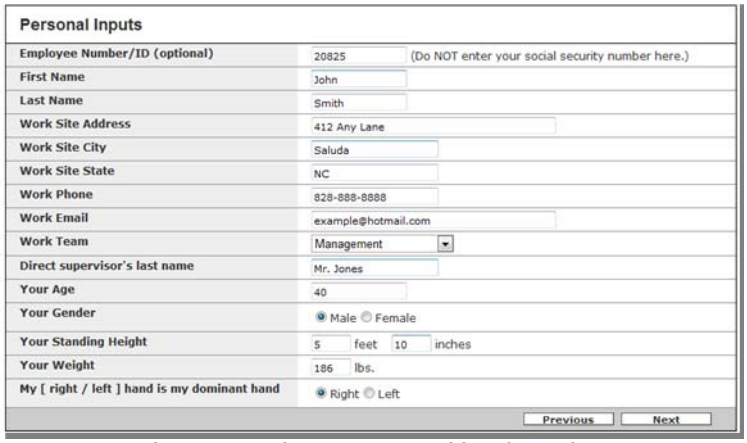

Figure 2: Employee Demographic Information

Figure 3 provides examples of the discomfort-related questions that an employee will fill out during the next part of the survey. Discomfort is assessed using a health index which is a combination of frequency and severity of symptoms on a 5-point scale using 2 decimal points of accuracy. The multiplicative value of these discomfort variables (F x S) is rated as low, moderate, high, and extreme.

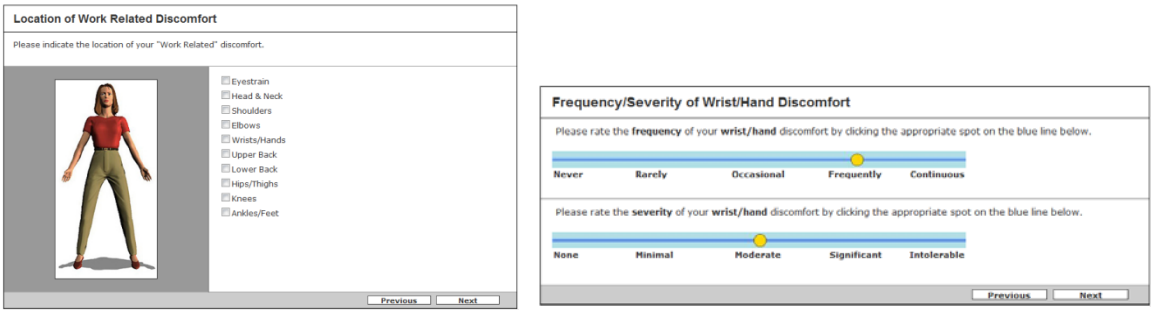

Figure 3: Location, Frequency, and Severity of Discomfort

Figure 4 provides an example of the questions within the survey that focus on equipment/furniture availability and set-up. Ergonomics risk is assessed by comparing questions related to personal and task variables (e.g. height, weight, hours of work, etc.) to an audit of the products that are present in the office and their features. Using a logic table, any gaps in product availability and design are identified. Depending on the size of the gap and the exposure level of the employee, a risk level of low, moderate, or high is assigned.

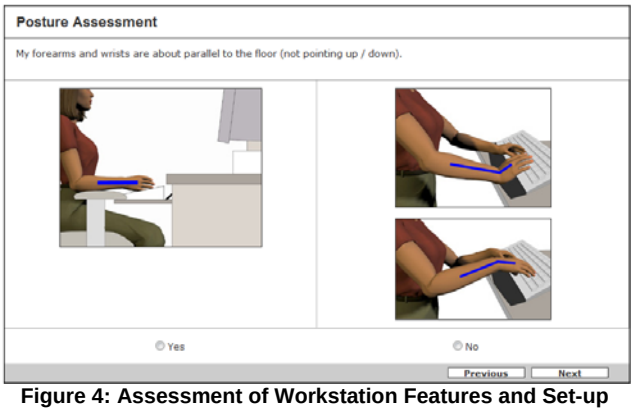

Figure 4: Assessment of Workstation Features and Set-up

Once the data has been submitted by the employee it is available to an analyst in checklist format. Additionally, raw data can be downloaded into an MS Excel spreadsheet for analysis and review.

DEFINITIONS

In order to compare discomfort to independent variables it was necessary to process the discomfort data and present it in formats that aided in viewing the potential relationships. Four key measures of discomfort were used to illustrate the interaction between demographics and discomfort:

Discomfort Prevalence:	At the time of the survey an employee is asked whether they are experiencing discomfort related to work activities. This Yes/No question provides a measure of the percentage of employees that are experiencing discomfort at the time of the survey.
Raw Discomfort Scores:	The frequency and severity scores are measured on a 5-point scale. The answers provided by the employee are multiplied together to provide a score termed the health index. This raw score provides a measure of the discomfort for a single body part.
Total Discomfort:	Adding all health indices for a single employee (i.e. scores for all body parts) provides a measure of the total discomfort for the employee.
Average Total Discomfort:	For comparing differences between groups, an average of the total discomfort scores across all employees in the group is calculated. For example, the average total discomfort for employees who are <5'1" is 33.01.

