An Atlas Ergonomics White Paper

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# Office Ergonomics Trends Part I: Relationship between Employee Demographics and Discomfort

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How well do we understand the link between the person, the job, and the onset of discomfort? Objective data can be used to provide clarity.

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## INTRODUCTION

As part of the system that Atlas Ergonomics uses to perform an individual office ergonomics assessment, data is collected using an online survey to help identify concerns and guide the assessment process. This survey gathers information on employee demographics (i.e. height, weight, age, etc.), work-related discomfort, workstation setup, and their level of understanding of ergonomics and office furniture and products.

With this information it is possible to gain insight into the characteristics of people and products that can affect the levels of risk and discomfort. By looking for trends in the data it is possible to find relationships that can guide future decisions. For example, with information on height and discomfort a question can be posed as to whether there are specific height ranges where employees are experiencing higher or lower levels of discomfort. If a trend exists, then specific actions can be taken to ensure that the assessment process and solution options meet the needs of the population. The correlations and relationships between the data can provide answers to many questions.

The relationships that were reviewed during this project concentrated on trends in employee demographics, product factors, and general knowledge of ergonomics. The goal of the paper is to answer three questions when considering the relationship between each factor 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 that the information in this paper will 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 solutions are available for employees with special needs; and
3. Justify recommendations with the data provided.

The answers to these questions will be presented over the course of three individual papers that each focus on one of the key relationships in the data. This first paper in the series focuses on the interaction of employee demographics and discomfort.

## DATA COLLECTION

*Expected Relationship*

To help define the expected relationship between employee demographics 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. The questions that focused on employee demographics are presented in Table 1.

**Table 1: Office Ergonomics Survey of Occupational Health Professionals**

| **Survey Questions and Results** | |
|---|---|
| 1. | Do men experience higher levels of discomfort in the workplace? |
| 2. | As you get older, do you experience higher levels of work-related discomfort? |
| 3. | Is work category (job title) a reasonable method to distinguish risk in an office environment? |
| 4. | Is computing time (number of hours on computer per day) a good measure of risk? |
| 5. | Are tall people at a similar level of risk as short people (i.e. individuals at extreme ranges of height)? |

*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 1 provides an example of one of the demographic survey pages, where information such as gender, age, height, and weight are collected.

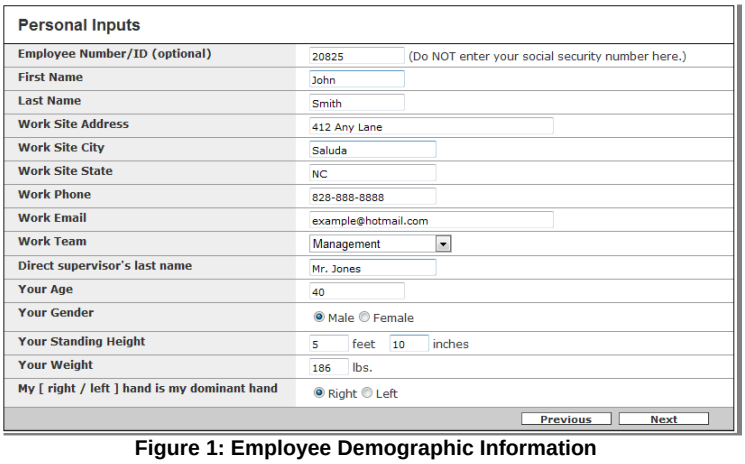



**Figure 1: Employee Demographic Information**

Figure 2 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.

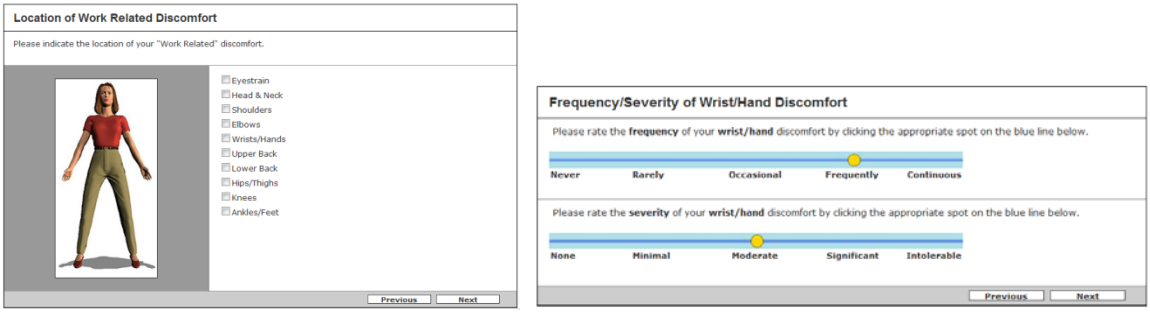



**Figure 2: Location, Frequency, and Severity of Discomfort**

Figure 3 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.

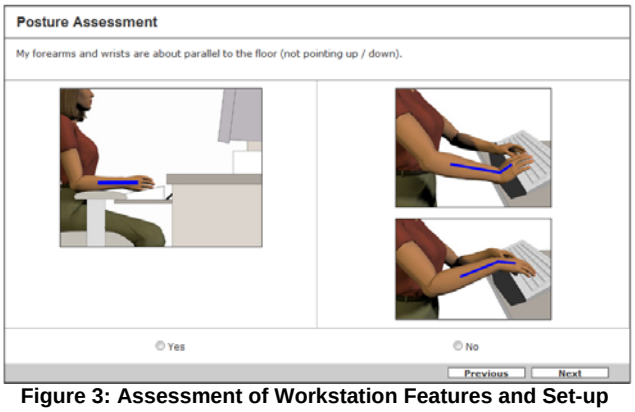



**Figure 3: Assessment of Workstation Features and Set-up**

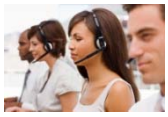
Once the data has been submitted by the employee it is available to an analyst in checklist format. Additionally, raw data can be downloaded into an MS Excel spreadsheet for analysis and review.

