TerranearPMC Safety Share

Week of May 27, 2014 – Anthropometry

During the first half of the 19th century, Germany produced one of the greatest composers in Western Civilization: Robert Schumann. He was a pianist with a very promising career; but unfortunately, as the story goes, he decided to help increase his dexterity in his fingers through his own invention that was designed to hold back one finger while he exercised the others. Another story suggests that in an attempt to increase the independence of his fourth finger, he had a procedure to surgically separate the tendons of the fourth finger from those of the third. MISTAKE! As a result of his desire to improve his finger dexterity and become the greatest pianist in Europe, his zealousness caused his own demise as he permanently ruined his right hand's ability to play at the virtuoso level that he so fervently wanted to attain.

As anybody that has ever taken up a musical instrument knows, practicing is more than just important. Going over scales and other "boring" rudiments, is necessary so as to improve and adapt one's anthropometric features (anthropometric features?!...hold on, we'll get to this in a bit!) to the intricate designs of their chosen instrument. Whether one is playing the guitar, piano, drums, tuba or flute; getting your body conditioned so that one can make music takes considerable time and patience. The design of musical instruments have changed over the years (just look at the guitar from the 1950's to now!) and to help improve the human ability to become more versatile as well as to meet the changing musical styles (including electric pianos, guitars, synthesizers, etc.) the musician must constantly work to maintain his/her dexterity as it pertains to making music on his/her chosen instrument.

Now, back to anthropometric features!....Anthropometry is the science that defines physical measurements of human beings as it pertains to a person's size, form, and functional capacities. As applied to the field of occupational safety and health, it is the study of injury prevention, where anthropometric measurements are used to evaluate the interaction of workers with tasks, tools, machines, vehicles, and personal protective equipment. This is particularly relevant with regards to determining the degree of protection necessary when performing certain job tasks where appropriate hazard exposure controls are necessary.

Designs that are incompatible with normal anthropometric measurements of a workforce could result in undesired incidents. The misfit of a heavy equipment cabin to a worker could produce operator blind spots that expose workers on foot to strike-by injuries. Inadequate length or configuration of seatbelts could lead to non use of seatbelts, which will affect post-crash survivability. Inadequate fit of personal protective equipment (PPE) will not provide workers with sufficient protection from workplace hazards. One example of a misfit of PPE to human anthropometric features is respirator fit testing. Have you ever known of a fellow-worker that could not get properly fit tested with a respirator? It is not that there is anything wrong with the employee, but due to the person's particular physical features, such as high or low cheek bones, or a large proboscis (nose) or a protruding or recessed chin, their attempt to get a proper seal with a respirator will not result in a satisfactory test. As it turns out, today's

respirator selection includes “loose-fitting” powered air purifying respirators, which will allow those persons who cannot get properly fit tested to have proper protection when involved with airborne contaminants. This is one way current technology has been able to design a piece of equipment that will take one’s anthropometric features into consideration.

So, once we understand our individual anthropometric features, the task is to redesign our tools and equipment to better fit us. In the case of Robert Schumann, he unfortunately tried to reconfigure himself.

We are all different; even though we have two arms, two legs, knees, feet, and head with eyes, ears and nose, all these singular features vary and therefore, what may fit fine with one person does not conform well for another. Currently, existing data on the size and shape of industrial workers is sparse, at best. Because of the lack of anthropometric data for the general worker population, safety researchers have generally had to rely on data drawn from studies of military personnel, most of which was collected during the 1950s through the 1970s. However, because of the substantial anthropometric variability among our diverse workforce populations, this data cannot provide us with the information necessary for today’s workplace.

Diversity within our country, as well as new roles for women in the workforce, requires body size data for designing adequate workplaces, systems, and personal protective equipment. In the past, variance in body dimensions was typically reported in terms of average dimensions and standard deviations for various body segments. This approach was successful in obtaining general, broad parameters for the sizing of PPE but was deficient in producing detailed fit information necessary for workplace equipment, as well as PPE, and other important workplace design features.

Anthropometric design procedures must take into consideration the large variation in dimensions from person to person and from population to population. In the research area of applied anthropometry, new initiatives have begun to collect 3D anthropometric data that will ultimately result in a better fit between workers and their tools, systems, and work environments.

While we all have striking physical similarities, we are individuals with countless variations that make us who we are. We live in an age where we can celebrate our diversity, which when we allow ourselves to appreciate our differences we can excel both as individuals and as a group. We need to recognize our individual strengths for which we can be viable contributors. And on the other hand, we need to understand where the various tasks for which we are assigned may present physical challenges and to recognize how such operations may require modifications to fit our anthropometric features, rather than trying change ourselves. By doing so, we have a the ability to make equipment and materials better suited for us and prevent serious injuries to ourselves and fellow-workers.

A person who is nice to you but not nice to the waiter is NOT a nice person (and I wouldn’t take a bite of his sandwich!)