In addition to these measures of discomfort, the data within this paper has been formatted to provide the most effective means of conveying a message. Additional descriptions of the methods used to create the graphs and format the data will be described as necessary.

PARTICIPANTS

This study included a population of 2441 employees who had participated in the Atlas process. These employees were pooled from fourteen companies that were assessed over a 4-year period. These companies were from relatively diverse sectors including petroleum, call center, pharmaceutical, hospital, and insurance agencies. The type of work performed within these 14 companies is well-distributed; the largest portion of the population (45.6%) performed customer service related activities (see Figure 4).

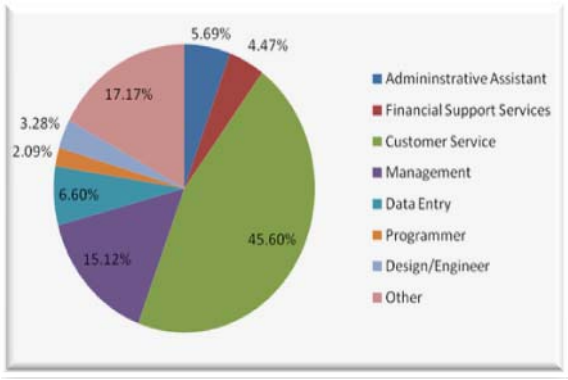

Figure 5: Work Category Distribution

The average age of the employees was 38 with a standard deviation of 11; the population had relatively equal representation of all age groups from 20-55 years old, with lesser representation in groups >55 years (see Figure 5). The distribution of gender was 30% male and 70% female.

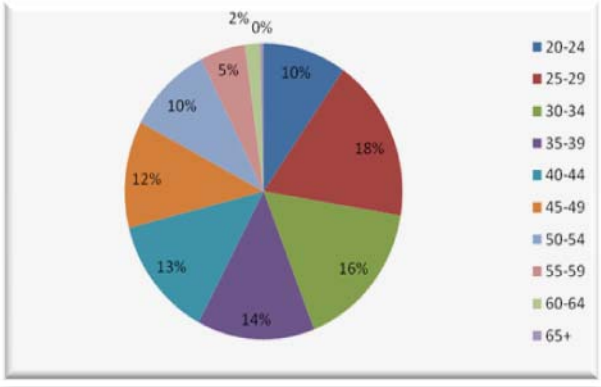

Figure 6: Population Age Distribution

Figure 6 presents the breakdown of the study population based on body mass index or BMI; this data falls directly in line with the information collected by the Center for Disease Control on distribution of the population by weight classifications. This agreement in data indicates that the study population is a representative sample of the workforce with respect to weight.

Figure 7: Distribution of Population by BMI

ATTITUDES AND KNOWLEDGE VS. DISCOMFORT

ATTITUDES

Expected Relationships

The importance of knowledge that an employee has of ergonomics and how to use their ergonomic equipment has been studied extensively in literature, but a secondary aspect of the employee's mind that is seldom studied is attitudes. From a practitioner's perspective, frustration develops when training and re-training is provided to an employee on how to use the solutions that are presented to them, only to find the person neglecting to follow the training because the importance of the information was deemed minor. If an employee does not consider ergonomics to be important and capable of addressing their needs, then how can the process work or have an impact?

As noted in the data collection section, the group of health and safety professionals was not polled on the subject of attitudes. Instead, the expected outcome for this section can be stated as a hypothesis based on the general perception of attitudes and behaviors – employees who feel that ergonomics is unimportant will not benefit from the solutions provided to them, and will therefore experience a higher level of discomfort.

Actual Relationship

In the Atlas Ergonomics survey provided to employees, the question that is posed to them relating to attitudes is "How important is the role of correctly fitting furniture?" The possible answers are *none*, *minor*, *moderate*, *significant*, and *critical*. Figure 8 illustrates that 74% of the population felt that correctly fitting furniture was either significant or critical.

Figure 9 illustrates that the actual relationship between attitudes and discomfort is an inverse one where the lowest prevalence of discomfort is experienced by the group noting that correctly fitted furniture is not important. The remaining opinion levels showed a steady prevalence between 65-72%.

