The Differences Between Women and Men: Anatomical, Physiological, and Perceptual Aspects and Their Impact Throughout Life

Abstract

This article will review the changes that have occurred in women's status in sports up to the present day. The differences between genders will be described from anatomical (structural), physiological (functional), and conceptual (perceptual) perspectives among both genders. It's worth noting that despite the progress in women's achievements and increased awareness among those involved, there are still (and likely will continue to be) gaps between the genders. Facts show that as women succeed in integrating into more sports fields and branches, the gaps will decrease both in achievements and in social positions.

In ancient Greece, the Olympics were intended for men only (existing documentation does not mention women as active participants in official games), and even with the revival of the Olympic Games, Pierre de Coubertin, who conceived the idea and renewed the Olympic Committee in 1892, claimed that "An Olympiad with females would be impractical, uninteresting, unaesthetic and improper." In 1928, the New York Times described the women's 800-meter race at the Amsterdam Olympics (1928) as "the coal track was strewn with miserable maidens in excruciating distress." The sight was apparently so painful and touching that participation in this event was banned for women. Another thirty-two years passed before women were allowed to compete in races longer than 200 meters. The situation changed throughout history; citizens of ancient Sparta were more enlightened in this respect than modern societies. They encouraged women to engage in sports, believing that healthy and strong women would give birth to healthy and strong babies.

The influence of the Church and French culture (according to which woman's place was to serve as help to her husband, preserve morality, and ensure racial continuity) gave way to the influence of feminist movements for women's liberation and gender equality, and thus more and more sports branches opened to women. Today, there is hardly an Olympic sport that isn't open to women's competitions, and there are even several sports where participation is mixed for both genders. There still isn't complete equality between genders (at the Sydney Olympics, 38% of participants were women), and there are still sports where gender distinction exists without real justification, but

undoubtedly, change has occurred since de Coubertin's days until today. Comparisons of physical abilities and performances between women and men were not conducted in the past under equal basic conditions. Women led different lifestyles (usually less active), received less training, less professional help, less competitive experience, and less appropriate clothing and equipment. Physical training was considered harmful to women's bodies, and female athletes had to rely solely on their natural ability.

Since the beginning of the 1970s, there has been a tremendous increase in girls' and women's participation in physical activity and sports. Training programs were increased and expanded to prepare women in the best way to participate and succeed in competitive sports. No one is deterred today by the sight of female athletes crossing the finish line, regardless of how sweaty, breathless, or suffering they appear. Over recent decades, women have steadily run, jumped, swam, and cycled their way to the forefront of world sports.

As opportunities in competitive sports become more equal, the gap between women's and men's performances decreases. In 1992, Dr. Brian Whipp and Susan Ward from UCLA Medical School tried to assess whether and when women would catch up to men in various running events. The researchers analyzed the development of world records since the beginning of the century and found that the rate of female improvement was faster than male improvement. Accordingly, they predicted a shared marathon record (2:02 hours) before 2000 and joint running events in the Olympic Games by 2040. Really?

This review will deal with the differences between genders from anatomical (structural), physiological (functional), and conceptual (perceptual) perspectives, in an attempt to trace the roots of differences in physical ability and sports achievements.

The differences, more anatomical than physiological, generally work in favor of men in sports requiring size and strength. Many of these differences can be eliminated through physical training. The physiological data of a trained woman are higher than those of a less trained man. Furthermore, inter-gender differences are not relevant in sports, as women compete with their peers and not with men. The physical dimensions of an adult male are 7%-10% larger on average than those of an adult female. There is very little difference between boys and girls until the beginning of puberty, a period when girls are temporarily taller than boys. This is because the puberty period in girls begins at an earlier age than in boys (11 versus 13). The later growth spurt in boys and their longer period of rapid growth cause them to grow taller, with broader shoulders, narrower pelvis, and longer limbs than girls. Under the influence of the female sex hormone, estrogen, girls have narrower shoulders, wider hips relative to their height, and a greater carrying angle of the elbows, which constitutes a biomechanical disadvantage in running and throwing. Estrogen is also responsible for excess fat storage in girls during puberty, while testosterone causes muscular development in boys.

