



Hidden Benefits of Shorter, Smaller Bodies

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Commentary

ABSTRACT

The advantages of smaller body size represent a major gap in our knowledge among a variety of disciplines, including medicine, public health, education, athletics, ecology and military science. The aim of this paper is to summarize several relatively unknown advantages related to shorter, smaller bodies. For example, shorter, smaller individuals are stronger pound for pound, have faster reaction times, and are more agile. While we frequently admire taller people for their leadership qualities, many short people have also been great leaders and successful business people throughout history. In addition, a wealth of research exists indicating that within similar environments, shorter, smaller people are healthier and live longer. Shorter people also help preserve our food, drinking water, resources and environment. The significance of this paper is that it provides factual information showing that it is unfair and unscientific to promote negative images of shorter and average height individuals as is commonly done in our world.

Keywords: Chronic disease; growth; environment; health; longevity.

1. INTRODUCTION

From early childhood, we have been conditioned to think taller height is desirable. It is doubtful

that any parents hope their children will grow up on the short side of the bell curve. Our adoration of taller height goes back many years and originally made good sense. During our Cro-

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Magnon days, we felt threatened by bigger animals because they were stronger and more dangerous. Likewise, individuals who were taller and bigger presented a better configuration for protecting their families from human and animal predators. However, unless we return to our early lifestyle, an objective view, based on facts rather than social bias, indicates that there are many personal and environmental advantages for humans to be shorter and smaller.

1.1 Aims and Significance of this Paper

One aim of this paper is to elucidate the benefits of shorter, smaller people so that society can eliminate its bias against smaller stature. Another aim is to recognize that people of all heights can make major contributions to improving our lives. The significance of this paper is that it presents information that is relatively unknown to most of the world's populations and can lead to changing modern beliefs that promoting a world of taller, heavier people has risks related to health and human survival. The increase in height and weight during the last century has led to an epidemic of chronic diseases [1] that will result in future medical costs that cannot be sustained by our civilization. The material in this paper challenges the traditional medical belief that promoting rapid growth and taller height is healthful.

1.2 How Shorter Height is Defined

When we talk about height, the question arises as to what is a short, average or tall person? Height is a relative description of our anatomy. It depends on what the median height is for one's community. In the US, the median height for young males is about 5'10". For Japan, it is a little over 5'7".

If a person is shorter than 2 standard deviations below the median height for his/her age, the individual is considered short. Individuals below the mean and within the 2 standard deviations are considered shorter than average. When a person is taller than two standard deviations above the mean, he/she is defined as tall. Of course, median height has varied over time, with shorter people more common in previous decades and centuries compared to today.

1.3 Disadvantages of Shorter Height

In contemporary society, shorter people tend to make less money and have poorer success in

various activities [2]. Lower classes also tend to be shorter than upper economic classes. A disadvantage of being in a lower socioeconomic bracket is a higher mortality rate compared to taller, higher income groups. People in lower economic classes also have higher stress levels compared to well off people [3]. When compared to taller people of similar build and physical activity levels, shorter people tend to have smaller muscles and are therefore inherently weaker. Their shorter limbs are also related to slower running and swimming although shorter, leaner people make better long-distance runners [2].

1.4 Psychological Impact of Shorter Height

There are many causes for psychological problems among children of all heights. However, one unnecessary cause is our view that shorter children are less mature compared to their taller peers. As a result, shorter children are less likely to be selected for leadership roles or sports. Awareness that they are less appreciated than their taller peers can have ramifications for their mental well-being. For example, research has shown many shorter people tend to experience feelings of inferiority, weakness, incompetence, and paranoia. Depression can also be related to shorter height [4].

1.5 Advantages of Taller Height

An important advantage for taller men is that women generally are attracted to greater male stature [5]. This favoritism is no doubt due to our society's bias that favors taller height. Another factor may also be due to female evolutionary programming to favor men who appear to be able to protect them and their children more effectively. This protection was important in earlier times but today, physical strength plays a much smaller role because modern weapons are available to men of all sizes. Another explanation for this favoritism is that taller men tend to be more successful than shorter men. Thus, economic power has probably replaced physical strength in today's society.

While the preceding facts appear to end the discussion as to the advantages of being shorter and smaller, there is a lot more to the story. The ramifications of increasing height and body weight have been studied for over 40 years. During this period a systematic effort looked at human ageing and its relation to height and

energy consumption, and Storms, Elrick, and Samaras published numerous papers on human ageing and height [6-11]. Subsequently, they looked at physical performance and the impact of height and body size on resources and environment. Besides articles and chapters on these areas, a book was published by Samaras [12] in 1994 and Samaras, Bartke and Rollo [13] published a second one in 2007. These books describe the many advantages of shorter, smaller body size. A summary of their findings follows.