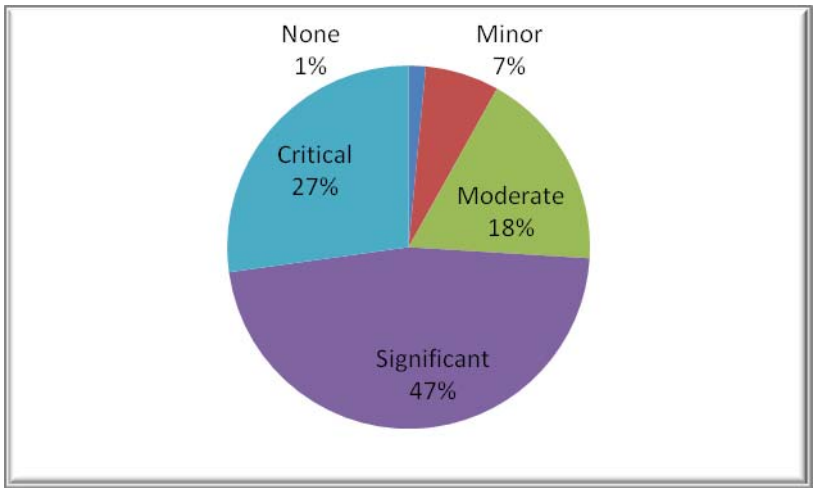

Figure 8: Population Opinion of Role of Properly Adjusted Furniture

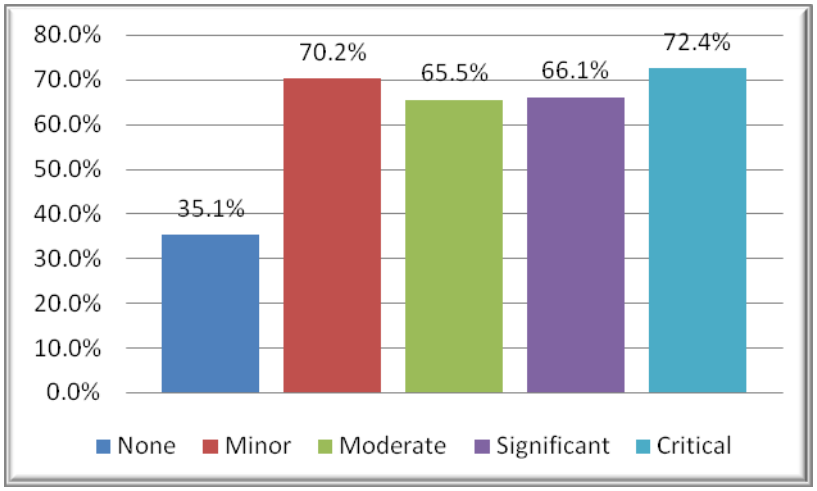

Figure 9: Prevalence of Discomfort vs. Attitude

Figure 10 provides further detail of the relationship between attitudes and discomfort by presenting the trends noted for the severity of discomfort (average total discomfort). In the figure, the "none" category is used as the baseline measure and all other categories are compared against it. The data further demonstrates the trend shown in prevalence by illustrating that employees who consider ergonomics furniture to be *significant* or *critical* have the highest level of discomfort. It must be noted that the drastic difference in the numbers from *none* to the other categories may be affected by the fact that this category only had 25 out of the 2441 employees who participated in the study. The small number of employees in this category appears to have little discomfort and consider ergonomics to be of little value to them. By removing the *none* category it is still interesting to observe the remaining trend in the data. The increase in

discomfort noted in the *significant* and *critical* versus the *moderate* and *minor* categories illustrate a significant outcome.

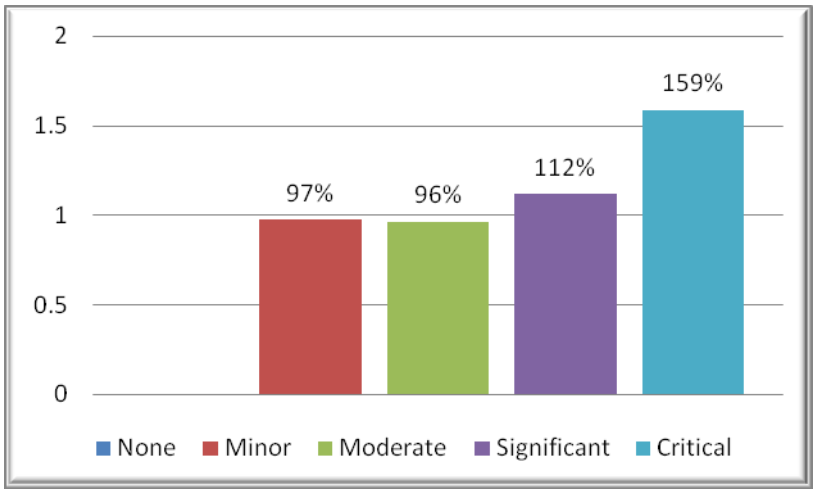

Figure 10: Average Total Discomfort vs. Attitude

The trend in average total discomfort is corroborated by the trend in average discomfort values for some of the commonly affected body parts (i.e. head/neck, wrists/hands, and low back). Figure 11 shows that there is a steady increase in discomfort from *none* through *critical* for all of these body parts.

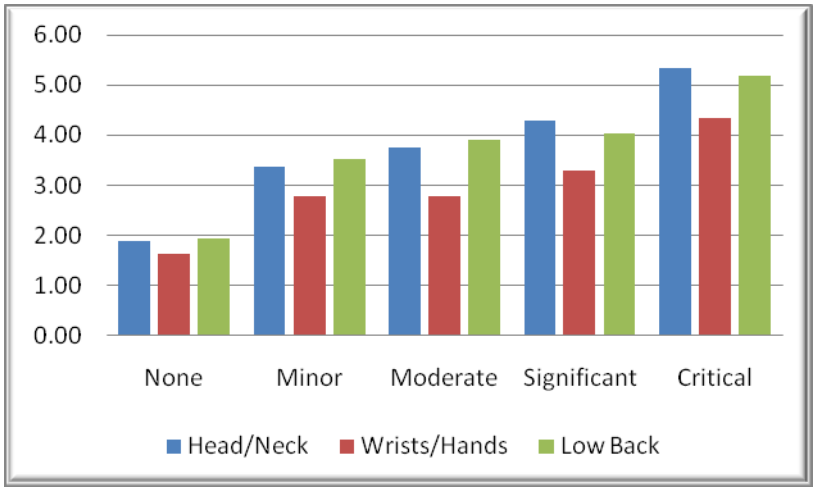

Figure 11: Body Part Discomfort Scores vs. Attitude

The consistency of the trends illustrated in both prevalence and severity data presents a very useful fact – employees who are experiencing the highest level of discomfort appear to be acknowledging the importance of ergonomics in their workplace and are ready to accept products and training to address their needs.

