Session No. 508

Wellness:
The Intersect of a Productive Worker

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Introduction

Obesity is a topic that is often discussed and researched on a societal level, but it is seldom seriously discussed within the workplace. Leaders and management alike tend to seek shelter with regards to this troublesome topic. The thought is often that the discussion of a person's weight may lead to awkward or difficult interactions. Addressing the topic head-on creates a level of distress and anxiety for all involved, as the issue is plagued with multiple pitfalls and landmines such as discrimination suits and ADA accommodation issues.

For many years the definition of obesity was associated with height and weight charts that offered ranges of healthy weight based on age, height, weight, and gender. The current definition of obesity relies on a measure called the Body Mass Index, or BMI (see Appendix A). The BMI, which is calculated with height and weight measurements, has come to be the most internationally accepted definition of obesity. A person with a body mass index exceeding 30 is considered obese, and someone with a BMI of 40 or more has morbid obesity. Morbid obesity (class III) refers to a dangerous condition in which the sufferer is at risk of physical disability and a severely impaired quality of life.

Some controversy exists over the accuracy of the BMI for setting obesity standards. Because the BMI uses a standard weight against height formula, it doesn't take into account whether the weight is fat or muscle. Other criticisms of the BMI method of assessing weight and health are that it does not account for:

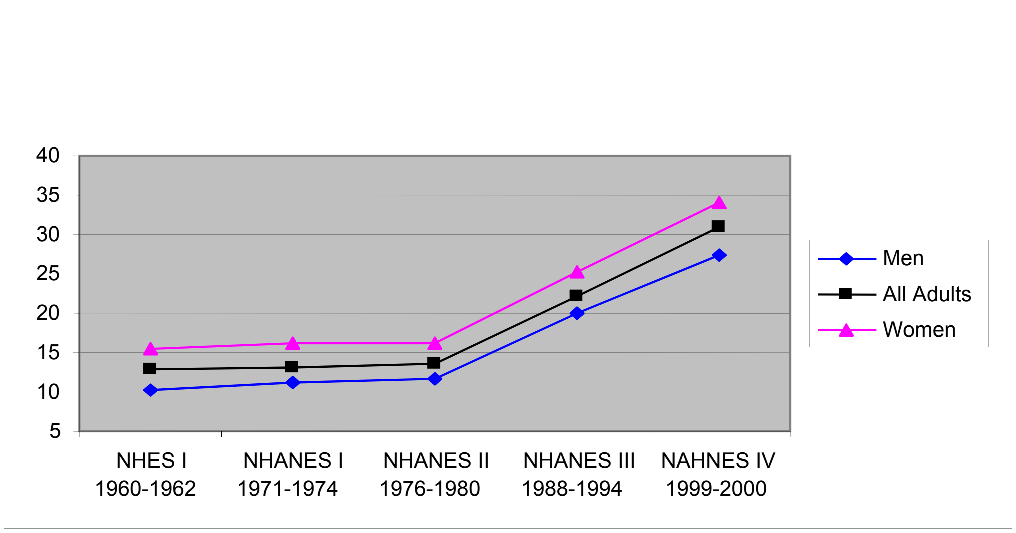
- Frame size—people with a larger frame have greater mass overall but a smaller ratio of lean mass to fat mass.
- Gender—weights are the same for men and women, even though women are expected to have a higher percentage of body fat.

Over the course of a 12-month period in which Atlas Ergonomics provided services to six Call Center Operations across the upper Midwest the issue of obesity in the workplace rose in prominence. While working within these companies, it was noted there was a relatively disproportionate populous of overweight and obese individuals as compared to the general population. This observation led to an in-depth review of the data collected, with the focus being the issue of obesity and its relationship to the seated call center worker.

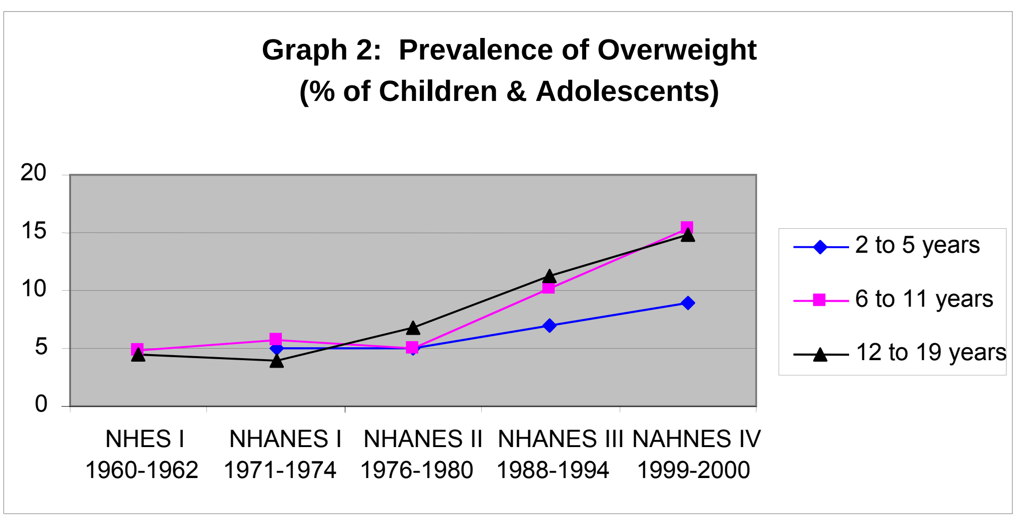
This paper will present the data that was collected over this 12-month period, and describe the driving characteristics of the associated ergonomic risk and workplace discomfort reported by the study population. The impact of obesity on ergonomics risk and discomfort will be presented in detail.

Background

The latest government figures show the prevalence of obesity has increased substantially over the last 2 decades. Data demonstrates that nearly 31% of U.S. adults aged 20 and older (approximately 59 million people) were obese, defined as having a Body Mass Index (BMI) of 30 or more (Gallagher et al., 2000). Amongst children and adolescents, 15% were determined to be seriously overweight. The latest estimates were based on body measurements of 4390 adults and 4258 children (Flegal et al., 2002; CDC, 2000).