## DEFINITIONS

In order to compare discomfort to demographic 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).

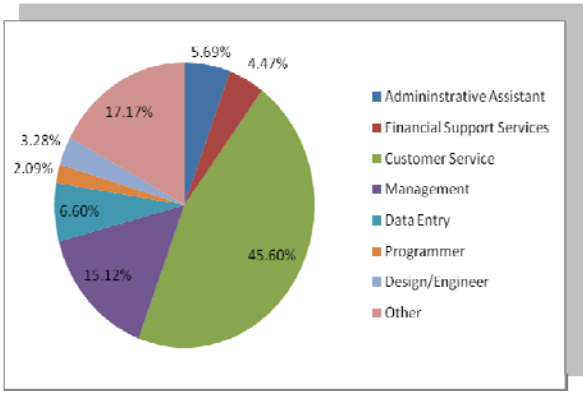



**Figure 4: Work Category Distribution**

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.

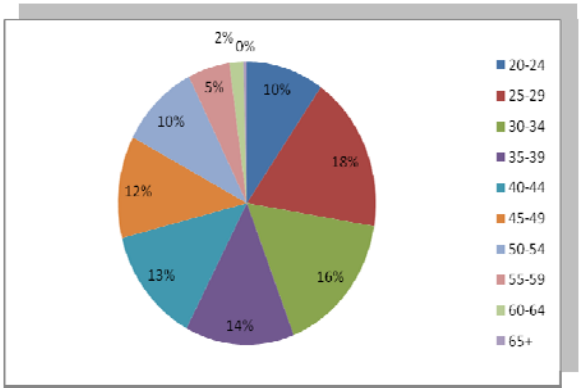



**Figure 5: Population Age Distribution**

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.

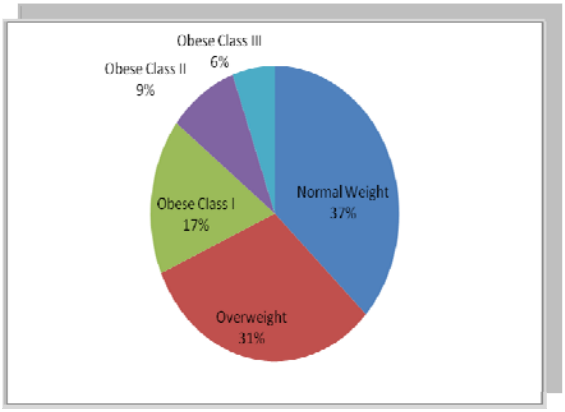



**Figure 6: Distribution of Population by BMI**

## DEMOGRAPHICS VS. DISCOMFORT

*Expected Relationships*

The results of the survey of professionals are presented in Table 2. This data provides the opinions or "hypotheses" that will be tested by the objective data reviewed in the remainder of this paper. If the data presented in this paper supports the opinions of the professionals, this provides a level of confidence that general beliefs about ergonomics concerns are in line with quantitative information. If data does not support the opinions of the professional community, then a shift in mindset may be needed.

**Table 2: Results of Office Ergonomics Survey of Occupational Health Professionals**

| Survey Questions and Results | | Yes |
|---|---|---|
| 1. | Do men experience higher levels of discomfort in the workplace? | 18% |
| 2. | As you get older, do you experience higher levels of work-related discomfort? | 82% |
| 3. | Is work category (job title) a reasonable method to distinguish risk in an office environment? | 51% |
| 4. | Is computing time (number of hours on computer per day) a good measure of risk? | 85% |
| 5. | Are tall people at a similar level of risk as short people (i.e. individuals at extreme ranges of height)? | 77% |

## WORK CATEGORY

*Expected Relationship*

Work category or job classification is not a factor that relates to the physical characteristics of an employee, but instead relates to the type of work they are exposed to on a daily basis. Depending on an employee's job and the tasks it entails, the level of exposure to seated work or computer activity will change. For example, a manager of a department will most likely have a completely different task list than an employee in a call center.

A question that often arises when implementing an ergonomics process is whether work category is an effective characteristic that can prioritize efforts. The assumption is that work categories with the highest exposure to intense computer use will have the highest number of employees experiencing discomfort, and therefore should be prioritized to receive assistance. 51% of the professionals surveyed considered work category to be a valid means of

prioritizing ergonomics efforts in the office environment. This is not a solid, majority opinion on this subject.

*Actual Relationship*

Figure 7 illustrates the prevalence of discomfort by work category. It is clear within this graph that Data Entry and Customer Service employees have a significantly higher incidence of discomfort within their population versus the other work groups. Close behind these groups are Designers/Engineers and Administrative Assistants. When looking at the levels of discomfort between the groups, it appears that the work categories with the higher level of exposure to computer activities have the higher prevalence of discomfort.

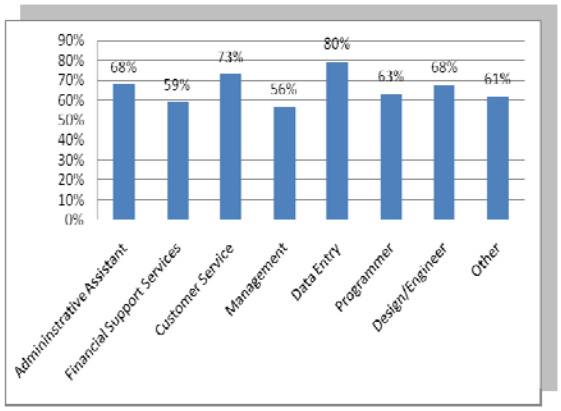



**Figure 7: Prevalence of Discomfort vs. Work Category**

The severity of the discomfort, as measured by the average total discomfort, illustrates an identical trend in the data, with the same groups illustrating the highest levels of discomfort (see Figure 8).