Adult women have twice as much fat tissue as men, when expressed as a percentage of total body weight. Body composition and types of fat - human body composition is determined based on the ratio between three main components: muscles, fat, and bones. There are significant differences between the two genders in the ratio between these three components, hence the difference in appropriate fat percentages for men versus women. Determining fat percentage ranges by gender does not indicate uniform classification, especially among athletes engaged in different fields. There are two types of fat in the body, and it's important to understand the role of each.

Essential fat - This is fat found in internal organs such as bone marrow, heart, lungs, liver, and more. This fat is essential for proper body function. In women's bodies, there is additional essential fat in the female reproductive system. This fat is very important in preparing the body for pregnancy and childbirth and maintaining proper hormonal activity. Women also have fat in the breasts (should not contribute more than 4% of body weight). The role of this fat is in maintaining proper biological-physiological activity of the body, and therefore it's important not to damage these reserves. This is one of the reasons why women don't "succeed" in reaching the same low-fat percentages as men in bodybuilding.

Fat reserves - The second type is found in fat tissues themselves. Fat tissue from a nutritional perspective provides energy and contains 83% pure fat, 2% proteins, and 15% water. Fat reserves include visceral fat located in the abdominal cavity that protects internal organs, surrounds the digestive system, and protects against trauma, blows, or external pressures. The additional type of fat is subcutaneous fat, composed of fat tissue located under the skin layer and providing protection, insulation, and body temperature maintenance. Women and men have similar total amounts of fat in terms of fat reserves, in a state of normal body weight.

Men have greater muscle mass, and therefore greater overall strength, about 45%-65% in the upper body, and about 25%-30% in the lower body. When expressing strength relative to body weight, the gap narrows to just 5%-15%. Finally, muscle strength relative to cross-sectional unit is similar in both genders. In the distribution of muscle fibers into red-slow (ST) and white-fast (FT) fibers, there is no difference between women and men, but the cross-sectional area of the fibers is larger in men, which gives them a decisive advantage in muscle strength.

Women are more flexible than men in most parts of the body. This difference stems from a higher basic level of the hormone relaxin in women. This hormone softens the tissues connecting the muscular system to the skeletal system and lengthens them. Men have one liter more blood than women and higher hemoglobin concentration (15.8 versus 13.7 grams/100 ml blood). Heart and lung dimensions are larger in men,

therefore their cardiac output and lung ventilation exceed those of women. In women, resting heart rate is slightly higher, but maximum heart rate is determined by age and is identical in both genders.

The accepted measure for maximal aerobic capacity is VO2 max (maximal oxygen consumption) - the maximal volume of oxygen the body can utilize in one minute. The difference in VO2 max between women and men is around 50%-60% in units of liters oxygen/minute (absolute oxygen amount), 25%-20% in units of ml oxygen/kg body weight/minute (oxygen amount relative to body weight), and only 5%-10% when the unit of measurement is ml oxygen/kg LBM/minute (oxygen amount relative to lean body mass).

Men have higher anaerobic capacity, mainly due to their ability to use more anaerobic processes while producing a larger amount of lactic acid. The concentration of enzymes responsible for anaerobic capacity in muscle is similar in both genders, but women usually have less muscle tissue.

The anatomical and physiological responses to physical training are identical in adults of both genders and include decrease in fat percentage, increase in muscle mass, and significant improvement in the aerobic system. The degree of improvement depends on the trainee's starting point, genetics, and type of training. Training affects the blood lactate accumulation threshold (OBLA), utilization of carbohydrates and fats, movement efficiency, and cardiovascular and respiratory systems.

Physiological differences between genders can be significantly reduced, and some anatomical ones as well, through appropriate training in terms of frequency, duration, and intensity. It's very likely that the gap between women's and men's achievements will continue to narrow in the future. All this, up to the possible limit of personal genetic potential exploitation, a limit where the true differences between genders will be expressed.

In sports where strength is a main component, and androgenic (male) hormones have a decisive influence on sports achievement - a larger gap between genders will be maintained. In sports where strength is not a main component, and competitors are required to have high endurance, low body weight, or extensive flexibility, the gap between genders will narrow and might even disappear completely. We can only wait and see if Whipp-Ward's prediction regarding gender equality will come true. On second thought, perhaps such comparison isn't necessary at all, because comparing women's sports to men's is like comparing boxer Mike Tyson to chess player Vladimir Kramnik: both were crowned world champions, but none of us expects them to compete against each other.