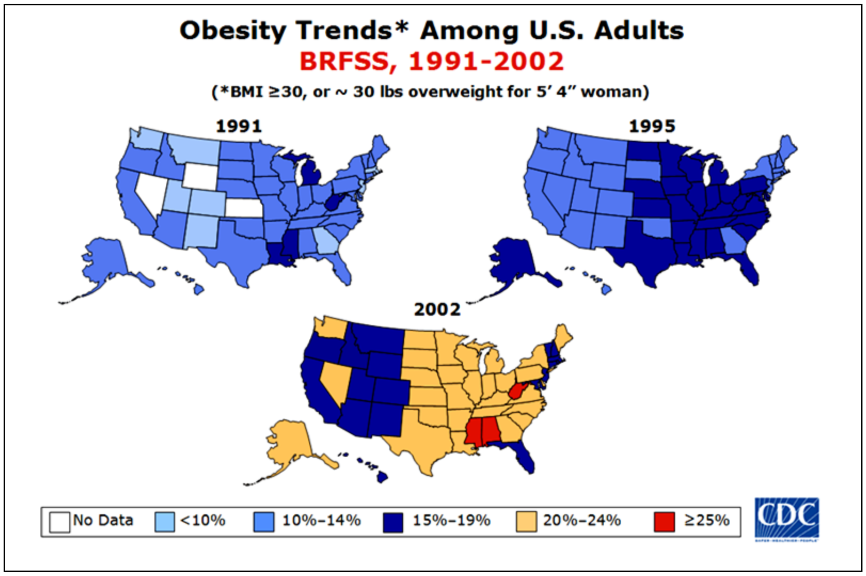


Graph 1: Prevalence of obesity among adults. Percentage of adults aged 20-74 who were classified as obese (body mass index ≥ 30.0 kg/m²) in the National Health Examination Survey 1 (NHES1) and in four National Health and Nutrition Examination Surveys (NHANES).



Graph 2: Prevalence of obesity among children and adolescents. Percentage of children aged 2-5, 6-11, and adolescents 12-19, who were classified as overweight (95th percentile of body mass index for age according to the 2000 Center for Disease Control growth charts) in the National Health Examination Survey 1 (NHES1) and in four National Health and Nutrition Examination Surveys (NHANES)

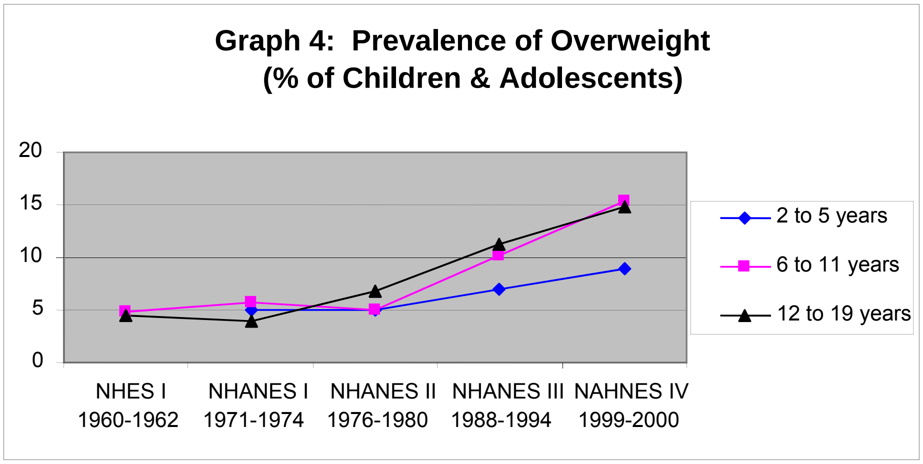
In fact, obesity has reached epidemic proportions. It is a complex condition that has many contributing factors, including behavioral, environmental, physiological, social, and cultural factors (Deusinger et al., 2004). According to the International Obesity Task Force, the current obesity pandemic is the result of "profound changes to society over the past 20-30 years that have created an environment that promotes a sedentary lifestyle and the consumption of a high fat, energy dense diet" (Graph 3).



Graph 3: The data shown in these maps were collected through Center for Disease Control's Behavioral Risk Factor Surveillance System (BRFSS). Each year, state health departments use standard procedures to collect data through a series of monthly telephone interviews with U.S. adults

The adverse health consequences of obesity and their associated costs have a far reaching impact to business and society as a whole. Research studies have shown that obesity increases the risk of developing a number of health conditions including type 2 diabetes, hypertension, coronary heart disease, ischemic stroke, colon cancer, post-menopausal breast cancer, endometrial cancer, gall bladder-disease, osteoarthritis, and obstructive sleep apnea (Table 2 and Table 3).

The prevalence of obesity amongst adults has increased dramatically over the past thirty years. The same is true for children and adolescents. Among children and adolescents estimates indicate that 30% of children are affected, with 15% meeting the criteria for overweight and 15% being classified as "at risk for overweight" (Ogden et al, 2002). As was observed in the adult population, the prevalence of overweight and obesity among children and adolescents changed very little between the 1960's and early 1980's but increased dramatically during the 1980's and 1990's (Graph 4). Current research predicts a shortening of the average lifespan of a child born today in the United States by 2-5 years based upon the medical consequences of obesity (Olshansky et al, 2005).



Prevalence of obesity among children and adolescents. Percentage of children aged 2-5, 6-11, and adolescents 12-19, who were classified as overweight (95th percentile of body mass index for age according to the 2000 Center for Disease Control growth charts) in the National Health Examination Survey 1 (NHES1) and in four National Health and Nutrition Examination Surveys (NHANES).

Atlas Data Collection

Data collection was completed using a combination of software and one-on-one interaction to prioritize concerns, pinpoint causal factors, implement solutions, and measure outcomes to show improvement.

Figure 1 provides a graphical representation of the system Atlas used to assess employees in an office environment. The system is divided into six phases that are followed in a cyclical fashion to ensure all employees are addressed with the appropriate control for their level of risk.