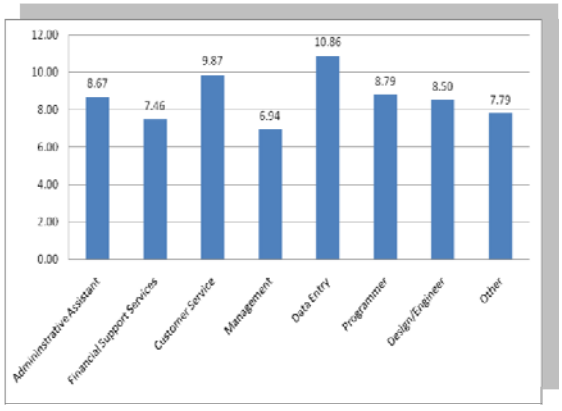



**Figure 8: Average Total Discomfort vs. Work Category**

Using work category as a means of prioritizing concerns and efforts is based on the assumption that the different categories can be associated with specific levels of exposure to computer activities. Figure 9 illustrates that this premise does not hold true as other work categories such as Programmers and Financial Support Services are exposed to longer hours of computing than those categories having the highest level of discomfort. Further, Customer Service has a higher level of exposure than Data Entry, which had the highest prevalence and average discomfort of all.

The correlation between computing hours and average total discomfort provides a score of r=0.70, which indicates a relationship exists, but a significant portion of the variance in these numbers is still explained by other factors. Factors such as the type of work and the concentration of the computer activity (within the number of hours at the computer) will have an effect on the intensity of the exposure. For example, Data Entry may spend less time on the computer compared to Customer Service, but the Data Entry job will involve more repetitive and consistent computer activity, whereas a Customer Service job will involve shorter durations of hand activity interspersed with phone conversations.

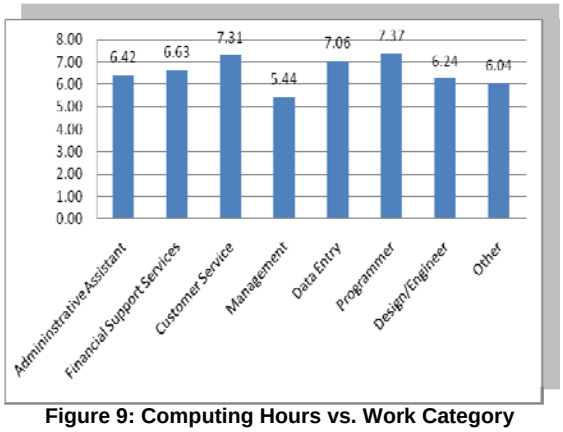



**Figure 9: Computing Hours vs. Work Category**

*Impact on Approach*

The data related to work category and discomfort clearly supports the concept that a company can prioritize its efforts based on the jobs with the highest levels of exposure to computer work. When determining the jobs with the most intense computer time, number of hours on the computer may be too simplistic a question and a true level of exposure must be verified using a task breakdown.

## AGE

*Expected Relationship*

One of the most common concerns within the ergonomics community is the potential impact of work on an aging workforce. With a large portion of the working population falling into the higher ranges of age (see Figure 5), the question is will this population start to experience a higher level of strain based on changes in their bodies over time? An outcome that would be expected from an aging population is that certain body parts would have increasing levels of discomfort while at work. This question is of greater concern in work environments with heavy workloads or repetition rates, but the question must still be asked within the office environment. When health and safety professionals were asked their opinion about age and the office environment, 82% of them felt that an older employee is more likely to experience work-related discomfort.

*Actual Relationship*

Figure 10 presents the prevalence of discomfort across the different age groups, and three facts stand out in this graph:

1. Employees <29 years had the highest prevalence
2. Employees >60 years had the lowest prevalence
3. The rest of the population had a relatively similar prevalence near 67%

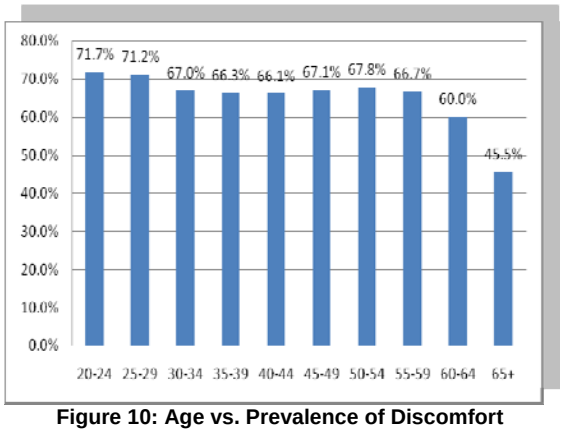



**Figure 10: Age vs. Prevalence of Discomfort**

The low numbers for the groups >60 years may be affected by relatively low numbers within the study population (~2.5%), but the values for the employees <30 years old are the truly interesting outcome here given that they represent 28% of the study population and have the shortest time in the workforce. When the severity of the discomfort is considered (see Figure 11), the lines become blurred for the younger categories, but the >60 years categories are still

dramatically lower. The youngest age category surprisingly had the highest average total discomfort.

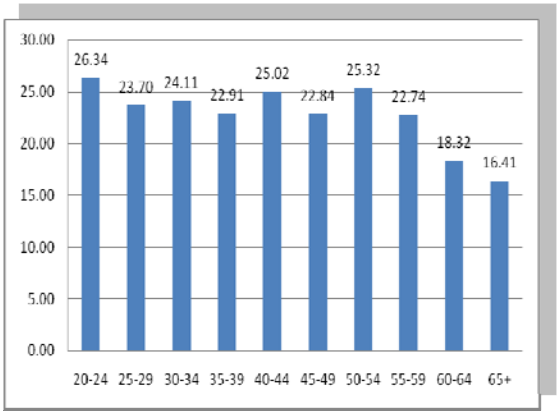



**Figure 61: Age vs. Average Total Discomfort**

Looking deeper into the data, Figure 12 illustrates the trends in average total knee discomfort across the age groups; this graph presents an expected trend of knee-related issues over time. Conversely, Figure 13 shows an exact opposite trend in low back discomfort where the average total discomfort decreases as the age groups increase. Without showing all of the individual body part graphs, it should be noted that the trend in Figure 14 is the more dominant trend in the data.