2. HEIGHT, WEIGHT AND LONGEVITY

The health risks of higher body weight are widely reported by a majority of studies. For example, a recent study found that the ideal body mass index (BMI) was 20-22 kg/m² for healthy, non-smokers tracked over the long term [14]. The finding was based on a review 230 studies involving almost 4 million deaths. In addition, a comparison of baseball player BMIs during playing careers and longevity showed that for the same height, a lower BMI (or smaller body size) increased longevity [6]. In addition, smaller total body mass is also a factor; e.g., "...biologists are firmly convinced that a small body size is preferable for longevity" [15]. In addition, many longevity researchers have reported that within a species, smaller individuals tend to live longer [11]. This is obvious to most animal lovers who are aware that smaller breeds of dogs live longer than bigger ones.

Over 75 papers have found that shorter, smaller people live longer. These findings cover various populations throughout the world. For example, Storms and Samaras researched deceased veterans and baseball players and found that they both showed that shorter individuals lived longer [6]. In fact, they found that individuals lose about ½ a year per centimeter increase in height. They also found that White California men were taller than women by 9% and had a 9% lower life expectancy at birth [6]. When two cohorts of men were compared, the taller cohort was 4.5% taller and had a 4.4% lower longevity compared to the shorter cohort. Thus, height was inversely related to longevity for taller males vs. shorter females and taller males vs. shorter males. Supporting findings include a study by Miller [16] who found that when he compared deceased men and women of the same height, their ages at death with almost identical. Data from animal studies also show males and females have the same longevity when adjusted for differences in body weight [13]. It thus appears that the reason

women live longer than men is primarily related to the difference in height and associated body weight.

In addition to the preceding findings, over 25 independent researchers have found that shorter people have lower all-cause mortality or live longer. For example, researchers studied deceased Ohio residents [16], elderly Japanese men in Hawaii [17], retired West Point graduates [18], a cross-section of the US population [19], deceased Polish men and women [20], deceased males in a Sardinian village [21] and retired basketball players [22].

While many researchers are reluctant to accept the longevity studies showing shorter people live longer, cancer studies show a strong positive correlation between height and cancer risk. In fact, Nunney, et al. [23] reported that the evidence shows "conclusively" that greater height is a risk factor for most cancers. The biological explanations for the greater longevity and lower cancer of shorter people are discussed in a paper that covers 36 biological parameters or factors that explain the relationship [10]. For example, studies have found that cell replication is limited during a lifetime [24]. Since a taller, larger body requires more cells, it uses up more cell replications to create and maintain this larger body. In addition, studies have shown that shorter people have more potential cell replications available and longer telomeres at old age compared to taller people [25,26]. Other factors are that shorter, smaller people have lower levels of insulin and insulin growth factor-1, and lower levels of these hormones are related to greater longevity [25]. Shorter people also have lower levels of DNA damage [27]. In addition, shorter people tend to have higher incidence of two longevity genes: FOXO3 [17] and Laminin, Alpha 5 [28]. Of course, if shorter people suffer from rapid growth during childhood, childhood trauma, overweight and poor nutritional and lifestyle practices, they may not benefit from their lower height [7,8].

The difference in longevity between tall and short men is no different than the difference between men and women. However, this does not mean that all tall people are condemned to shorter lives. Many tall men live longer than the average short male. In addition, many men outlive the average woman. Keep in mind that height represents an estimated 10% of the longevity picture and many factors play a role on how long an individual will live, such as genetics, childhood trauma or illness, body mass index, nutrition,

medical care, socioeconomic class, stress levels, smoking, and physical activity.

Note that mortality studies in the past have shown taller people have the same or lower death rates. However, most mortality studies do not look at homogeneous populations, adjust for childhood illness, and or track their subjects until they all die. Also, adjustments may not be made for the fact that many short people are relatively overweight compared to taller people. Another difference is that most of the studies referenced in this paper looked at deceased populations or tracked cohorts into advanced ages, such as baseball players, elderly Japanese males and West Point officers.

3. ATHLETIC ABILITY

In the US, our favorite sports involve tall athletes. These include basketball, football, and baseball. However, there are many sports where the average height is rather short; e.g., gymnastics, figure skating, long-distance running, weightlifting, diving, certain skiing events, boxing and wrestling. Of course, within the weightlifting and wrestling sports, there are large individuals because of the different weight classes involved. Many martial arts fighters were relatively short, such as Jet Li and Bruce Lee, but it depends on the weight classification as in boxing and weight lifting.

A Finnish study [Sarna, email, 4/6/1999] found that the athletes in several sports were shorter than the average military recruit. In order of descending height, they included boxers, long-distance runners, cross-country skiers, wrestlers, and weightlifters. How small can athletes be? Simone Biles, the Olympics gold winner gymnast, was 4'8", and the famous Olympics gold winning weightlifter, Suleymanoglu, was 4'10". In the recent winter Olympics, Red Gerard at 5'5" won the snowboard gold medal. Another snowboard silver champion was Ayumu Hirano (5'3"). The lower height of weightlifters is surprising but appears to be valid. Suleymanoglu is not an isolated example. British, Russian and Finnish weightlifters in the recent past have been relatively short. For example, it was reported (Sarna, email, 4/6/1999) that world class Finnish weightlifters averaged 2 inches shorter than the average military recruit.