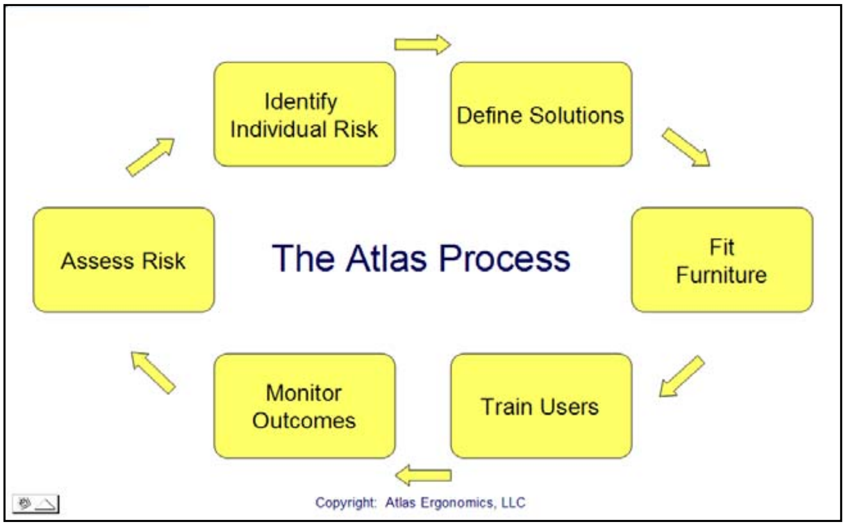


Figure 1: Atlas Ergonomics Office Assessment Process

Phase I – Assess Risk: The Atlas system starts with an assessment of risk which is performed using an online employee survey. 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 was chosen based on current research and standards. Within the data-collection process, height and body weight was self-reported by participants. Self-reporting of these characteristics tends to lend itself to underreporting of weight, particularly among women and people who are obese (Lawlor et al., 2002). In addition, older adults tend to underreport their height, secondary to reduction of bone quality with age (Nawaz et al., 2001).

Phase II – Identify Individual Risk: The Atlas system contains an algorithm that categorizes employees into three levels of risk: low, moderate, and high. These levels are assigned based on responses in three areas: discomfort, ergonomics, and other factors. 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. Ergonomics 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. The final indicator of individual risk (other factors) allows an employee to indicate if there are any conditions that may place them at increased risk of developing symptoms of MSDs (e.g. recent accident, previous injury to body part, etc.).

Phase III – Define Solutions: With all the data collected and verified, standard engineering controls are defined to ensure that all employees have the appropriate equipment, furniture, and accessories to fit them correctly and meet the needs of their job. Employee-specific solutions are provided based on personal characteristics and/or ergonomics risk.

Phase IV – Fit Furniture: A second on-site visit to the employee is performed to provide an initial level of training and to fit the workstation to the employee. In order to assist in the transfer and retention of ergonomics awareness training, Atlas has developed a system to mark furniture and fit employees within their workstation. Figure 2a and 2b illustrate a furniture marking system and the report provided to employees to help them to reproduce the settings that place them in an optimum position.

(A) (B)

Figure 2: (A) Labeling of ergonomic furniture; (B) Fit Report© for individual employee

Atlas installs color-coded labels on the critical adjustment features of an employee's office (i.e. seat height, arm rest height, work surface height, etc.). The labels are used in conjunction with fitting and training to help strengthen the training process and guide an employee to maintain their settings over time.

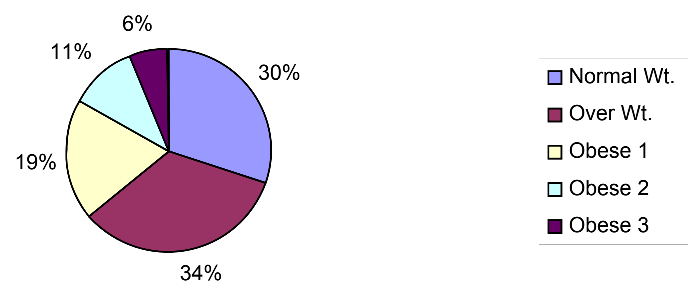
Phase V – Train Employees: In addition to the personalized training provided in Phase IV employees are educated in a classroom setting and through a web-based refresher. Providing the key information in multiple formats at different points in time is designed to supply continuous reinforcement of the training in an effort to enhance retention and utilization of the recommended behaviors; this type of training has been found to be critical for long-term effectiveness of an ergonomics intervention (Faucett et al, 2002).

Phase VI – Monitor Outcomes: Follow-up surveys are provided to employees through a similar system used in the initial online questionnaire. The goal of the follow-up survey is to monitor the health index (frequency x severity of symptoms) of individuals and identify where additional resources may be required to address at-risk employees. Employees are provided with the first follow-up survey one month after Phase V, a second survey at the 3-month interval, and subsequent surveys are administered every three months.

Participants

Nine hundred thirteen employees were pooled from six companies over a 1-year period. The average age of the employees was 37 with a range of 18-70. The distribution of gender was 25% male and 75% female. The average tenure within the companies was 3-5 years. Data from the study population indicated a 6 percentage point re-distribution of the population away from the "Normal Weight" classification toward the classifications of "Over-weight and Obese" compared with the Center for Disease Control data (CDC, 2000). The CDC study indicated 36% of the population was "Normal Weight", which is 20% higher than the demographics of this study.

Graph 4: Distribution of Population Based Upon BMI Classification

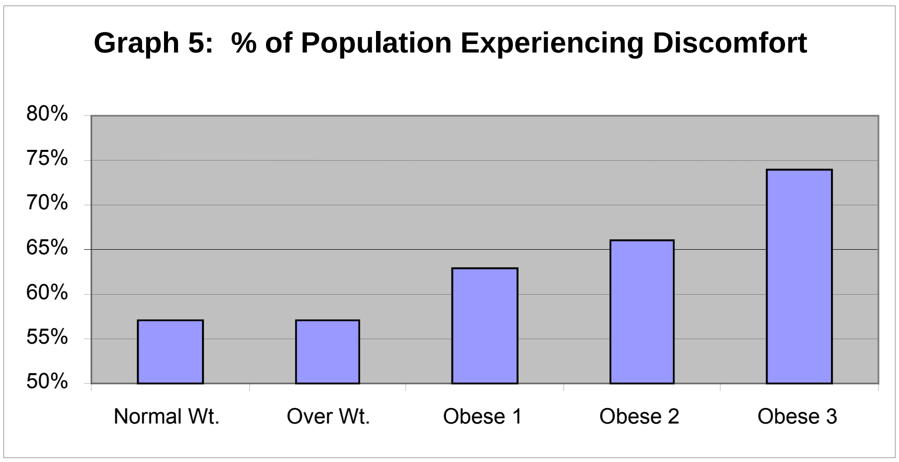


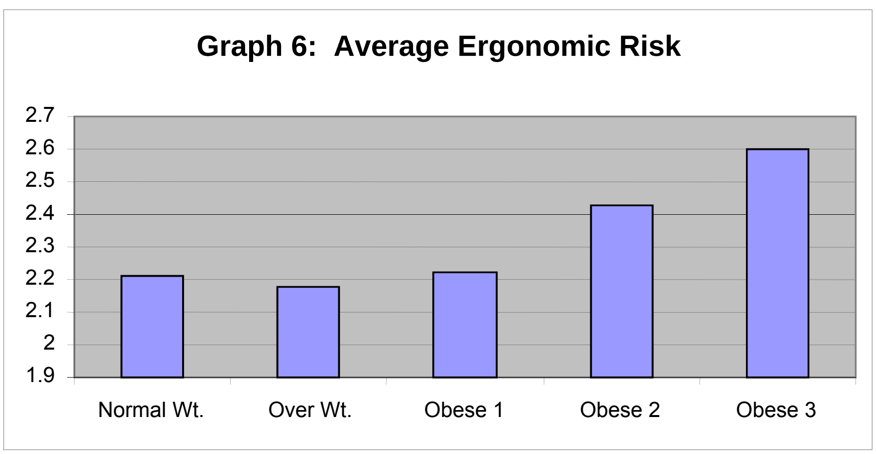
General Trends in Ergonomics Risk and Discomfort

