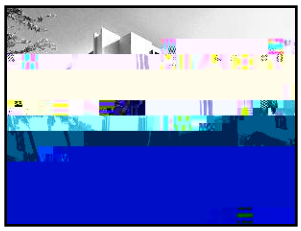

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F H M M B A S F P S C T

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Objectives:

(HbF), such that increasing levels are associated with better patient outcomes.[3,4]

Hemoglobin is one of the best-studied proteins in humans because of its role in distributing oxygen to the organs and other peripheral tissues and because of its clinical importance as the cause of inherited anemias, including SCD. Hemoglobin consists of four polypeptide chains, two α and two β chains ($\alpha_2\beta_2$). The α- and β-globin genes that produce these protein subunits are found in clusters on chromosomes 16 and 11, respectively. The expression of the three different α-like and five β-like globin genes involved in the production of hemoglobin is a classic example of cell and developmental-stage specific regulation.[5–7] In brief, during the embryonic stage of development, three types of embryonic hemoglobin (HbE) are produced through the activity of the HBZ ( ), HBA, and HBA2 (α) α-like globin genes, and the HBE1 ( ), HBG1, and HBG2 ( ) β-like globin genes (as the tetramers $_2{}_2$, $\alpha_2{}_2$, and $\alpha_2{}_2$). During the first 3 months of gestation, production of HbE declines as HbF becomes predominant. HbF consists of two α and two chains ($\alpha_2{}_2$). In addition, during the fetal stage, the HBB (β) β-like globin gene is expressed at a low level and increases as birth approaches. After birth, a minor adult β-like gene, HBD ( ) also is expressed. During the first year of life, the adult forms of hemoglobin ($\alpha_2\beta_2$, $\alpha_2{}_2$) become predominant. Most babies are born producing both fetal and adult hemoglobin; however, levels of adult hemoglobin 2 ($\alpha_2{}_2$) remain low because of past changes in regulatory elements in the promoter of HBD.[8] In adulthood, most people produce >95% of adult hemoglobin 1 ($\alpha_2\beta_2$). Although HbF typically declines after birth, there is variation in the levels of HbF in adults. It has been shown that greater levels of HbF in adults ameliorate symptoms of hemoglobinopathies.[6,9–12]

Adults with HbF levels greater than ~5% have hereditary persistence of fetal hemoglobin

and reviewed at the Arizona State University Office of Research

The Homozygotes and Heterozygotes for Rs10189857 SNP at the BCL11A Differ in their Mean Body Mass Index (BMI) and Weight

We hypothesized that because heterozygotes for the rs10189857 SNP at the BCL11A produce more HbF, athletes would be able to train more and achieve greater musculature. To test this hypothesis, we divided participants into genotypic groups (AA and AG) for the rs10189857 SNP at the BCL11A and computed their mean height, weight, and BMI. According to our expectations, the heterozygotes were 10 k heavier ($P = 0.04$) and almost 2 BMI units larger than the homozygotes ($P = 0.04$), whereas their heights were virtually identical. A one-way test is appropriate in this case because our hypothesis was that the heterozygotes would achieve greater weight and BMI but not an equal or lesser weight or BMI with a median two-sample test (Table 2).

Association of Alleles with Symptoms

Three symptoms were significantly associated with the SNPs analyzed in this study. In the following, we present the odds ratios (ORs) according to how the odds of each symptom change from one SNP state to the other:

- A previous diagnosis of exertional sickling was associated with both SNPs in the β-globin gene cluster, where the derived alleles are protective of a diagnosis of exertional sickling ($OR_{ancestral\text{-}derived}$ 0.68, 95% confidence interval [CI] 0.51–0.9071). In our sample, the two individuals who had been diagnosed with exertional sickling were homozygote for the ancestral allele. Being heterozygote for the derived allele, which has been shown to result in higher levels of HbF, is protective of a previous diagnosisFl37(Hb)16.7xertionaaisonfkoinh

Lack of Association Between G6PDD
SNPs and Symptoms

3. Meier ER, Fasano RM, Levett PR. A systematic review of the literature for