**Feeding Tools**

A person holding a knife and chopsticks

Description automatically generated with medium confidenceFor this experiment I will be comparing a pair of tongs, a pie scoop (hereby referred to as a [cake shovel](https://en.wikipedia.org/wiki/Cake_and_pie_server)), and a pair of chopsticks. The targeted food will be peanut butter M&M’s. My alternate hypothesis is that the cake shovel will outperform the other tools in terms of M&M’s retrieved per unit of time. The null hypothesis would be that there is no difference in the food retrieval abilities of these three utensils. The different trials all ran for one minute apiece. The results of the experiment are as follows (all measurements are in M&M’s retrieved per Min):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Utensil | Run 1 | Run 2 | Run 3 | Avg |
| Tongs | 69 | 79 | 85 | 77.7 |
| Cake Shovel | 206 | 218 | 225 | 216.3 |
| Chopsticks | 3 | 12 | 13 | 9.3 |

True to its name, the cake shovel came out on top with an average M&M’s per minute of 216.3. This is significantly above the rate achieved by the other devices; therefore, I will reject the null hypothesis.

If these feeding apparatuses were represented in a natural system, due to the dominance of the cake shovel, the phenotype for this apparatus would increase relative to the other options. The phenotype for the remaining apparatuses would correspondingly decrease. This is because the cake shovel organisms would outcompete the other organisms for food.

The environment shapes adaptations because different adaptations perform differently in different environments. In other words, whether a phenotype is advantageous or not depends on the environment in which that phenotype appears. In the hypothetical applesauce environment, it is likely that the cake shovel will no longer be as dominant. Unfortunately, the chopsticks alleles will quickly go extinct, and depending on the viscosity of the applesauce, the cake shovel and the tongs may be roughly equally well adapted to the new environment. In the chicken broth environment, the tongs slight scoop shape will likely outcompete the cake shovel.

Should the evolved population suddenly be thrust into the applesauce world, it would likely have trouble adapting. The dominance of the cake shovel in the previous M&M based environment would have led to less genetic diversity, with the chopstick allele likely dying out, and the tongs phenotype appearing in far fewer organisms. This lower diversity would result in the population having less tools available to it in the event it needed to adapt to new circumstances. This effect would be magnified in the case that this applesauce environment was more of a chicken broth environment, as discussed in the previous sections, where the cake shovel would be particularly ill-suited to compete.

The main way that this simulation is unrealistic is that it simulates only a small piece of what constitutes an organism’s fitness. The ability to scoop up abundant M&M’s, while an important trait in college dorms, is a poor representation of how an organism will fare in a real-world environment. Some additional thought exercises that would add more realism to the simulation would be to consider what effect the apparatuses have on the ability to mate (are cake shovels attractive to the opposite sex?), or the ability to resist predators (chopsticks may not be great at picking up M&M’s, but a poke in the eye with one is a much greater deterrent to predators that getting smacked with a cake shovel).

One method to make this into a classroom activity would be to mimic the classic game Hungry Hungry Hippos. Give students a variety of small arts and crafts components and have them build and equip themselves with a device of choice. These tools will be mostly unique, simulating variation. Have the students sit in a circle, and in the middle of that circle, scatter food (or something representing food). On a signal, have them attempt to pick up as many pieces of food as possible within a certain amount of time. After that, students who did not collect enough food “starve” and are removed from the circle (simulating fitness). In between rounds, it may be possible for the students to “reproduce”, allowing them to share their design with students who starved in previous rounds, making their devices heritable. This cycle can go on as long as desired, or until all the students starve (simulating that more individuals must be born that die for the cycle to continue).