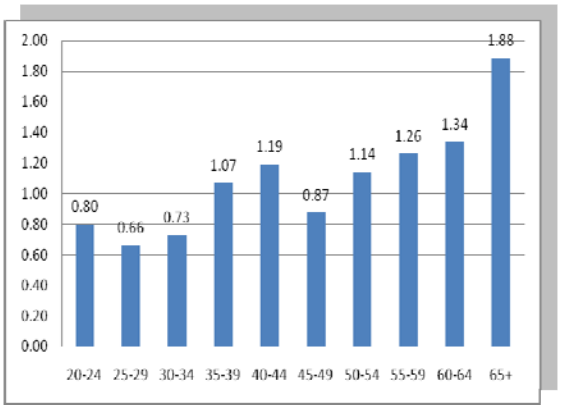



**Figure 12: Age vs. Knee Discomfort**

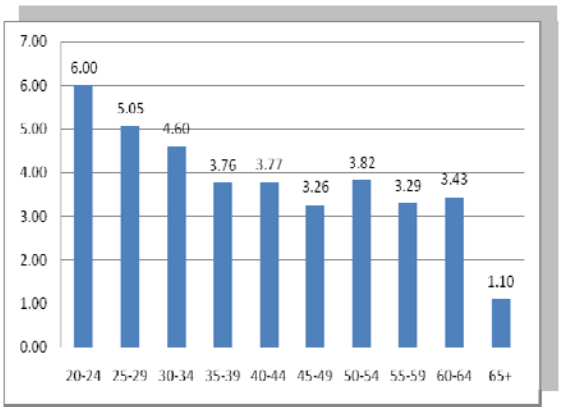



**Figure 13: Age vs. Low Back Discomfort**

Possible explanations of this trend include such factors as work category and tenure. Employees in the younger age groups are more likely to work in jobs that have a higher duration of exposure to computer work (see Figure 14). There is also a greater likelihood that you will move to a higher level position within a company as you get older, often resulting in lower levels of computer activity (see Figure 9). It should be noted that the survey question related to daily computing

time asks for a total of work and non-work related computer use, which may further explain the longer hours of computer use by the younger age groups.

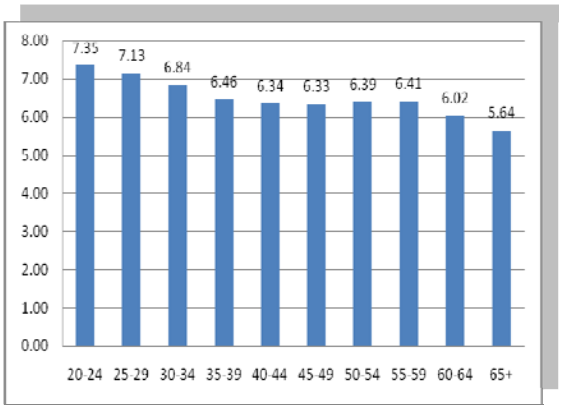



**Figure 14: Age vs. Computing Time**

*Impact on Approach*

It is apparent that the office environment is not a type of work place that wears down a body simply by putting in time, but instead the amount of computer work that is performed in the short term (i.e. how much time is being spent now) is the more critical indicator of risk and discomfort.

Given that younger employees are exposed to higher amounts of time on the computer, and the fact that they are demonstrating higher levels of discomfort while at work, this group may benefit from targeted programs. For example, training and reinforcing good work habits may provide younger employees with the knowledge and motivation to take care of themselves early on in their careers. As noted in a previous Atlas white paper (*Product Knowledge and the Effect on Reducing Office Employee Discomfort*), knowledge is one of the most critical factors in reducing work-related discomfort.

## HEIGHT

*Expected Relationship*

When discussing height as an ergonomics issue within the office, the question revolves around adjustability. The workstations that are provided to employees are designed to adjust to difference sizes of individuals. Based on the specifications from manufacturers, office furniture and products have been designed to fit 90% of the working population. Figure 15 provides an illustration of the distribution of physical characteristics, showing how the majority of people fall into the middle range (i.e. near average height), with 5% of the population falling on the extreme high and extreme low ends of the scale.

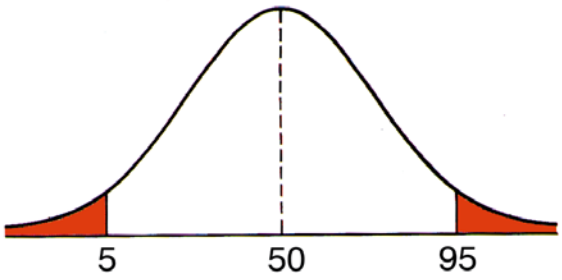



**Figure 15: Normal Distribution (Statistics)**

The expectation when choosing solutions for the office is that employees whose height falls within the extremes of the population, both low and high ends of the scale, would have a greater challenge finding comfort within their office. 77% of the professionals surveyed felt that this situation exists.

*Actual Relationship*

Figure 16 provides a view of the actual distribution of the study population based on height. The figure shows a slight skew in the data towards the shorter height ranges, but it is not far from a normal distribution.