Two of the key measurements that are taken from Phase I and II of the Atlas process are ergonomics risk and discomfort. These variables are used to prioritize which individuals and departments within the company need assistance, and potentially the type of assistance that is recommended. In this project the prioritization process looked at the trends in discomfort and ergonomics risk as it pertained to the weight classification of the employees.

Graph 5 demonstrates a correlative relationship between reported levels of workplace discomfort and BMI classifications. Almost 75% of Obese Class III individuals reported workplace discomfort versus only 57% for Normal Weight individuals. Similarly, a correlative relationship between the level of obesity and the average ergonomic risk reported within the environment was found (Graph 6). These trends have a high level of significance as 36% of the study population fell into the obese classifications (BMI>30).

Based on these results it was determined that a concerted effort was needed to determine targeted solutions for the obese population.





Targeted Ergonomic Controls

The trends in the study population's discomfort and ergonomics risk indicated that a specific effort be made to address those employees that fell into the overweight and obese classifications. The solutions that are required for this population are not dramatically different from any other ergonomic solution. The controls required for an obese individual need to adapt to the differences in their physical characteristics. Regardless of the population the standard principle of ergonomics applies – fit the task to the person.

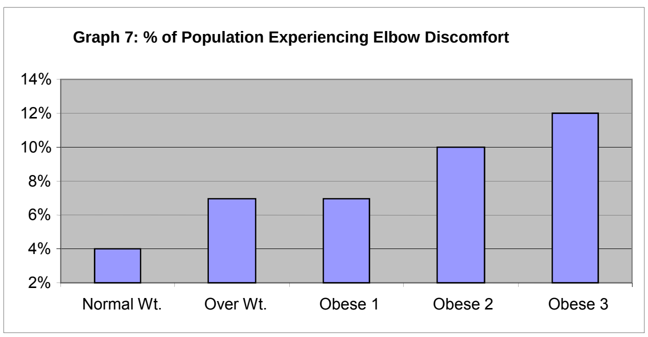
When reviewing the different elements of the office workstation, three areas of the body were identified that required modifications to standard solutions to fit the overweight and obese population:

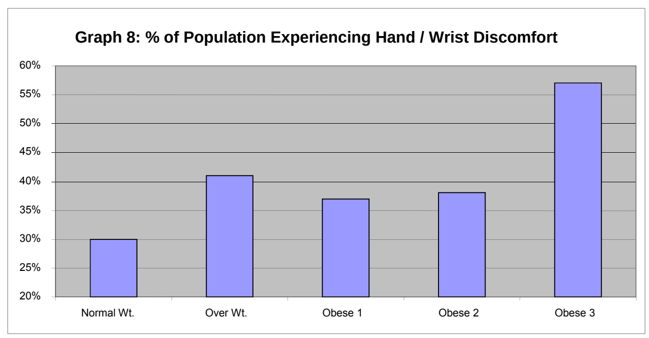
- Upper Extremity
- Lower Back
- Lower Extremities

Upper Extremity

<u>Discomfort Trends</u>

Graph 7 and 8 outline the percent of the call center population reporting Elbow Discomfort and Hand / Wrist Discomfort, respectively. Relative to our population, Obese Class III individuals were three times more likely to report Elbow discomfort and twice as likely to report Hand / Wrist discomfort compared to Normal Weight individuals.





<u>Anatomical Considerations</u>

The first parameter that needs to be considered for the upper extremity is the anthropometrics of the obese worker, specifically the "breadth" of the worker. The natural carrying angle of the shoulder of an obese worker is displaced into an abducted or flared posture. Not-with-standing of the angle or flare of the shoulder, the worker still needs to bring his or her hands forward into a fixed alignment as he or she engages with a standard keyboard. To do so, the worker must make significant adaptations of their upper extremities. This adaptation requires the worker to move into the extreme ranges of wrist pronation and ulnar deviation of the hands.

The position of extreme pronation will place the forearm supinators in a position of excessive stretch. This chronic elongated position disrupts the normal length-tension relationship of the supinators. This ineffective use of the muscle contributes to the potential issue of lateral epicondylitis (Tennis Elbow). In addition, the chronic positioning of ulnar deviation can contribute to a number of over-use injuries. First of all the posture can contribute to development of tendonitis, an inflammatory response of the muscle – tendon – bone interface, by disruption of the normal length tension relationship of the muscle. Secondly, it can lead to teno-synovitis, an inflammation of the tendon as it runs through its corresponding tendon sheath. In essence the tendon becomes impinged within the tendon sheath due to the deviated posture. Finally, this state of chronic posturing can contribute to the development of carpal tunnel syndrome. The posture mechanically compromises the size of the tunnel which in turn compromises the median nerve as it passes through the tunnel. The net result or clinical manifestation of this condition is numbness, tingling and/or pain in digits 1, 2, 3 of the corresponding hand.