In the first paper in this series that focused on employee demographics versus discomfort, the results provided insight into what types of individuals were experiencing more or less discomfort. Combining the results from the first paper with the data on attitudes, it would be expected that the employees (demographic groups) with higher levels of discomfort would have a more positive attitude towards the value of ergonomics.

When looking at age as a demographic variable, the results of the first study found that younger employees had higher levels of discomfort and were exposed to higher levels of daily computing hours. When looking at attitudes broken down by age groups, an important trend noted is employees under 30 have lower representation in the significant and critical categories and higher representation in the lower categories (see Figure 12). For the critical category the difference between the under 30 and over 30 employees represents a 30% difference between the groups. In this situation we are likely seeing the "invincibility" factor, where younger employees do not believe they can get hurt, especially from exposure to office-based tasks.

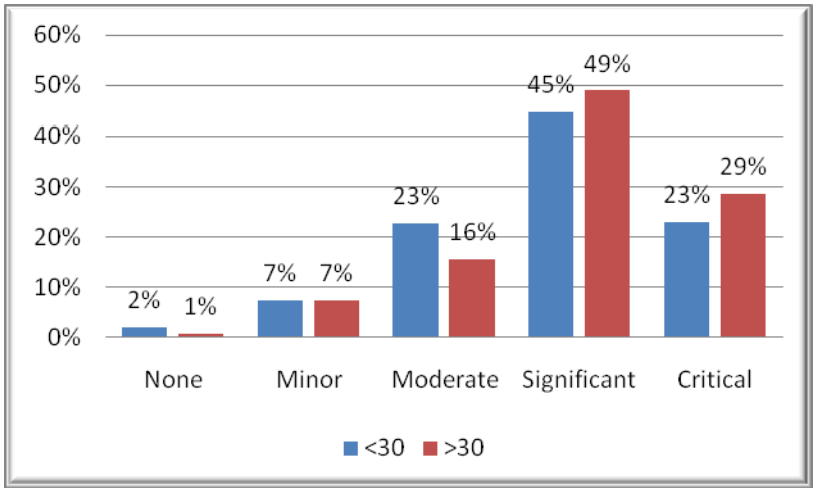

Figure 12: Age vs. Attitudes

For height and weight, the results of the first paper showed higher levels of discomfort for shorter employees and employees in higher classifications of obesity. When breaking down the attitudes data by height, an interesting trend is noted in the categories of *significant* and *critical*. As seen in Figure 13 the percentage of employees considering ergonomics to be significant increases with height, while the percentage falling into the critical category shoes a downward trend as height increases. This trend illustrates a shift in opinion towards critical for shorter employees, which falls directly in line with the trends in attitudes presented in this paper.

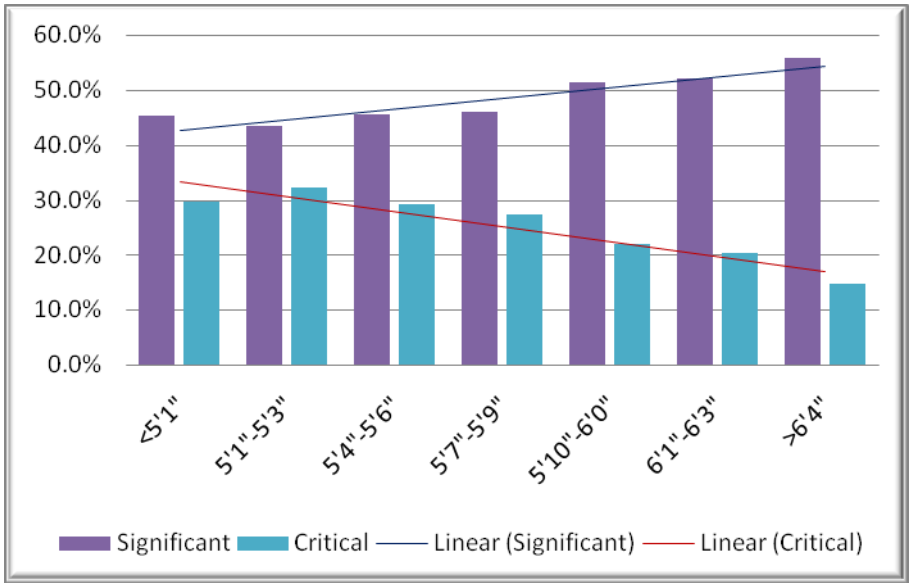

Figure 13: Height vs. Attitudes

With obesity, there was not a discernable trend in the data illustrating a consistently higher rating of importance by employees in the obese classifications. In fact, Obese II individuals had the lowest number of people rating the importance of properly fitting furniture as *critical* (36% lower than average). The challenge with this result is that Obese II employees had the highest discomfort scores for the majority of body parts. For the obese classifications a plausible reason for the lower attitudes ratings is that these employees are placing more emphasis on personal stressors versus workplace factors. Essentially, there is a lack of confidence that new furniture, products, or accessories will help reduce discomfort.