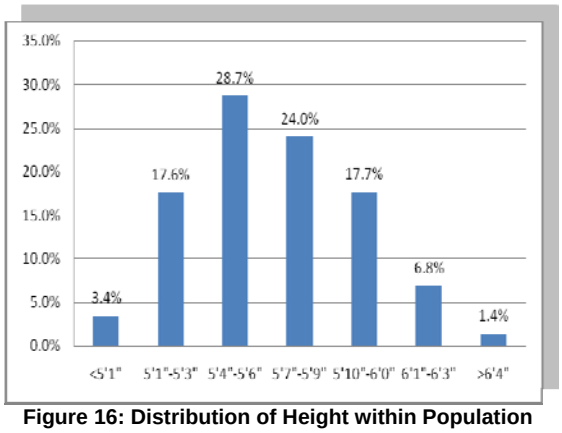



**Figure 16: Distribution of Height within Population**

Figure 17 illustrates that both extremes of height do not experience discomfort at equal levels; there is actually a steady decline in the prevalence of discomfort from the shortest to the tallest height ranges. Figure 18 presents data on average total discomfort that shows a similar downward trend in average total discomfort from the shortest to the tallest employees.

This trend in discomfort for shorter employees raises a potential concern as to the range of adjustability of the products that are available for the office environment. A potential source of the problem is the anthropometric data that many furniture manufacturers have used to design their products; the data commonly used in ergonomics is based on military personnel, which has a tendency to exclude individuals in extreme ranges of size. Herman Miller published a paper in 2007 on the anthropometrics of fit that further supports this concern. In the paper, a survey of 778 average individuals resulted in <68% of the group fitting into a standard chair designed to fit 90% of the population.

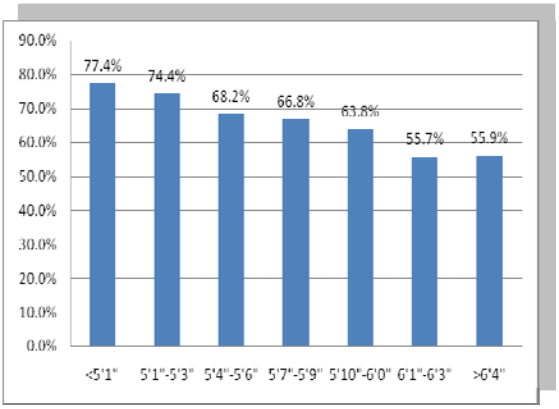



**Figure 17: Height vs. Prevalence of Discomfort**

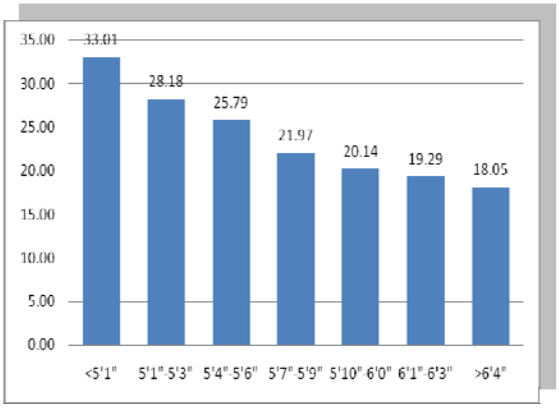



**Figure 18: Height vs. Average Total Discomfort**

Chair adjustability is a work-related factor that is assessed by several questions within the survey; this factor is evaluated by providing questions that are specific to the product, as well as questions pertaining to posture and fit within the workstation. Figure 19 illustrates a difference in the number of employees who can comfortably place their fleet flat on the floor. For employees >5'6", 33-39% of this population could not achieve the desired posture of having their feet comfortably on the floor. Conversely, 46% of employees 5'1"-5'6" and 51% of employees <5'1" could not place their feet flat on the floor. This data further supports a trend in design that neglects the shorter height ranges. Figure 20 shows that this design concern results in a direct outcome of increased discomfort in the low back for the shorter population.

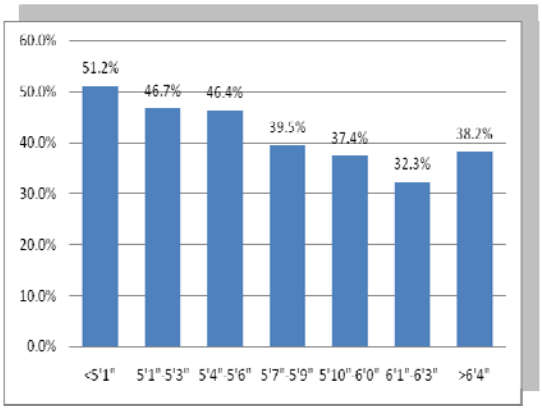



**Figure 19: Height vs. Feet Not Flat on Floor**

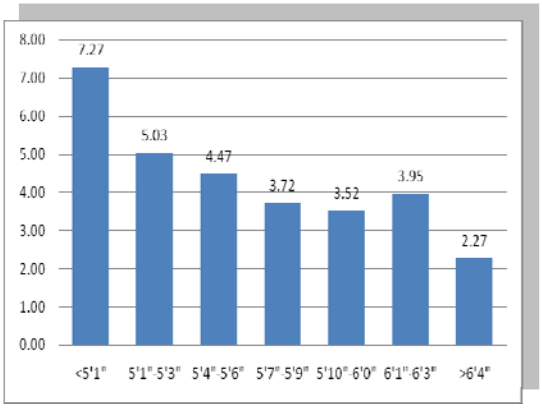



**Figure 20: Height vs. Average Low Back Discomfort**

*Impact on Approach*

The data provided in this section does not support the opinions put forth in the survey of health and safety professionals. This data illustrates two facts that must be considered to ensure employee height is adequately addressed in an ergonomics evaluation:

1. Individuals <5'7" and especially those <5'1" have a higher level of risk due to their stature, and therefore their ability to easily adopt to the workstation and task without experiencing ergonomics stress.

2. It appears that the products and furniture available for the office environment do not adequately address employees in the lower height ranges. Special effort must be made to find products and furniture to fit shorter employees; the term "petite" is often used in marketing materials by product vendors to indicate products that may fit this population.