Solutions

To minimize these issues it is critical to move toward a neutral wrist posture. The solutions that are required to achieve a neutral wrist posture for a larger individual, whether obese or not, are to adopt the workstation and equipment to their breadth. Three key, simple solutions were implemented within this project:

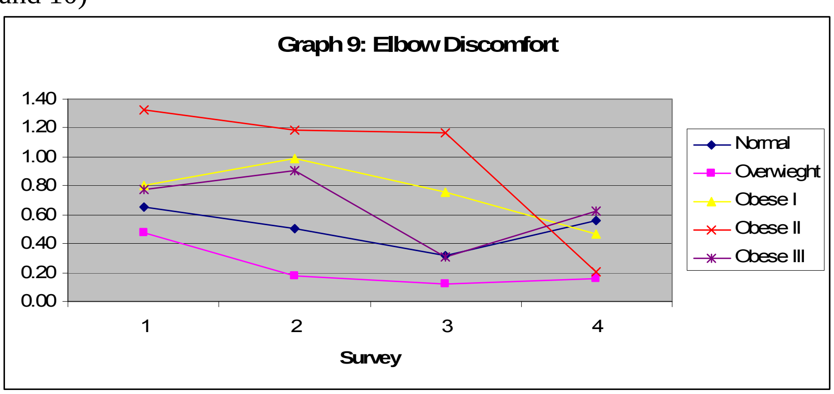
1. A split keyboard such as the Microsoft Natural Keyboard or comparable alternative keyboards provides a viable solution for individuals with larger torso breadth. The angulated rise of the keyboard diminishes the need to pronate the wrist and the split / angulated nature of the keys themselves decreases the potential for ulnar deviation. The net result is that the construction of the keyboard allows for a more neutral wrist posture.

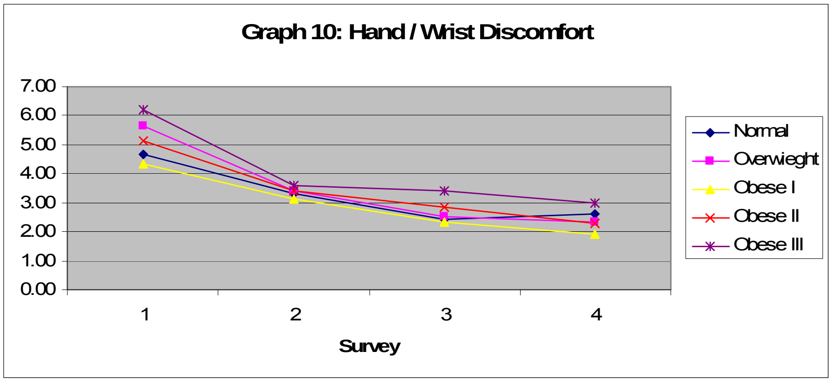
2. A radius contour versus a straight contour to the edge of the work-surface is another option for improving posture. A radius contour brings the work closer to the worker and avoids further reaching activities. It is important to avoid all situations which would place the obese worker in a corner set-up. This only increases the need to reach for the mouse and keyboard, and thereby increases the stress placed on the upper extremity.

3. Training on proper positioning of the keyboard and mouse was critical to ensure that employees adopted behaviors to minimize awkward postures of the upper extremity. As noted in the Atlas Ergonomics white paper *Product Knowledge and the Effect on Reducing Office Employee Discomfort*, the ability of the employee to adopt a neutral wrist posture was the key factor in determining hand/wrist discomfort. For overweight and obese employees, this ability is a combination of the engineering controls noted in #1 and #2 and the training provided to accurately position and use these solutions.

Results

Upon implementation of the controls for the study population, the results show a steady decline in the symptoms experienced by the workers, including the obese classified employees. The relative discomfort for obese employees tended to be higher than normal and overweight employees, but all employees responded to the implementation of effective engineering controls and training. (see Graph 9 and 10)

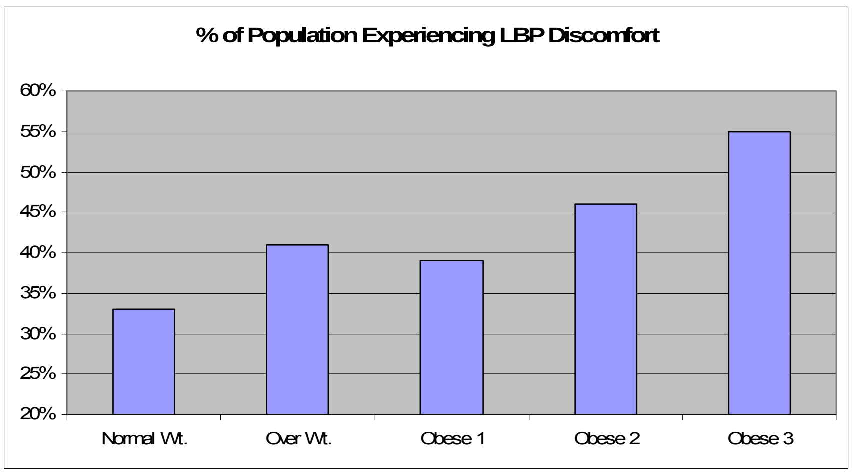




Low Back

Discomfort Trends

Graph 11 outlines the percent of the call center population reporting Lower Back Discomfort. The prevalence of Lower Back Discomfort increased across all weight categories, and was 66% greater in Obese Class III individuals versus Normal Weight individuals (33% of the population reporting vs. 55% of the population reporting).



Anatomical Considerations

A variety of issues come to play with regards to the interplay of lumbar support in the obese worker. As with any employee, the need for proper lumbar support is integral to minimizing low back discomfort during task involving extended periods of sitting. For overweight and obese employees, the ability to achieve lumbar support revolves around the design of the chair.

The height (location) and depth (size) of the lumbar support in a chair is the first factor that must be considered. With respect to height, the apex of the lumbar support of a typical ergonomic office chair adjusts from 7-11 inches above the seat pan. Similar to the upper extremity it is important to consider the impact of the breadth of an obese individual, specifically the adipose tissue of the posterior buttocks and thigh. This propensity of tissue tends to elevate the worker relative to the lumbar support, regardless of its position. Considered another way; place a pillow on the seat pan of a typical ergonomic office chair. Now have a Normal Weight individual sit down in the chair. The net effect is the same for both individuals. The position of the lumbar support is too low for both individuals, and needs to be modified to adjust approximately 7-14 inches above seat height to accommodate obese employees.

With respect to the depth of the lumbar support, an obese individual may well require a deeper lumbar support to reach full contact with natural position of the lumbar lordosis. If full contact is not achieved, the individual will tend to move into a flattened position of the lumbar spine, thus promoting a forward head posture. As these awkward positions of the spine are adopted discomfort in the low back, upper back, and neck will increase.

The second factor that must be considered is the width and depth of the seat pan. When many manufacturers offer a Big & Tall version of seating the tendency is to strengthen the cylinder of the chair from 270 of 500 pounds to accommodate the added weight and then broaden and lengthen the seat pan of the chair. The additional width in the chair reduces contact stress produced by the edge of the chair on the thighs and buttocks. In many cases the deeper seat pan can be problematic, particularly with shorter employees, as the excessive depth may add contact stress to the back of the legs and lead to awkward positioning of the knees and hips.