4. ACHIEVEMENTS OF SHORT PEOPLE

Short people have been high achievers since the ancient Egyptians, Greeks and Romans. These

populations averaged 5'5" to 5'6". Their civilizations are remarkable because they didn't have thousands of years of acquired knowledge to support their work as we have today. During the Renaissance period of 1300 to 1600, Europeans produced great accomplishments in architecture, science, literature, music and art. The people of this period were shorter than we are today and were actually getting shorter during this entire period. More recently, many successful businessmen were short, including Andrew Carnegie, Aristotle Onassis, Ross Perot, David Murdock, and Michael Bloomberg. In science, Stephen Hawking, Albert Einstein, Robert Millikan, Albert Michelson, Buckminster Fuller, Barbara McClintock, and Charles Steinmetz are examples of relatively short men and women.

In terms of music, Wolfgang Mozart, Gustav Mahler, Ludwig Beethoven and Igor Stravinsky were on the short side. Alexander Pope, Tennessee Williams, William Faulkner, F. Scott Fitzgerald, Upton Sinclair, Voltaire, and John Keats were also relatively short. Famous short artists include Pablo Picasso, Juan Miro, Mark Chagall, and Michelangelo.

The preceding is not intended to show that shorter people are more creative or productive than average or taller people. The discussion focused on shorter high achievers because their smaller height tends to be ignored while tallness is often mentioned in relation to successful achievements. The truth is that all humans have the same potential to contribute to society depending on their socioeconomic status as children, adult support during their growth, focus, motivation and work ethics.

5. LOWER IMPACT ON RESOURCES AND THE ENVIRONMENT

A world of larger people presents a burden to the planet as well as to human civilization. Bigger people require more food, water and energy. They also produce more wastes that have to be disposed of in our land, water and air. For example, Dannenberg, a Centers for Disease Control and Prevention researcher, found that a mere 10-pound increase in the average American would increase airline fuel consumption by 350 million gallons/yr [29].

Most people don't realize that if we compare two people of the same body proportions with a 10% difference in height, the taller individual will weigh 33% more than the shorter one [13]. Thus, if

people in the US increase by 10% in height and maintain the same body shapes, the impact on resource needs and pollution will increase exponentially. For example, a US population of 10% taller people would have the following annual impact on resources, energy, air and water quality, etc.

1. Food needs would increase by 50 million tons
2. Water needs would increase by 30 trillion gallons
3. Farmland needs would increase by 70 million acres
4. Energy needs would increase by 15 quadrillion BTUs
5. Garbage production would increase by 30 million tons
6. Mineral, metal and plastic needs would increase by 400 million tons
7. Carbon dioxide production would increase by 1 billion tons
8. The cost for all of the above would increase by 1 trillion dollars.

Of course, if we only look at obesity without a change in height, the costs would be similar. Thus, without becoming shorter, we could lose a lot of weight to help preserve our resources and environment. However, a diet that would keep pregnant mothers lean would reduce the infant's birth weight with a subsequent reduction in adult height and weight. This has been done in Japan since the late 1980s [30]. For example, Japanese women reduce their caloric intake upon pregnancy to avoid gaining weight. As a result, the lower birth weight infants tend to grow shorter as adults. While the researchers of this study think this may be harmful to health, the facts are that in 2017, the Japanese had the world's second lowest infant mortality and longest life expectancy.

While many studies have warned about the dangers of low birth weight, the authors of a large study concluded that low birth weight is related to lower long-term risk of overweight and high birth weight promotes overweight [31]. Their conclusions were based on the review of 66 studies and 25 countries. Of course, mothers need to consult their physicians and nutritionists to assure adequate nutrition and avoidance of harmful effects to the mother or child.

6. CONCLUSION

Promotion of smaller human size does not mean we all have to be the same height. A relatively

small percentage of taller people is not a problem. However, smaller people, stopping population growth, and reducing consumption of many environmentally damaging goods is a three-pronged approach that could save the planet for future generations. Another step is to reduce the average weight of our present population. In addition, educators need to emphasize that taller height is not a badge of achievement and that we should focus on the value of individual rather than his or her height. Based on the longevity research presented, paediatricians and nutritionists also need to re-evaluate the amount and type of food that infants and children should receive for optimum health. The public also needs to be informed of the benefits of smaller human size so they don't think they are benefiting their children by promoting height through over nutrition or genetic engineering.

ETHICAL APPROVAL

The author hereby declares that no experiments have been conducted in the preparation of this paper.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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