

PERSPECTIVE

HIGHLIGHTS

The article provides an insight on current status of fitness genetics and how it can be integrated in precision medicine.

ABSTRACT

Although better fitness prevents risk of major diseases, the genomics of physical fitness is quite neglected. In this era of precision medicine, where the disease prevention is a prime goal, boosting fitness could be a major strategy in disease management. Similarly, fitness related markers are also associated with risk of many diseases making a way to use these markers in dual purposes thus paving a way to correlate fitness-disease interactions through these markers. However, large and multi-ethnic population based studies are required to establish and use these marks in precision fitness driven precision medicine.



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KEY WORDS

Fitness genetics, precision fitness, precision medicine, SNP, markers

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While precision medicine initiative [1] is slowly maturing towards its applications mainly in cancer and few other diseases; fitness and sport associated precision medicine is yet to start its journey. This is probably due to lack of interest of majority of people in their fitness or not giving the importance to the subject. However, if one of the aims of precision medicine is early prediction and prevention, physical fitness must be considered as a key component of precision medicine. Physically fit people are more resistant to disease [2] and various fitness associated traits are known to be genetically governed [3]. However, only few genetic markers associated with physical fitness are well established [4]. Therefore, fitness genomics needs to be considered as an integral part of precision medicine approach and the field needs to be explored for identifying highly specific markers for various fitness associated traits towards use those markers in precision medicine.

The status of fitness or sports genetics research is not mature enough as compared to some diseases. A search in PubMed with key words "physical fitness" AND "genotype" AND "human" gives you only 57 articles. "sports" AND "genetics" AND "human" =808,. However, if we change only one key word to "cancer" AND "genetics" AND "human", we get 220926 articles. This number clearly indicates that we are not interested in our fitness and how our genes govern our fitness. The consequent of this fact is that we have only few reliable genetic markers for a few fitness traits.

Many commercial companies are providing single nucleotide polymorphism (SNP) panel based genetic tests for fitness in recent years [5]. However, if we compare the marker SNPs that various companies are using vary largely [5]. If we take 10 companies and compare their SNP markers, we can observe that the traits these companies are testing for are not common, even for the same trait different SNP are used, and hardly 10% common SNP you may get across the test SNP panels. This fact clearly shows the lack of standard criteria for selecting the SNP markers for a trait that warns us to develop a standard guideline for such tests [5]. While some of the companies have selected markers based on multiple replication studies in multiple populations, other companies may have only selected based on a single study. Therefore, what is the specificity of such single study based marker is a question and such markers would have been reported in literature by chance, or may be population specific, and may be having no specificity to the trait as no further confirmation if found in literature.

The above fact shows the poor progress of fitness genetics that needs to go a long way! A number of markers so far identified are found to be associated with both fitness and disease traits (Table-1). Therefore, these markers are potential to be used in precision medicine through fitness. However, these markers should be replicated in pan-ethnic population to establish their specificity to the particular fitness trait and then the correlation of the fitness trait and the disease having common link through the SNP marker needs to be evaluated. Identification a strong correlation will make the marker strong candidate for predictive diagnosis in precision medicine through fitness associated physical phenotype.

Gene	SNP	Fitness trait	Disease traits
VEGFA	rs2010963	Aerobic Capacity	CAD, Diabetes, Lymphoma, Arthritis
PPARA	rs4253778	Power, Endurance, Aerobic Capacity	Heart disease, Diabetes, Obesity
PPARGC1A	rs8192678	Endurance	Diabetes, Obesity
IL6	rs1800796	post-operative Stiffness	CAD, osteoporosis, cancer
NOS3	rs1799983	Power	Heart disease, Hypertension, Osteoporosis
ACTN3	rs1815739	Endurance, Power	Heart failure

Table-1: A list of SNPs that are associated with both fitness and disease

CONFLICT OF INTEREST

The author declares no competing interests.

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