## WEIGHT

*Expected Relationship*

When it comes to the influence of weight on fit and comfort within the office environment, there are two key factors that affect the expected relationship:

1. The weight of an employee affects how they interact with furniture, equipment, and the workstation. As an employee moves into higher obese classifications, their physical characteristics will challenge their ability to use standard furniture, resulting in a poor fit and lack of comfort.

2. Known health hazards associated with obesity may contribute to baseline levels of discomfort outside of the workplace, which can transfer to higher levels of discomfort at work.

Given these factors, the expected outcome with respect to weight is that heavier employees, especially those who can be classified as obese (based on body mass index), will experience more frequent and more intense discomfort while at work; 85% of the professionals surveyed by Atlas agreed with this expectation.

*Actual Relationship*

In order to effectively compare and illustrate the differences between the BMI classifications, the following graphs use Normal Weight as the baseline measure and then compare subsequent weight classifications to the Normal Weight value. For example, in Figure 21 the Obese II population has a prevalence of discomfort that is 20.9% higher than a Normal Weight individual. The values presented in Figures 21 and 22 illustrate that the prevalence and the severity of discomfort is notably higher for the obese classifications.

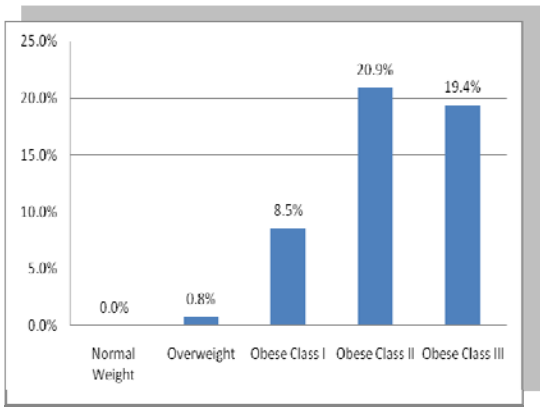



**Figure 21: BMI Classification vs. Prevalence of Obesity**

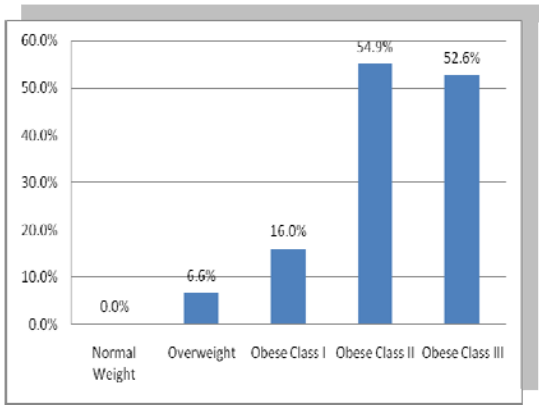



**Figure 22: BMI vs. Average Total Discomfort**

One of the concerns with employees in the higher weight classifications is that the changes in their physical characteristics will increase the strain placed on their body while performing work activities. For example, the additional weight and size of an obese individual would be expected to have an impact on low back and lower limb discomfort based on challenges with seating choices and compression of tissues while seated. Figures 23 and 24 illustrate that the level of discomfort experienced by Obese II and Obese III individuals is significantly higher for the low back (38-45%), and reaches extreme levels for the lower limb (150-300% higher for knees, ankles, and feet).

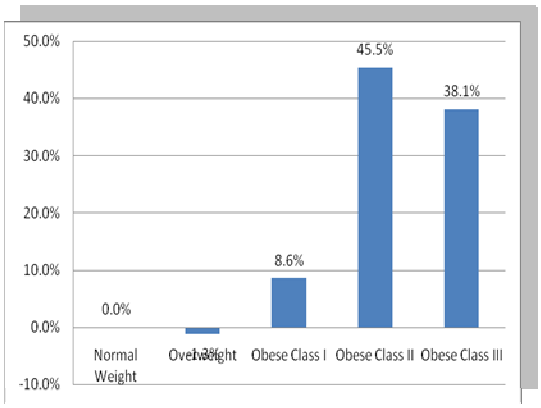



**Figure 23: BMI vs. Low Back Discomfort**

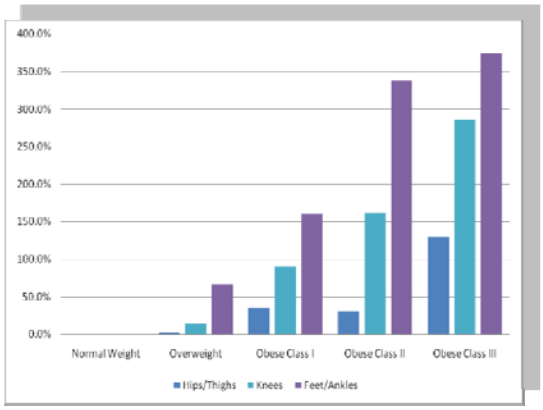



**Figure 24: BMI vs. Lower Limb Discomfort**

A similar issue develops for the upper extremity, especially the hand/wrist, where an increase in girth results in different postural angles for the shoulders, elbows, and hands/wrists while typing. These extreme postures result in dramatically higher levels of discomfort for the Obese II and Obese III individuals. Figure 25 show that employees in these population groups have 45-70% higher levels of discomfort versus normal weight individuals.

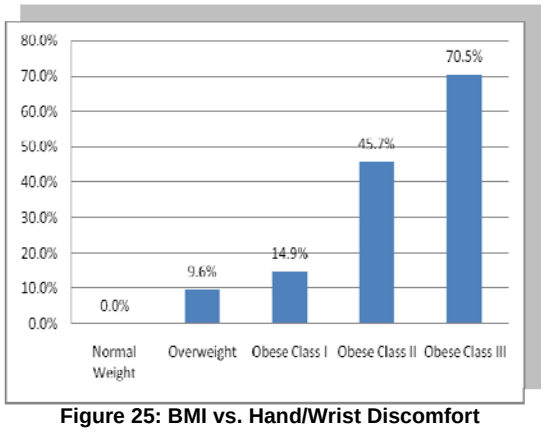



**Figure 25: BMI vs. Hand/Wrist Discomfort**

*Impact on Approach*
The data related to weight suggests two facts that should be considered when performing an ergonomics assessment.