One final demographic variable that showed interesting trends with respect attitudes was work category. Work category divides employees into types of workload that result in differences in the duration of their exposure to computer work (i.e. hours per day) and the intensity of this work (i.e. percent of time on computer). When looking at work category, data entry, customer service, and administrative assistants had highest percentage of employees rating ergonomics furniture as *critical*; these work categories included the highest daily exposure hours to computing. Additional groups such as financial support services and design/engineers had the highest percentage of employees rating *significant*. These groups represent 4 out of the top 5 for exposure time and discomfort, with data entry being the one group that did not follow the trend. For the most part, the groups with the greatest need for ergonomics support appear to recognize its value.

Impact on Approach

In most cases, the employees who need assistance, whether this is measured by discomfort or exposure time, have the attitude that ergonomics will provide assistance. They see the role of properly fitting ergonomics furniture as either *significant* or *critical*. These results emphasize the value of a good prioritization process to get to the people who need help. If employees in need can be found and prioritized for ergonomics services, it is highly likely that these people will be willing and ready to accept help.

In cases where employees are not seeing the potential benefit of ergonomics (e.g. Obese II and younger employees), special considerations must be made to address these attitudes. Research has shown that ergonomics efforts can help these populations, but additional effort must be placed on "selling" the solutions in order to be successful.

KNOWLEDGE

Expected Relationship

Research into the impact of new ergonomics furniture has provided insight into the importance of training and knowledge. In a study by Green and Briggs (1989) it was noted that the availability of ergonomics furniture did not prevent the onset of discomfort. In fact, the study noted that those employees who were given new furniture without any training expressed a higher level of discomfort. Robertson and O'Neill (2003) provided excellent insight into this situation when they found that a test group that was given new equipment experienced a 27% reduction in employees experiencing symptoms, while a group that received training and new equipment experienced a 46% reduction. For the office environment, many studies have clearly shown that ergonomics awareness training has a positive effect on employee discomfort (Brisson et al, 1999; Robertson and O'Neill, 2003; Green and Briggs, 1989). Critical components of the improvements seen in the office environment due to training are changes in the behaviors of the employees and increases in their knowledge of how to properly use ergonomic products (Rizzo et al, 1997; Harrington and Walker, 2004).

In Atlas' earlier white paper on the impact of training and knowledge on discomfort (*Product Knowledge and the Effect on Reducing Office Employee Discomfort*) the results of the field study clearly illustrated the importance of training and its impact on employee discomfort. When the health and safety community was asked whether knowledge would have an effect on discomfort, 87% responded *yes*.

Actual Relationship

Employees were asked about the furniture and equipment in their office, and they are allowed to answer each question with one of three responses: yes, no, and I don't know. If an individual answers "I don't know", it means they are unsure whether they have that product or product feature in their office. Additional questions were asked about the employee's knowledge of how to use their equipment, and they were instructed to provide one of the same three responses. Figure 14 presents the results of questions that focused on the presence/absence of adjustable features on chairs. Employees answered "I Don't Know" regarding the features of their office chair between 23-39% of the time. Given the inherent value of these features (see *Office Ergonomics Trends Part II*), a potential impact on discomfort is possible as these employees cannot use features that they do not know exist.