Solutions

To address the issues present in the low back it is critical to implement solutions that provide full support through the thighs and into the lumbar region of the spine. Two solution options were implemented within this project:

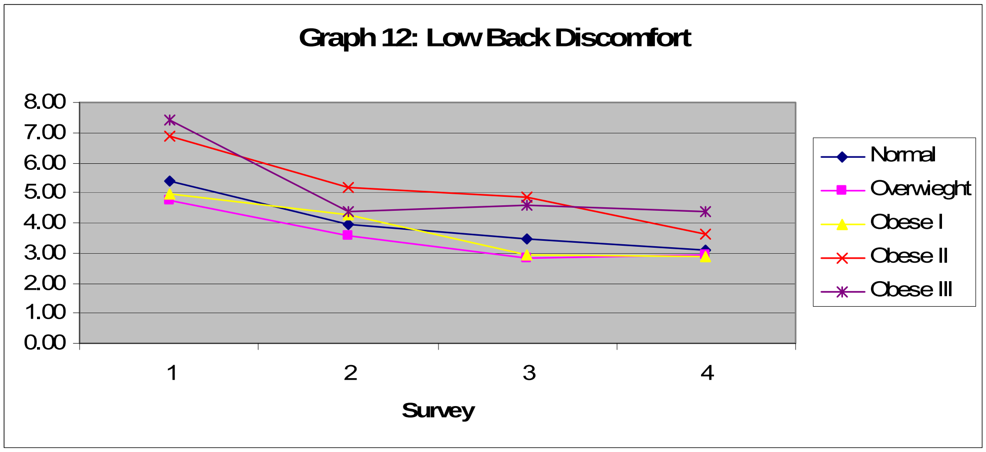
1. The first solution involved ensuring each individual had the correct chair for their size. This process may have included moving employees into the correct size category of the Herman Miller Aeron chair, or providing a Big & Tall chair option for those employees whose weight and size warranted this chair. Only chairs that allowed for proper lumbar support and positioning of employees were recommended.

2. Phase IV and V of the Atlas Ergonomics process define the furniture marking, fitting, and training techniques that were implemented for each employee (see Pg. 6-7). These processes provided a measurable and sustainable approach for positioning employees in their chairs. For overweight and obese employees, the ability to replicate positioning of lumbar support was critical for reducing the strain on the low back.

Results

A review of the discomfort surveys over a 6-month period illustrated improvements for all employees (Graph 12). Obese Class II and III employees reported the highest severity of low back pain within the population, but they experienced a similar reduction in the severity of their symptoms to all other employees (~40% reduction for each BMI class).

The values presented in the fourth survey, which occurred 6 months after implementation of changes, shows that Obese Class III employees were still experiencing a level of discomfort 28% higher than normal weight employees; this gap is fairly consistent from the initial survey through the fourth. The reason for this elevated discomfort level can be attributed to potential issues with the fit of the chair (i.e. depth of seat pan), or to personal stressors related to obesity.



An additional psychosocial factor arose when different approaches were used to assign Big & Tall chairs at two of the test sites. Consider the two seating options which were offered by two of the companies that participated in the study:

Standard Seating	**COMPANY 1**	Big & Tall Seating

Standard Seating **COMPANY 2** Big & Tall Seating

In Company 1, essentially all workers (100%) moved into appropriate Big & Tall seating without hesitation. Conversely, in Company 2 there was significant employee "push-back" against the recommendation for Big & Tall seating (approximately 40%). This push back was more significant in female population versus male populations. Upon interviewing employees it was determined that the push-back was directly related to the difference in the shear presence and magnitude of the seating options offered by Company 2. The chair, in and of itself, had become a cultural label within the environment. This lesson moved beyond the standard engineering approach of ergonomics and highlighted the need to find Big & Tall Seating that is comparable in shape, fabric and appearance to achieve maximum acceptance.

Lower Extremities

<u>Discomfort Trends</u>

Graph 13, 14, and 15 outlines the percent of the call center population reporting Hip/Thigh, Knee, and Foot/Ankle Discomfort, respectively. These finding provide evidence of correlation between lower extremity discomfort and the prevalence of obesity.

<u>Anatomical Considerations</u>

The primary explanation for the relationship between obesity and lower extremity discomfort must revolve around seating, where the possible link is the ability of the employees' current chairs to fit and provide adequate support for obese individuals. The support relates to the anatomical and furniture factors discussed under low back discomfort, as well as the additional factor of seat cushioning. The shape and density of the foam in seating is designed to support the buttocks and lower extremity, and distribute the pressure of the person's weight evenly over the maximum area of the seat. The better the padding can distribute and support the weight, the greater the comfort a person will experience in the seat. If a chair is not designed to handle the weight of an obese individual the distribution of pressure may lead to high stress points, often occurring near the ischial tuberosities (sit bones) or near the side and front edges of the seat (see Figure 3).