1. A high percentage of employees in the obese classifications are experiencing discomfort, and the severity of this discomfort is significantly higher than normal weight class individuals. Case studies and experience has shown that employees who are experiencing higher levels of discomfort are more likely to require medical attention and/or become a workers' compensation case. Figures 26 and 27 present data from the Archives of Internal Medicine (2007) that illustrate a trend towards higher lost work days and higher costs of injuries as BMI increases.

   These facts emphasize the need to prioritize efforts to assist obese employees in achieving a comfortable working posture.

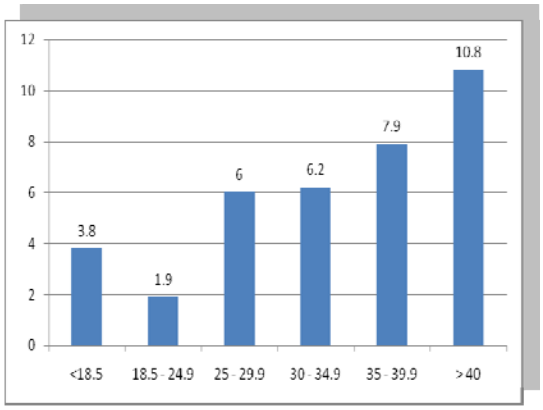



**Figure 26: Lost Work Days per Incident vs. BMI**

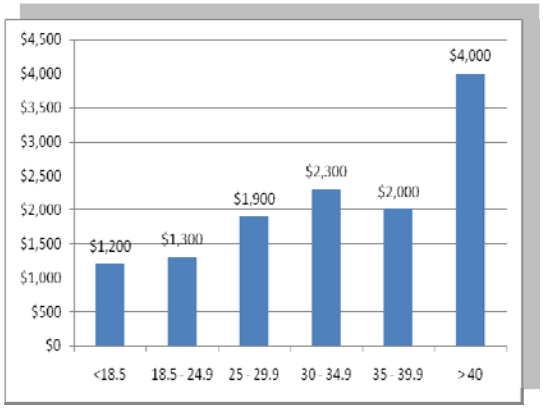



**Figure 27: Cost per Claim vs. BMI**

2. Individuals in the Obese II and III categories (i.e. BMI >35) have a higher level of risk due to their physical characteristics. Special furniture and products are needed to help the obese population adopt comfortable postures and reduce any ergonomics-related stress.

A case study presented in a previous Atlas white paper, *Addressing the Challenge of Obesity and Ergonomics in the Office Environment*, illustrated that solutions are available to address the concerns with this population and drive down discomfort effectively. Part II of this series of white papers will provide additional input into choosing the right furniture for obese employees, and the gaps in design that are currently present for addressing this population.

## GENDER

*Expected Relationship*

The question posed to the group of health and safety professionals asked whether they felt the men would experience a higher level of discomfort versus women. Only 18% of the responses felt that this trend would exist. This does not necessarily mean that 82% of those polled felt that women would have higher levels of discomfort; the alternative reason for the low agreement could be that people felt gender is not a factor that can distinguish who will have greater levels of discomfort. The real question for this section might be whether gender has an impact on how a person adopts to the physical demands of an office task? Is the relevant difference gender itself, or are the physical differences between genders the real influence? The answer may have a significant impact on the approach to office ergonomics.

*Actual Relationship*

56% of men and 72% of women indicated that they experienced work-related discomfort. Figure 28 presents a comparison of the average total discomfort between female and male employees. For each of the body parts noted, the percentage illustrates how much higher the average total discomfort is for women versus men. Across every body part, women had 39% to 85% higher levels of discomfort. These initial results provide an instant perception that women have a higher degree of ergonomics risk and discomfort within the workplace.

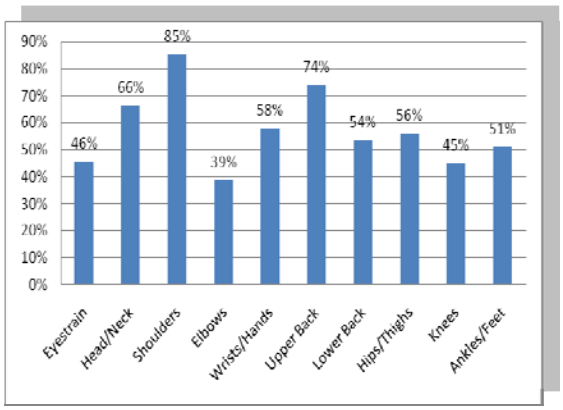



**Figure 28: Comparison of Female vs. Male Discomfort Prevalence**

Given that these trends exist with respect to gender, the question becomes what is the solution from an ergonomics perspective? The answer does not center on gender, but more correctly revolves around determining the actual differences between genders that can lead to these higher levels of discomfort for women. These differences can be categorized into personal and job-related factors.

Personal factors would include variations in height, weight, and strength (between genders) that may influence risk. The average height of women within this study was 5'5", and for men it was 5'10"; the results presented earlier in this report noted a distinct issue for employees whose height was <5'6". Therefore, the recommendations for addressing height-related concerns should address some of the issues that influence the trends in gender data.

Figure 29 illustrates the distribution of gender within each of the BMI weight classifications. As noted in the section on participants, the study population is split by gender 30/70 (male/female). When looking at this graph, any deviation from this 30/70 split would indicate a shift in the population; essentially, all weight classifications should be split 30/70 on the graph. Instead, women represent a higher percentage of both the normal weight, and the obese II and III classifications. The information provided in the previous section on weight clearly indicated a higher level of ergonomics risk for obese class II and III employees. Therefore, any effort to prioritize and address the needs of the obese population should have a positive impact on the discomfort levels noted for women.