From a conceptual perspective, we witness gaps in thinking and perception among both genders that are manifested in the choice and engagement in both recreational

and competitive sports. Despite the abundance of physical activities offered to the general population and variety of sports classes in both competitive and recreational sports, girls tend to engage in physical activity less than boys and choose activities traditionally perceived as suitable for girls, such as gymnastics, dance, ballet, aerobic exercise, and body shaping, and less in fields perceived as more "masculine," such as basketball, football, judo, boxing, and muscle development, or in fields currently perceived as suitable for both genders, such as swimming, tennis, cycling, and more.

In studies where girls and boys were asked about their motivations for engaging in sports, it was found that boys want to improve their physical fitness and strength and develop muscles, while girls want to maintain low weight and shape their body, and also improve physical fitness (Koivula, 1999). Children engage in physical activity with the aim of improving their appearance and feeling more "masculine" while increasing muscle mass in the shoulder girdle and legs area. Girls engage in physical activity with the aim of becoming more "girlish" while sculpting the buttocks and thighs areas (Pinchas, 2019).

Where do these differences come from? Feminist writer Simone de Beauvoir said already in the middle of the last century that a woman is not born a woman but learns to be one. In these words, the writer did not intend to ignore the biological differences existing between men and women but argued that a very large part of our perceptions regarding roles and behaviors appropriate for men and women is not related to biology but to culture. Society and culture dictate to us the behavioral norms appropriate for each gender, including sports behavior.

A woman engaging in power and physical contact sports, such as football, basketball, boxing, or muscle development, is perceived as not "feminine." The main role that society designated for women is to bear children and care for them on one hand, and to be a sexual object for men's fantasies and pleasures on the other hand. Therefore, society prohibited women in the past and still doesn't encourage them today to engage in too forceful sports that might harm their fertility and childbearing ability, and on the other hand, society encourages physical activity that will contribute to a sexy appearance that will attract men.

The male world encourages women to be thin to take up little space, to be quiet, to move and speak gently, and to adorn themselves for men with clothing, makeup, and body and hair styling. Girls learn how they should behave if they want to be "feminine" and find favor in men's eyes in a long process of education, in which all socialization agents participate - parents, kindergarten teachers, teachers, and written and electronic media, all presenting to girls "models" worthy of "woman" and ideals of beauty.

Fashion magazines present us with thin and sculpted models, and from the television screen, we see beautiful, sculpted, and fashionably dressed broadcasters and presenters. Sports programs on sports channels and regular channels frequently show men's football and basketball competitions and interview male sports stars, and rarely show women's team games in these or other sports. Even when the media chooses to present female athletes, it prefers to photograph and interview athletes with sculpted bodies who dress extravagantly and grow long nails. From here we understand how much the media does not lead change in stereotypes but even contributes to their perpetuation!

The health and beauty industry and the fitness and physical activity industry exploit girls' and women's yearning for beauty ideals and sell them products, diets, and physical activity supposed to achieve the desired feminine appearance. Advertisements facing us from every poster, and articles in fashion magazines, women's newspapers, radio, and television try to convince women that aerobic exercise or spinning bike exercise will cause rapid weight loss and that exercise at "Studio C" or exercise in the "Pilates" method or other methods, popping up new all the time, will shape the muscles and sculpt the body. Unfortunately, we witness phenomena of plastic surgeries and other kinds of shortcuts promising improvement in physical fitness and appearance.

Gym activity can certainly suit females from childhood to "golden age." Activity in the gym allows training in a comfortable and protected environment (air-conditioned) including advanced equipment adapted to all fitness components and different muscle groups in the body. There is a possibility to isolate relevant muscle groups and strengthen body parts symmetrically. Gym activity is individual and allows progress at a personal pace, where each trainee can be composed of a personal program according to their personal needs.

