

# The Trait Continuum

## *Genes & Environment*

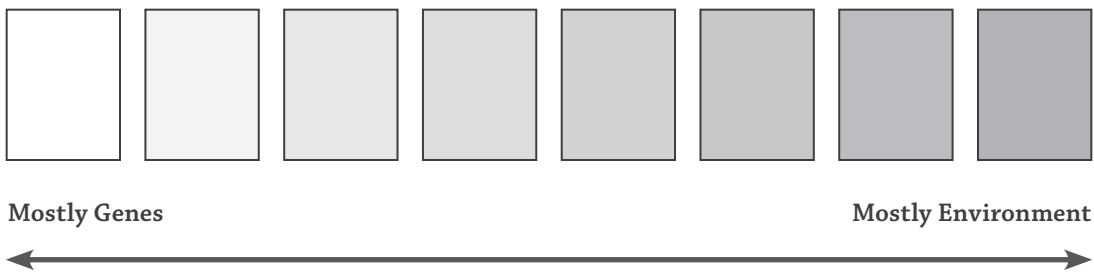
### Background

For all living things, genes and environmental factors influence traits. A few traits are shaped almost entirely by genes, and others almost entirely by the environment. But, to varying degrees, most are a product of both.

In other words, it's not a question of whether nature OR nurture influences our traits. It's nature AND nurture.

### Instructions

1. Get a set of Trait cards.
2. Read the information on each card. Decide whether you think the trait is shaped more by genes, more by the environment, or equally by both. Look for key information, like:
  - Is the trait influenced by a specific gene or genes?
  - Does the trait appear only under certain circumstances?
  - Is it easy to change the trait?
3. Arrange all of the cards in a line along a continuum:



## Customs & Traditions



Customs and traditions are shared among family members. Through teaching and practice, they pass from parents to children. Yet as you grow up, you get to decide which customs to keep, and which ones to let go of. You can also make up new traditions or learn them from friends and chosen family.

## Nutrient Deficiencies



Essential vitamins and mineral come from food. If one is missing, you can get sick and even develop permanent problems. In the past, nutrient deficiencies were often mistaken for inherited traits. Some even thought they came from contagious diseases or dirty, crowded living conditions. Today we know what causes nutrient deficiencies. And we know how to avoid or cure them with the right food or supplement. Yet some gene variations make it easier for a person to develop a nutrient deficiency. These variations can make it harder for a person to absorb, process, or use a certain nutrient—so they need more of it than usual.

## Preference for Sweet vs. Salty



People are naturally drawn to both sweet and salty foods. Sugar gives you energy, and salt keeps your nerve cells working. Yet some people prefer salty food, and others prefer sweet.

Habits help to shape this preference: we keep eating what we're used to eating. But variations in dozens of genes—each with a small effect—also affect taste preferences. Scientists can even use your genetic profile to predict your preference for sweet or salty foods.

## Absolute Pitch



If you have absolute pitch (or perfect pitch), you can sing a note without having to hear it first. You can also name any note that you hear. To do this, you need some musical training—so you can understand what a C, E, or G note sounds like. And training needs to start at a young age. Yet not everyone can learn this skill, even with years of training.

Absolute pitch tends to run in families. And scientists have found a few DNA variations that are more common in people with absolute pitch than those without it.

## Organ Damage from PKU



People who have PKU\* have no working copy of a gene called PAH<sup>+</sup>. Without the function of this gene (and the protein it codes for), they cannot break down Phe<sup>o</sup>, a building block of proteins. When they eat protein, Phe can build up to toxic levels, damaging the brain and other organs. Yet PKU can be managed with just one environmental factor: diet. By eating less protein and avoiding foods with Phe, people with PKU can live healthy, fulfilling lives.

\* phenylketonuria

<sup>+</sup>phenylalanine hydroxylase

<sup>o</sup> phenylalanine

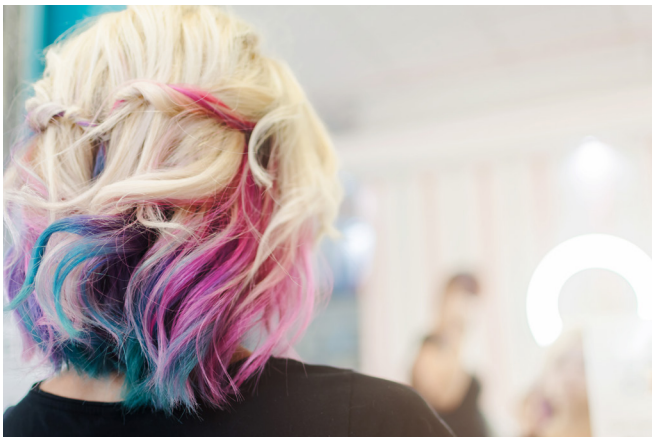
## Body Mass Index (BMI)



BMI is a measure based on a person's height and weight. BMI is the same in 70% of identical twin pairs, but only 34% of same-sex fraternal twin pairs. Yet because twins share many environmental factors, these numbers tell only part of the story.

Your genes give you the *potential* to reach a certain height, and they make your body *likely* to be a certain shape. But environmental factors matter too. Diet, illnesses, socio-economic status, culture, activities, habits, and life experiences also influence how bodies grow.

## Hair Color



Hair color is determined mostly by variations in a few genes that you inherit from your parents. Yet people rarely keep the hair color they're born with.

Hair usually gets darker as we grow up. Spending time in the sun can bring out brighter highlights. For most people, hair is genetically programmed to turn grey at a certain age—though stress can speed up the process. While you can use dye to change your hair color, it's just temporary. Your roots will always grow back with their natural color.

## Huntington Disease



Huntington Disease (HD) is caused by having one disease-causing version (allele) of the *huntingtin* gene. People with the allele develop HD. People without it do not.

The disease-causing allele passes from parent to child. If a person has HD, each of their children has a 50% chance of inheriting the allele—and having the disease.

Until recently, there has been no way to slow HD and no cure. New experimental treatments help control HD by changing the *huntingtin* gene or affecting how cells read it.