**Chapter 7 – Multifactorial Traits**

1. Athletic ability is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - determined by many genes as well as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Any single \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is unlikely to have a great influence.
3. What are the environmental factors that affect athletic ability?
4. What else do genes influence?
5. What is genetic determinism?

**7.1 Genes and the Environment Mold Traits**

1. What is a modifier gene?
2. Define polygenic.
3. Define multifactorial. Give an example
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are not inherently different from other types of traits; they involve the functioning of the brain, rather than another \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. Why is it difficult to predict multifactorial traits?
6. Different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ may contribute different aspects of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_that was once thought to be due to the actions of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ gene.

**7.2 Polygenic Traits are Continuously Varying**

1. Explain what is meant by “shades of grey” or continuously varying” phenotype
2. Define quantitative trait loci or QTLs.
3. Explain the “all-or-none” phenotype.
4. Within genes, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can have differing impacts depending upon exactly how they \_\_\_\_\_\_\_\_\_\_\_\_ an encoded protein and how \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ they are in a population.
5. Why are polygenic traits continuous?
6. Why is dermatoglypics included in genetics?
7. Why are identical twin fingerprints not exactly alike?
8. Why are people taller in this decade than in 1920?
9. What colors the skin?
10. What is a pure polygenic trait?
11. How many dominant alleles in Figure 7.4 per color group: white, medium, black?
12. Why is skin color NOT a good indicator of ancestry?
13. Compare the pros and cons to “race-based prescribing.”
14. Write the Key Concepts in the box from page 136.

**7.3 Traditional Ways to Investigate Multifactorial Traits**

1. Define empiric risk.
2. Define incidence.
3. Define prevalence.
4. Empiric risk \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with the severity of the disorder the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ family members, and how \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a person is to the affected individuals.
5. If a trait has an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ component, then it makes sense that the closer the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between two individuals, one of whom \_\_\_\_\_\_ the trait, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the probability that the second individual has the trait because they share more \_\_\_\_\_\_\_\_\_\_\_.
6. Why is observation for empiric risk a good measurement?
7. Define heritability.
8. What does heritability refer to?
9. Define coefficient of relatedness.
10. Give an example of a rare dominant allele with a large impact.
11. Explain concordance of a trait.
12. For a polygenic trait with little \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ input, concordance values for MX twins are significantly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than for DZ twins. A trait molded mostly by the environment exhibits similar concordance values for\_\_\_\_\_\_\_\_\_\_\_\_ types of twins.
13. Why are identical twins studied?

**7.4 Genome-Wide Association Studies**

1. Define genome-wide association study (GWAS) according to the NIH.
2. How are genetic markers used and compared? *(Recall that Haplotypes are the use of LD blocks to track genes of interest in populations.)*
3. What is the difference between a cohort study and a case-control study?
4. What’s the logic behind the older technique of tracking linkage in families?
5. What is homozygosity mapping?
6. Genome-wide association studies are prone to error simply because they include so many data points, but ironically, the large numbers of markers, measurements, and people are necessary for accuracy in pointing toward genes that affect health.
7. Explain the difference between association and correlation.
8. List 3 errors in genome-wide studies.

**7.5 A Closer Look: Body Weight**

1. What multifactorial trait do we ALL have?
2. Excess food = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What is BMI?
4. Explain an “appetite brake.” What is the antonym or this?
5. Define leptin resistance.
6. While \_\_\_\_\_\_\_\_\_\_\_\_ acts in the \_\_\_\_\_\_\_\_\_\_\_\_\_ term to maintain weight, the stomach’s appetite control \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ function in the \_\_\_\_\_\_\_\_\_\_\_\_ term.
7. Which population has the highest prevalence of obesity on earth?
8. Explain the “thrifty gene hypothesis.”
9. List the multifactorial conditions that arose from epigenetic alterations of gene expression.