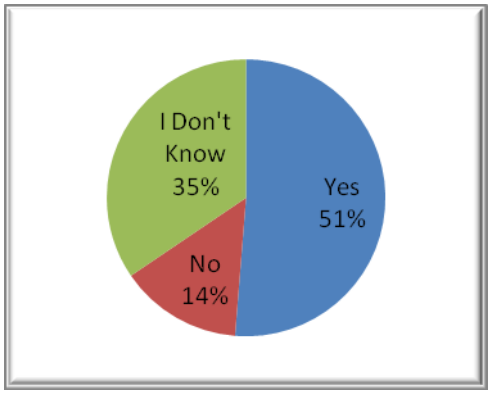

Figure 14-a: Knowledge of Lumbar Support

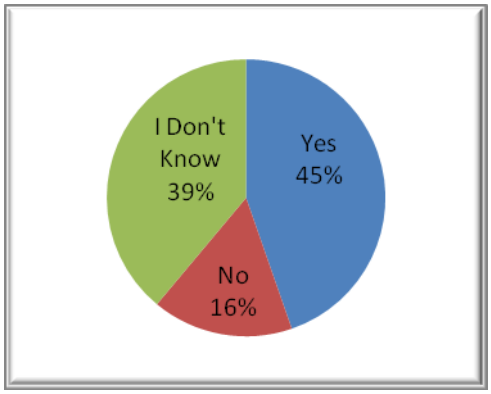

Figure 14-b: Knowledge of Seat Depth

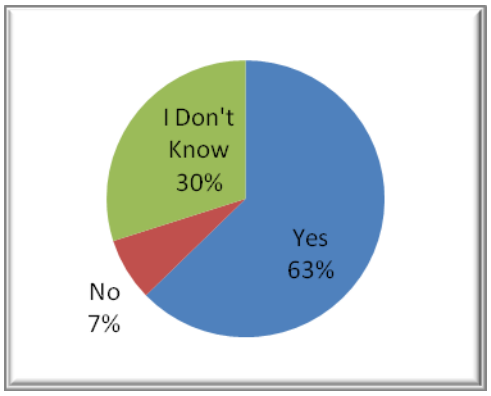

Figure 14-c: Knowledge of Tilt lock

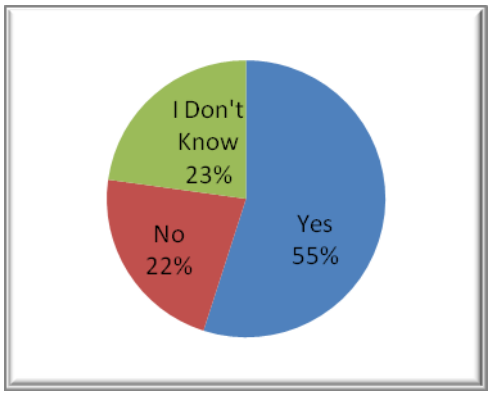

Figure 14-d: Knowledge of Armrest Width

Figure 15 illustrates that 47% of the population feels that they have good to complete knowledge of the ergonomics features in their office. Conversely, 17% of the population is on the opposite end of the scale with limited to no knowledge in this area. Figure 16 shows a very distinct downward trend in the prevalence of discomfort as the knowledge level of employees increased. The reduction in discomfort when an employee moves from *limited* to *good* or *complete* knowledge ranges from 24-53%. Each move up the ladder of the knowledge scale results in a reduction in discomfort:

Limited to General = 8% reduction
General to Good = 14% reduction
Good to Complete = 23% reduction

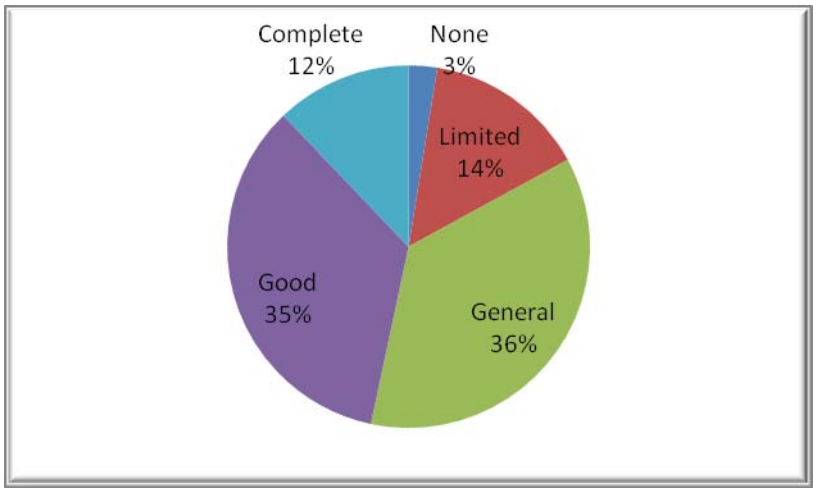

Figure 15: Population Knowledge of Ergonomics

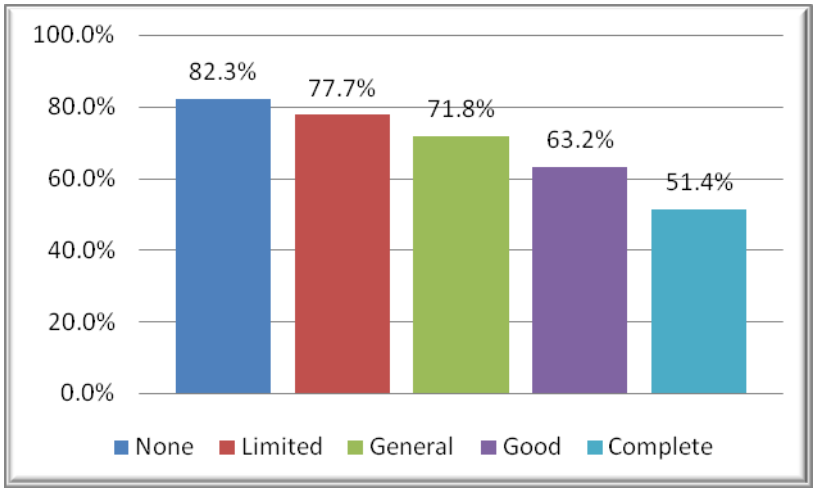

Figure 16: Prevalence of Discomfort vs. Knowledge

Figure 17 shows the trends in average total and average maximum discomfort, using complete knowledge as the baseline. Average and maximum discomfort values increase steadily and dramatically as knowledge of ergonomics decreases.