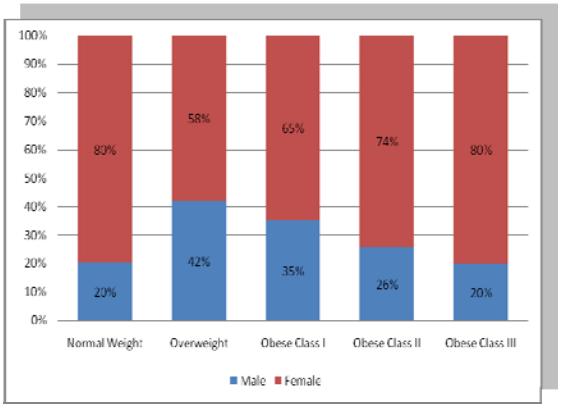



**Figure 29: Distribution of Gender within BMI Classifications**

A job-related factor that may be a differentiator between genders is daily computing hours. Figure 30 shows that women work approximately 42 more minutes per day on the computer versus men. This extra time may be a result of many factors, but a specific contributing factor noted in this paper may be work category. It is possible that women are working in more computer-related jobs resulting in higher levels of exposure, and more intense levels of daily use. This additional daily exposure may be a critical factor in the differences in discomfort. A prioritization of ergonomic efforts to address intensive computer users may have an impact on the discomfort levels for women.

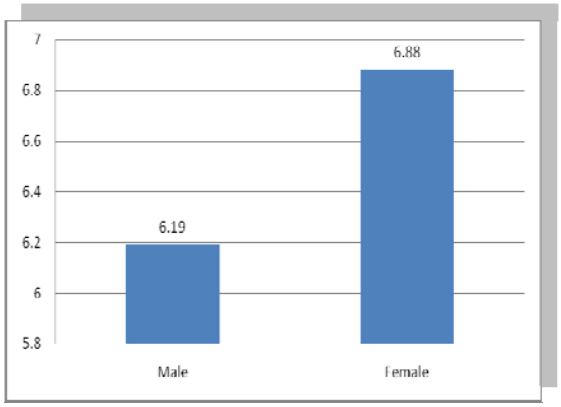



**Figure 30: Gender vs. Computing Time**

*Impact on Approach*

The data illustrates that there is a clear difference in the trends between women and men. Prioritizing efforts to assist women based solely on gender is not a justifiable approach given the additional data reviewed. Specific demographic and work-related data illustrating the differences between genders illustrates a more effective approach for assisting women. The previous sections of this report illustrated ergonomics challenges related to work category, height, and weight; the data shows that women are affected by each of these categories, and it appears that they often fall into the higher risk levels for these categories.

Therefore, if efforts are put into place to follow the recommendations noted for work category, height, and weight, assistance will inherently be provided to high-risk women.

## CONCLUSIONS

When preparing for an ergonomics assessment, and even when developing solutions, there are many preconceptions on how we need to address the employee's needs. In many cases, these concepts are based on some science and some level of consensus on what the problems and solutions likely are. This paper has started a discussion about current beliefs and whether adjustments need to be made to improve the service provided to both employees and companies.

Table 3 presented a list of questions that Atlas provided to a group of health and safety professionals regarding potential relationships or trends in office ergonomics. After a review of the data presented in this paper, it appears that the general opinions within the professional community have some errors.

**Table 3: Evaluation of Office Ergonomics Survey of Occupational Health Professionals**

| Survey Questions and Results | | Yes | Correct? |
|---|---|---|---|
| 1. | Do men experience higher levels of discomfort in the workplace? | 18% | ☑ |
| 2. | As you get older, do you experience higher levels of work-related discomfort? | 82% | ✗ |
| 3. | Is work category (job title) a reasonable method to distinguish risk in an office environment? | 51% | ✗ |
| 4. | Is computing time (number of hours on computer per day) a good measure of risk? | 85% | ☑ |
| 5. | Are tall people at a similar level of risk as short people (i.e. individuals at extreme ranges of height)? | 77% | ✗ |

In this paper, trends related to the work categories of age, height, weight, and gender were analyzed and discussed to determine the potential impact of these factors on discomfort. To summarize, here are the facts that should be considered when addressing ergonomics concerns and these personal characteristics come into play:

Work Category: The job that a person performs provides a valid method of prioritizing efforts based on the intensity of the task. The more intense the task and the greater the time an employee spends on a computer, the higher the likelihood that the employee will have discomfort as well as a higher level of discomfort.

| | |
|---|---|
| Age: | A person's age and the amount time you have been working in your life is not the best predictor of who may have discomfort. Instead, the factor of greater importance is the short term exposure time to intense computer activity. It appears that younger employees are spending greater amounts of time on the computer, and therefore are experiencing higher levels of risk and discomfort. Targeted training of new hires within an organization, especially younger employees, may result in a significant reduction of employees experiencing discomfort. |
| Height: | The current setup of workstations in conjunction with the available products and furniture appear to be under servicing the needs of employees with shorter statures. Efforts must be taken to address the needs of employees at the extremes of height, but particular care must be taken to address employees in shorter height categories (i.e. <5'1"). |
| Weight: | The ergonomics risk associated with the obese population is fairly clear and easily explained. It is important to recognize that the risk, and therefore discomfort experienced by obese individuals, is not solely related to a single piece of furniture (i.e. chair). The impact of the physical characteristics of a larger employee affects multiple body parts, tasks, and therefore solutions. Employees in Obese II and III categories should be given high priority for solutions. |
| Gender: | Women appear to be at higher risk than men, but caution should be taken to not prioritize efforts by gender. Instead, prioritization and specific effort to address concerns noted for height, weight, and work category should provide the needed assistance for gender. |

The next paper in this series will focus on the impact of furniture on discomfort. The questions that will be addressed include whether the availability of a product has an impact and whether the features of specific products have a positive impact on discomfort.

Any questions or comments related to this paper should be directed to info@atlasergo.com