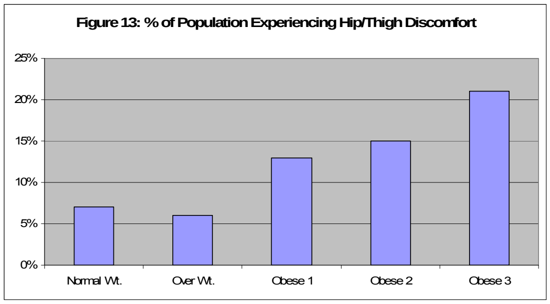


Figure 13: % of Population Experiencing Hip/Thigh Discomfort

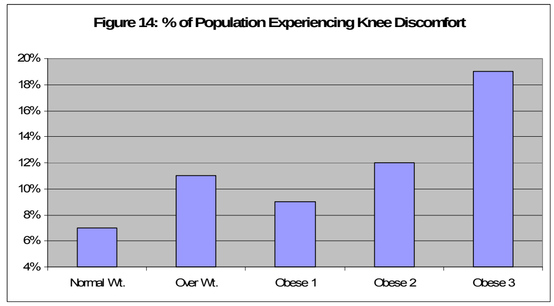


Figure 14: % of Population Experiencing Knee Discomfort

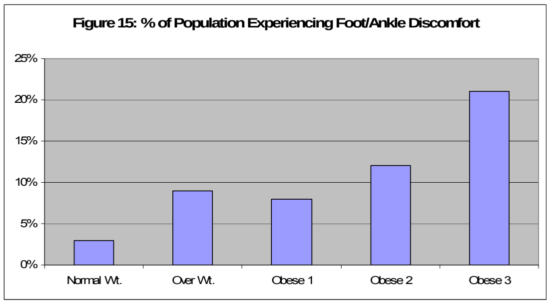


Figure 15: % of Population Experiencing Foot/Ankle Discomfort

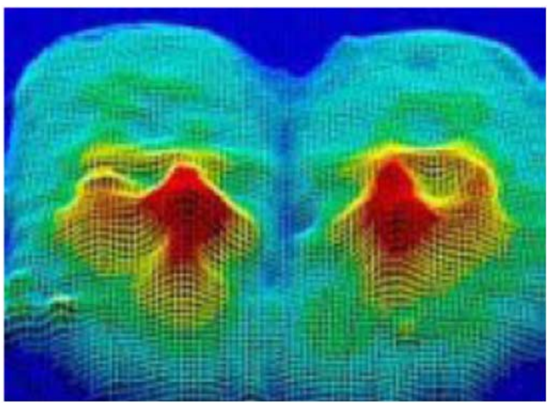


Figure 3: Pressure Mapping of Seated Individual

Solutions

To minimize the stress placed on the lower extremity the solutions focused on proper support and distribution of pressure. Three solutions were implemented within this project to address the lower extremity:

1. Seating was the primary solution that needed to be considered. When identify chairs that were correct for a person's size, the width and depth of the seat were reviewed to ensure full support of the thighs without the presence of contact stress. As the weight of the individual increased it became necessary to Big & Tall chairs to ensure proper cushioning was provided.

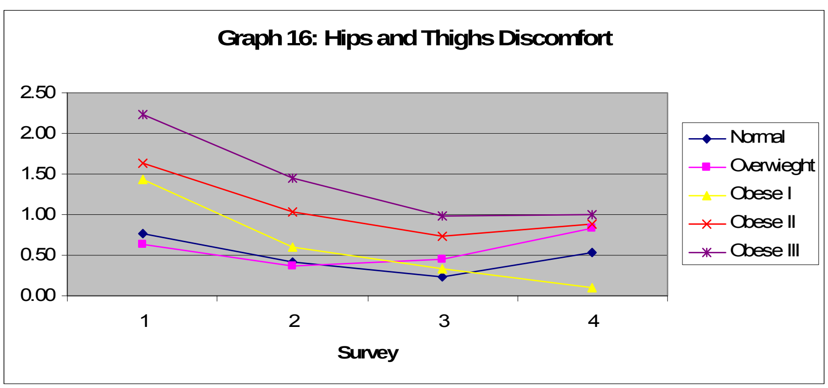
2. A footrest was another simple solution that was used to help support the lower extremity. A footrest allows for control of the pressure placed on the thighs and knees by ensuring the lower extremity does not hang off the edge of the seat. By minimizing the pressure on the back of the knee, blood and nerve supply is not compromised, which improves comfort in the feet/ankles.

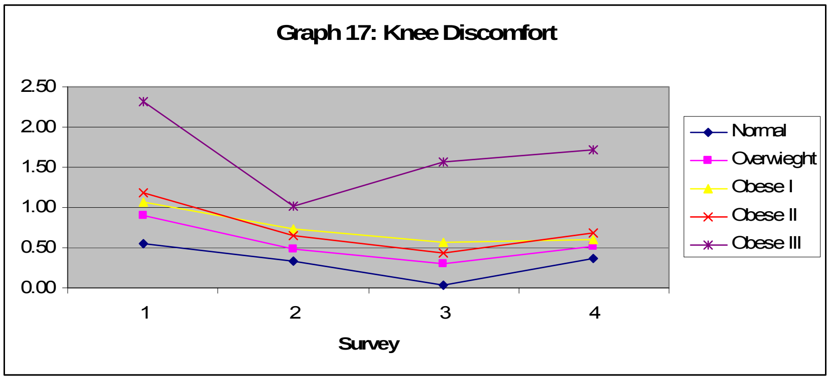
3. Training on proper positioning in the chair is critical to ensure employees set their chair and the appropriate height to minimize stress on the lower extremity. Phase IV and V of the Atlas Ergonomics process define the furniture marking, fitting, and training techniques that were implemented for each employee (see Pg. 6-7). By establishing a set height with the Atlas marking system, employees were able to replicate the set-up provided in their training.

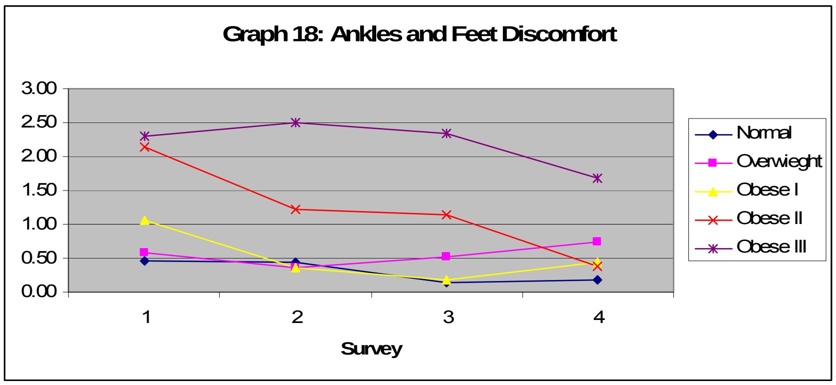
<u>Results</u>

Tracking the progress with the symptoms over time (Graphs 16, 17, & 18) shows that improvements were noted over the course of the study. Similar levels of improvement were found for all employees with respect to the hips and thighs. For the knees, feet, and ankles there tended to be a steady improvement in symptoms for employees except for Obese Class III individuals, whose symptoms tended to fluctuate and stay at a higher level than all other employees.

The primary solutions implemented to assist with lower extremity issues were new chairs (when needed), footrests, and training. These solutions worked well in most cases, resulting in anywhere from 30% to 80% reduction in the average level of discomfort. As improvements were seen for Obese Class I & II employees, it is clear that proper positioning and the effective use of Big & Tall furniture can provide a benefit. For Obese Class III employees the reason for the relative lack of improvement in symptoms for the knee, feet, and ankles can fall to two explanations: 1) the current design of furniture does not adequately address individuals in the Obese Class III category; and/or 2) the personal stressors present in Obese Class III individuals result in symptoms that cannot be completely addressed through ergonomics.







Summary

A prediction could be made at the beginning of this project that obese employees would have higher levels of discomfort due to personal stressors. Further, many would predict that it would be impossible to help obese individuals because their discomfort is due to their obesity and not the workplace. The results of this field study support the first statement, but refute the second.