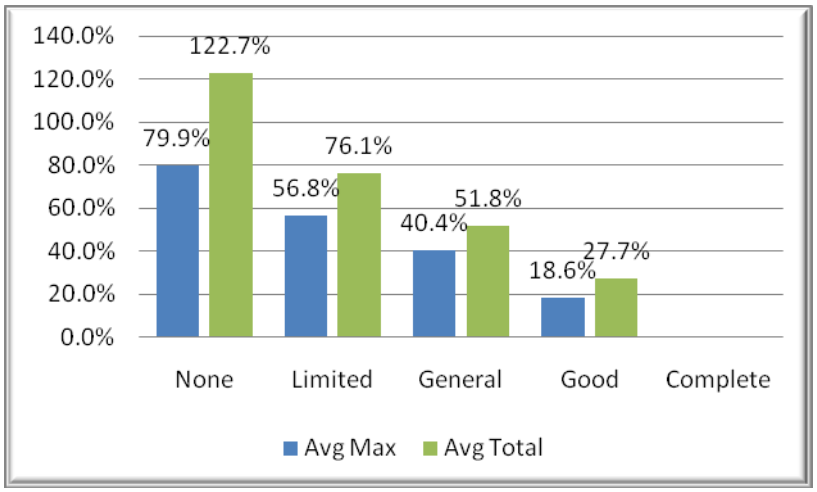

Figure 17: Average Discomfort vs. Knowledge

Figure 18 presents the data across all body parts, again using complete knowledge as the baseline. A consistent upward trend in discomfort is noted as knowledge level decreases. Of particular note is the fact that the shoulder, wrists/hands, upper back, and low back all have close to 100% increases in discomfort as knowledge level becomes limited.

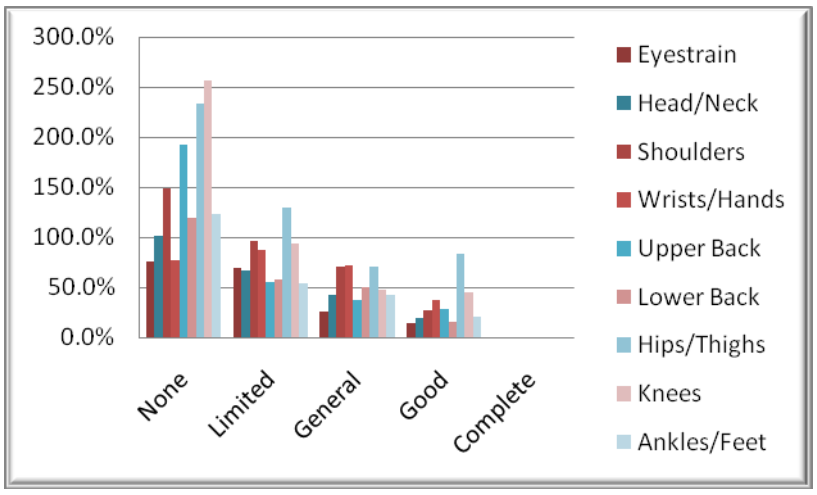

Figure 18: Body Part Discomfort vs. Knowledge

These results further validate the information presented in Atlas' earlier work focusing on knowledge and discomfort (*Product Knowledge and the Effect on Reducing Office Employee Discomfort*). In this earlier paper, the study group was primarily made up of call center workers; the study population for this paper included employees from all work categories, thereby illustrating that the impact of knowledge extends beyond call center environments. The additional focus provided in this paper highlighted a valuable element of knowledge within the workforce – increasing an employee's knowledge of ergonomics from *general* to *good* to *complete* can have a significant impact on discomfort (see Figures 16-18).

As with the final discussion in the section on attitudes, combining the results from the first paper in this series (on employee demographics) with the data on knowledge provides further insight into this issue. Based on the results presented, it would be expected that the individuals with higher levels of discomfort would have less knowledge regarding ergonomics and the features of their furniture and equipment.

Demographic variables such as height and weight should have a limited relationship with knowledge. A review of the data found, expectedly, that there were no significant trends with respect to height and knowledge. Conversely, an interesting outcome was present for weight where Obese II & III employees had lowest percentage of people in the good to complete categories (see Figure 19). For example, there was 70-130% fewer employees at the *complete* knowledge level from Obese II & III populations, respectively. In the majority of the cases with obese individuals, an assessment reveals that they do not have the correct chair, keyboard, or set-up to allow them to achieve a comfortable working posture. As noted in a previous paper by Atlas (*Addressing the Challenge of Obesity and Ergonomics in the Office Environment*), effective solutions are available to successfully meet the needs of this population. Educating these employees on available solutions, and how to use these solutions, is critical to reducing the discomfort in this high-risk group.

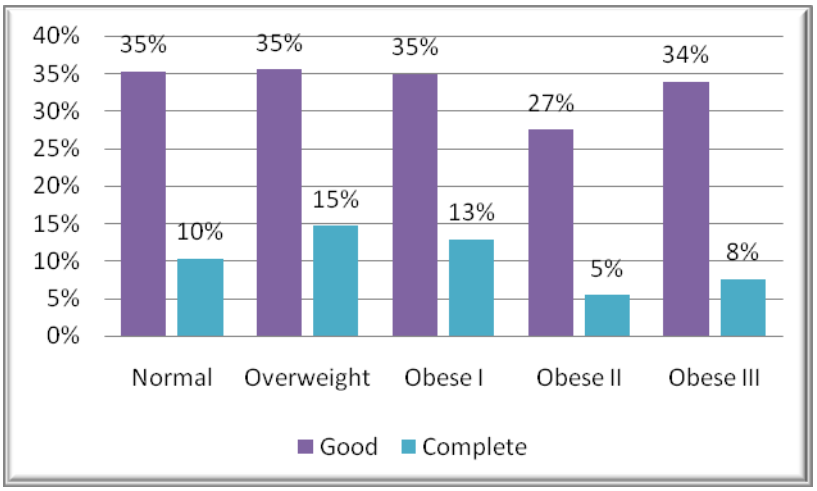

Figure 19: Good/Complete Knowledge vs. BMI

With work category the highest percentage of employees at the *complete* knowledge level was found in the administrative assistant and management categories (see Figure 20). From an ergonomics risk perspective the management group has a low level of need, but their high level of ergonomics knowledge provides a potential benefit for encouraging or accepting ergonomics training for the intensive users in the population. Within the intensive user groups, financial support, customer service, and design/engineer were solidly positioned with the *good* level of knowledge (>50% of group). Data entry was the weakest group among the intensive users with the highest percentage of employees with no knowledge of ergonomics (7% vs. average of 1%) and lowest *complete* knowledge (6% vs. average of 11%).

