I built avg_age_diff, avg_height_diff, and avg_weight_diff to indicate the difference between the average age, height, and weight of all competitors in a certain sex or sport and that of medalists exclusively. I was curious to see how these data vary between men and women in the same sport. As a result, I prepared a new table with similarly called measures, but this time I showed the differences between men and women.

Men are about 12-18 kg heavier and 9-13 cm taller than women in most sports, according to my research. Surprisingly, there was one sport where the disparities were quite small: boxing. This is most likely owing to the fact that men and women compete in the same weight divisions.

Furthermore, I was curious to examine how trends in height, weight, and age differed between different sorts of sports. As a result, I designed a new feature called Sport Category, which assigns sports to one of three categories:

1. Race (sports in which the object is to get the fastest time): Rowing, Bobsleigh, Speed Skating, Short Track Speed Skating, Swimming, Triathlon, Athletics (Track), Cycling, Sailing, Canoeing, Cross Country Skiing, Alpine Skiing, Biathlon, Skeleton, Luge, Motorboating
2. Hi-Score (sports in which athletes take separate turns competing, and whoever gets the best score, distance, etc. wins): Synchronized Swimming, Rhythmic Gymnastics, Gymnastics, Athletics (Field), Snowboarding, Shooting, Weightlifting, Diving, Figure Skating, Freestyle Skiing, Trampolining, Golf, Equestrianism, Ski Jumping, and Archery
3. Versus (sports in which two athletes/teams compete directly against each other): Basketball, Softball, Hockey, Curling, Football, Volleyball, Baseball, Water Polo, Handball, Ice Hockey, Rugby Sevens, Tug-Of War, Rugby, Lacrosse, Judo, Boxing, Wrestling, Badminton, Fencing, Table Tennis, Tennis, Taekwondo, Beach Volleyball
4. Combined (disciplines combining sports from more than one of the above categories)

Looking across the different categories, I discovered that athletes in high-score events have the shortest height/weight ratio. Races occurred in the center, while "versus" sports featured the tallest/heaviest participants - they included the top five average heights in each event. I believe this is because certain high-score activities require flexibility (Gymnastics, Figure Skating, Diving, etc.) while others require athletes to be active for only a brief period of time during each turn. Competitors in races remain "active" for the duration of the race, requiring a steady supply of strength. However, it makes logical sense that "versus" activities are at the top because many involve physical struggle with an opponent (fighting sports, Rugby, etc.) and often necessitate quick reflexes.

The one hypothesis I had not yet thoroughly examined was #3: the relationship between height and weight. This week, I investigated this association in general, with men and women separately, and among the many sports categories I outlined above. The Pearson correlation coefficients between height and weight for certain gender and event category combinations are:

- All athletes
    - All events: 0.87
    - Races: 0.92
    - Hi-score events: 0.74
    - Versus events: 0.89

- Men
    - All events: 0.73
    - Races: 0.66
    - Hi-score events: 0.43
    - Versus events: 0.78

- Women
    - All events: 0.71
    - Races: 0.78
    - Hi-score events: 0.44
    - Versus events: 0.78

Height and weight are often moderately to highly positively associated. The sports that featured as outliers the most frequently were:

- Female Rhythmic Gymnastics: avg_height = 167.8 cm, avg_weight = 48.8 kg (~10 kg less than expected according to the best fit line among all athletes and events)
- Female Weightlifting: avg_height = 160.5 cm, avg_weight = 67.8 kg (~15 kg more than expected)
- Male weightlifting: avg_height = 169.4 cm, avg_weight = 81.8 kg (~15 kg more than expected)

Moderate:

- Male Bobsleigh: avg_height = 182.2 cm, avg_weight = 90.3 kg (~10 kg more than expected)
- Male Judo: avg_height = 177.5 cm, avg_weight = 83.7 kg (~1 kg more than expected)
- Male Rugby Sevens: avg_height = 182.8 cm, avg_weight = 91 kg (~10 kg more than expected)

Olympic sports appear to necessitate well-balanced skill sets and training procedures that do not stray much from the naturally occurring height-weight correlation. Here is what I discovered to explain some of the above-mentioned exceptions:

- Female Rhythmic Gymnasts are much taller and thinner than average for their age. Reasons for this include:
    - Rhythmic gymnasts experience delayed puberty, stopping at around the age of 18, as opposed to 15 for most women, because they follow strict diets and put their bodies through extreme intensity. Longer limbs also make rhythmic gymnastics exercises that include throwing and catching (balls, hoops, etc.) easier.

- Men and women Lifters of weights are rather small for their size. The basic explanation behind this is that the greater your height, the less you can lift in relation to your weight.
- The reason behind the excessive weight of bobsledders compared to their height is physics: a bobsled can travel down a track more quickly the more weight it contains. Prior to the introduction of weight limits in the 1950s, contestants with heavier weights were actually routinely surpassing the other competitors.