The data from this project illustrates that overweight/obese individuals are at a higher risk of reporting discomfort. As individuals move from normal to obese classifications of weight the percentage of employees experiencing discomfort and the severity of this discomfort increases. In order to address these individuals effectively, a respectful way of collecting information about height and weight is critical to help find the individuals who need specific products to fit their frame.

The results of this paper have shown that when targeted solutions are employed, the positive results obtained with overweight/obese individuals are similar to those obtained with normal weight individuals for all areas. In many cases the level of discomfort experienced by overweight/obese employees may not decrease to the same level of normal weight individuals; the reasoning for this gap is a multi-factorial issue related to both personal and workplace considerations.

As noted in the Atlas Ergonomics white paper *Product Knowledge and the Effect on Reducing Office Employee Discomfort*, the importance of training is a critical element of the solution process. Given the inherit stress of obesity; the solutions implemented at the workstation must be used consistently and correctly in order to provide maximum benefit. Further, with overweight and obese individuals having higher levels of relative discomfort, the importance of using the available solutions is amplified.

It is obvious from the results that equipment that is currently on the market can help overweight/obese individuals achieve more comfortable and supported postures, but the question is can we do more? A review of the current Business and Institutional Furniture Manufacturer's Association (BIFMA) standard for office furniture design suggests that it may be time to consider revising the values for the 5th and 95th percentile for product design. BIFMA and office furniture manufacturers need to consider revising certain chair characteristics based on the changing needs of a growing population of obese/overweight individuals. For example, a critical gap exists for obese individuals who are below 5'1" in stature – finding a chair for this individual is almost impossible.

A further issue arises from a legal perspective with respect to providing solutions for overweight and obese employees. Many employers may be unaware of the design standards for office chairs; placing an employee in standard seating that is not designed to safely handle their weight may create a liable situation if an injury occurs. Realistically and practically, this issue needs to be addressed all the way back up the design chain to BIFMA and the furniture manufacturers. The design of products by furniture manufacturers for the overweight/obese population needs to be standardized to ensure that the current population is adequately and safely addressed.

Given everything that is presented in this paper about the impact of obesity on employees in the office environment, the most profound mistake that can be made is the "do-nothing" attitude. As with any ergonomic situation, the answer is fitting the job to the person. This task falls on everyone from manufacturers to designers to employers.

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Appendix A: Body Mass Index (BMI)

Body Mass Index (BMI) is a common measure expressing the relationship (or ratio) of weight-to-height. It is a mathematical formula in which a person's body weight is divided by the square of his or her height (i.e., wt/(ht). The BMI is more highly correlated with body fat than any other indicator of height and weight. BMI has gained international acceptance as a meaningful measure of obesity because of its association between BMI and adipose tissue, BMI and disease risk, and BMI and mortality.

BMI is a good tool, but not a perfect tool when it comes to predicting weight classifications. It tends to over report the BMI in athletic populations due to the relative density of lean body mass (skeletal muscle). BMI can also be misleading in older adults who may have a BMI value in a healthy range despite having muscle wasting and excess adipose tissue. (Baumgartner, 2000)

An example of a BMI chart that can be used to estimate an adult's BMI index is provided below. As an example, given a male that is 6'0" tall, the person's height is found on the left side of the BMI table. The next step is to move right across the table until the weight of the person is found (e.g. 177 lbs). Moving up to the top of the chart from this intersection, the BMI for this individual is 24.

BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	50+
Height (ft-in)	Body Weight (lbs)																																
4'10"	91	96	100	105	110	115	120	124	129	134	139	144	148	153	158	163	167	172	177	182	187	191	196	201	206	211	215	220	225	230	234	239	
4'11"	94	99	104	109	114	119	124	129	134	139	144	149	153	158	163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238	243	248	
5'0"	97	102	108	113	118	123	128	133	138	143	148	154	159	164	169	174	179	184	189	195	200	205	210	215	220	225	230	236	241	246	251	256	
5'1"	101	106	111	116	122	127	132	138	143	148	153	159	164	169	175	180	185	191	196	201	206	212	217	222	228	233	238	243	249	254	259	265	
5'2"	104	109	115	120	126	131	137	142	148	153	159	164	169	175	180	186	191	197	202	208	213	219	224	230	235	241	246	252	257	262	268	273	
5'3"	107	113	119	124	130	135	141	147	152	158	164	169	175	181	186	192	198	203	209	215	220	226	231	237	243	248	254	260	265	271	277	282	
5'4"	111	117	122	128	134	140	146	151	157	163	169	175	181	186	192	198	204	210	216	221	227	233	239	245	251	256	262	268	274	280	285	291	
5'5"	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	
5'6"	118	124	130	136	142	149	155	161	167	173	180	186	192	198	204	211	217	223	229	235	242	248	254	260	266	273	279	285	291	297	304	310	
5'7"	121	128	134	140	147	153	160	166	172	179	185	192	198	204	211	217	223	230	236	243	249	255	262	268	275	281	287	294	300	306	313	319	
5'8"	125	132	138	145	151	158	164	171	178	184	191	197	204	210	217	224	230	237	243	250	256	263	270	276	283	289	296	303	309	316	322	329	
5'9"	129	135	142	149	156	163	169	176	183	190	196	203	210	217	223	230	237	244	251	257	264	271	278	284	291	298	305	311	318	325	332	339	
5'10"	132	139	146	153	160	167	174	181	188	195	202	209	216	223	230	237	244	251	258	265	272	279	286	293	300	307	314	321	328	335	341	348	
5'11"	136	143	151	158	165	172	179	186	194	201	208	215	222	229	237	244	251	258	265	272	280	287	294	301	308	315	323	330	337	344	351	358	
6'0"	140	147	155	162	170	177	184	192	199	206	214	221	229	236	243	251	258	265	273	280	288	295	302	310	317	324	332	339	347	354	361	369	
6'1"	144	152	159	167	174	182	189	197	205	212	220	227	235	243	250	258	265	273	280	288	296	303	311	318	326	333	341	349	356	364	371	379	
6'2"	148	165	164	171	179	187	195	203	210	218	226	234	241	249	257	265	273	280	288	296	304	312	319	327	335	343	350	358	366	374	382	389	
6'3"	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	280	288	296	304	312	320	328	336	344	352	360	368	376	384	392	400	
6'4"	156	164	173	181	189	197	205	214	222	230	238	246	255	263	271	279	288	296	304	312	320	329	337	345	353	361	370	378	386	394	403	411	