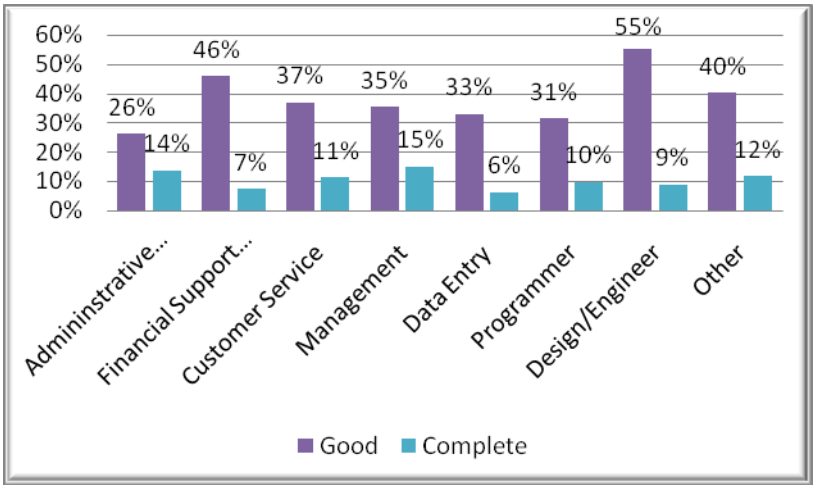

Figure 20: Good/Complete Knowledge vs. Work Category

Two of the demographic variables that would be expected to show trends with respect to knowledge are age and tenure. One would expect that time and increased exposure to ergonomics training and information would increase the base knowledge of the older or more experienced population. With age, no trend in the data is evident; unlike attitudes, there is no distinct difference between the under and over 30 age groups.

In general, no real trend in knowledge is seen with tenure as well. The one blip on the radar that was visible with tenure was a 45% increase in *complete* knowledge for employees with > 5 years experience. Other than this one noted improvement, extended periods of time with a company does not appear to increase an employee's knowledge of ergonomics.

Impact on Approach

The data from this study reinforces the value of knowledge and the need to develop and maintain an effective training program in order to drive down discomfort in the workplace. In addition to the overall result that indicates the value of knowledge, the impact (on discomfort) of continually achieving a higher level of knowledge is an important outcome. Employees who were older or with higher levels of tenure did not illustrate a higher level of knowledge; this illustrates a common weakness within ergonomics programs that promote a one-and-done approach to training. Faucett et al (2002) noted that training employees using a 1-time event does not produce sustainable results, which will obviously have a sustainable impact on discomfort in the workplace.

The trends in knowledge and the impact on discomfort would indicate the following measures should be considered for an ergonomics process:

1. Measurement of training outcomes is valuable to track knowledge levels and encourage employees to achieve higher levels of knowledge and increase self-sufficiency.

2. High-risk employee groups should be prioritized to ensure they have the knowledge to use the equipment that is provided to them.

3. Training should be provided early in the hiring process and subsequently reinforced and advanced to allow for constant improvement of employee knowledge levels.

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CONCLUSIONS

Research continually builds to prove that training and building knowledge about ergonomics is a critical piece of an office ergonomics program. The data collected by Atlas in the field reinforces this point and adds to this puzzle the consideration of attitudes. The connection between attitudes and knowledge results in two key pieces of information that we need to recognize:

1. The employees who need assistance, whether this is measured by discomfort or exposure time, have the attitude that ergonomics will provide assistance. They are aware that ergonomics can help and they are prepared to accept the assistance.

2. Employees with a higher level of knowledge about ergonomics and how to use the products and furniture that are given to them have the ability to make the adjustments needed to reduce the strain on their body and address discomfort when it starts. In order to achieve a level of awareness and self sufficiency, employees need to gain the correct knowledge and build on it over time.

Addressing both attitudes and knowledge can be summarized by one word – culture. A company that works towards building an ergonomics culture that emphasizes employee health and wellness will see the benefits that knowledge and a positive attitude can bring.

The three papers that Atlas has released in this series bring to light the issues of demographics, products, attitudes, and knowledge, and their impact on work-related discomfort in the office environment. The data and analysis provided in these papers provide the necessary information to help create effective processes, justify decisions and approaches, and guide the development of a comprehensive office ergonomics program. The questions that were raised or remained unanswered by the analyses will be addressed in future papers.

To assist in further synthesizing the information presented across these papers, Atlas will be releasing additional demographic and product specific white papers that will provide a guideline for implementing a state-of-the-science ergonomics program.

If there are any questions or comments related to this paper, they should be directed to info@atlasergo.com.

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