It is worthy and important to address the psychological dimension when comparing men and women in the context of physical activity, as thinking habits and terminology are fundamentally different. Findings of a new study by researchers Sirit Ben Israel and Erez Hagai from E.H.P company "illuminate the subject of differences between words from a different angle according to findings: each gender attributes different and unique meaning to words. The word 'competition' raised the association of 'victory' in men while women wrote 'difficult'. The meaning according to them is that when a man hears about competition he fills with adrenaline, while the woman 'withdraws' contracts and fills with concerns. 'Audacity' aroused associations of achievements in men, while women wrote 'weakness, lack of culture'. Meaning men sometimes use breaking existing rules to progress and achieve achievements, while women see it as something immoral and problematic.

Another example they defined as 'enlightening' is the word 'success' - men find power, money and influence, while women are content with less and seek pleasure. The word

'decision' also brought different results. Men said 'worthiness', women said 'deliberation'. For women, the researchers write, speech and language use is less goal-oriented, more emotional. Additionally, a thought pattern emerged which they defined as intimacy versus autonomy. Women constantly act out of a desire to create intimacy and closeness, while men have a constant need to maintain autonomy and their boundaries. Therefore, they explain, when men compete with each other, at the end of the competition they shake hands and move on. Women don't do this, because for them the intimacy has been broken. 'We were amazed to discover how different the language is,' conclude the researchers.

After all these declarations and amazement, it seemed almost necessary to have simple yet deep analysis and research conclusions, or at least observations about the fundamental differences between women and men. Instead, relatively superficial statements were made, as if identifying the sun but insisting it's just the moon, stating: 'This isn't about different genetic structure or divine decree. It's simply about different education that has trained us, women and men, into certain thought patterns... if we know about these differences we can address them.'

For those who have studied, known, or even delved into the foundations of Judaism, the new research findings weren't surprising. According to Torah perspective, there are two main elements in the human soul from which two reactions or basic approaches to reality stem - these are the feminine element and the masculine element. The feminine element is the aspiration for completeness - even at the expense of progress, and the masculine element is the aspiration for progress - even at the expense of completeness. Or as the researchers found and termed it, a pattern of autonomy versus a pattern of intimacy.

John Gray writes in his book 'Men Are from Mars, Women Are from Venus': 'In the absence of awareness that we are supposed to be different, men and women are constantly in conflicts with each other.' The social revolution of the second half of the 20th century was characterized by a trend to treat men and women equally, educate boys and girls identically, and believe there was no difference between the sexes except for physical differences.

The claim that there is no difference between male and female brains was the fundamental assumption for an approach that advocated absolute equality between the sexes in all tasks and occupations. However, current scientific findings support the determination that men and women are fundamentally different, and attempts by either side to deny this for their own reasons do not align with reality supported by science. Jeri Levy (Professor of Psychology at the University of Chicago, published in Time International): 'When I was young, I believed that 100% of the differences between sexes stemmed from environmental influence. Today, after 20 years of brain research, I

am c-e-r-t-a-i-n that biological differences are at the base of our different behavior.' (emphasis not in original)

Dr. Richard Restak writes in the Washington Post: 'Biochemical differences were found in the brains of men and women indicating important functional differences between male and female brains. Evidence received from recent brain research indicates that the many behavioral differences between men and women are rooted in brain function differences that are biologically inherent in humans.'

In conclusion, the gap between women and men in physical abilities is innate and biological, and justifies, in certain cases, separation in sports competitions between the sexes, for the sake of equal opportunities for both sexes to succeed. Beyond this legitimate distinction that separates men and women in sports competition, one can see that in Israel there exists real discrimination against women in all its aspects: their participation in sports, filling management positions, budgeting, and in giving monetary prizes to winners!

Bibliography:

* Poria, Gal. "His Word-Her Word." *Hidabrut September 2000*. (Hebrew).

* Feigin, Naomi. "Boys to Soccer and Girls to the Garbage Bin": Or Physical Activity and Self-Image of Girls. *Alma: Journal for the Advancement of Women's Status May 2004, Issue 13*. Ministry of Education Culture and Sport. Publications Department. (Hebrew).

* Pinchas, Yigal (2019). *The Complete Guide to Physical Activity in the Gym Third and Expanded Edition*. Israel: Yigal Pinchas. (Hebrew).

* Sagi, Dror https://www.foodsdictionary.co.il/articles/1293

* Yael Dror http://www.ayalot

*National Institutes of Health http://womeninscience.nih.gov/