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perfect fit

There's more to health and fitness than exercise and dieting. Genes also play a role

WHY do some people lose weight faster than others, and by making less of an effort? Why do some people tend to put on fat in only certain parts of the body? Why does exercise produce different results in different people, in spite of their dietary intake and training regimen being the same?

Whether you like it or not, we're all subject to heredity. We are the genetic products of our parents, and their parents, going back generations. As close as you get to any family member in physical appearance, your genetic blueprint is still unique to you, and predetermines your health and fitness profile to a large degree.

Today's article will identify the health and fitness parameters which may or may not be altered through exercise and diet.

Remember: With the exception of identical twins, every person is different genetically from all others. This is so as they are the product of a single egg. Fraternal twins, however, are no more genetically alike than any other siblings are.

Every individual's genetic make-up comprises a 'genotype'

and numerous 'phenotypes'. The genotype is the basic combination of all genes in the body and phenotypes are the traits through which genes are expressed - for instance, eye colour, facial features and blood pressure. Now the genetic effect, that is the degree to which genes play a role, varies. Genetic effect tends to affect structure more than function. For instance, the size of the lungs have a high genetic effect, whereas the rate of ventilation has a lower genetic effect.

From a cellular standpoint,

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each person is different from all others, the only exception to this rule being identical twins. Because they are the product of a single egg, they are essentially the same person in duplicate.

Put basically, heredity also plays a large role in people who are high responders, average responders, low responders and non-responders to change. This is why some people lose weight or

improve their fitness level much faster and more easily than others. This is a variation in phenotypes.

RESEARCH IMPACT

The difference in phenotypes and their responses to stimuli allow the scientist to study the role of genetics. If, for instance, 50 people started a training programme, and in spite of the environment being the same the fat loss varied greatly within the group, then it would be concluded that genetics played a significant role. This is known as genetic effect.

THE EFFECT OF GENETICS ON PHYSICAL FITNESS

Genetics has a major effect on linear measures - for instance, height, and the length of a person's trunk, arms and legs. In other words, these phenotypes are said to have a high genetic effect. For example, tall parents are known to commonly have tall children. In a family, one child may be the shortest, because that child's height was inherited from perhaps the paternal grandmother.

There is, however, a low to moderate effect on the circumference and breadth of various body parts, because these can be altered through exercise and a controlled, sensible diet.

About muscle size, strength and composition (percentage of fast-twitch and slow-twitch muscle fibres), studies have determined that there is a high genetic effect. It is important to differentiate that the effect of genetics is higher as it relates to muscle structure, and lower as it relates to muscle function.

Similarly, as far as the size and volume (structure) of the lungs go, there is a high genetic effect, but when it comes to respiratory rates (function), the effect is low. As far as the cardiovascular system goes, the size of the heart and coronary arteries, all have a high genetic component, but the functional measure of blood pressure has a lower genetic effect, as BP can be modified by diet, lifestyle, exercise and so on.

Note that someone can genetically have a high level of fitness, in spite of being inactive, while the reverse is equally true. The bottom-line being, fitness and activity are not necessarily the same. Yes, it is true that more active people tend to be fitter and vice versa, but it would be hard to judge the majority of people who fall somewhere in between these two extremes based only on levels of activity.

ROLE OF GENETICS IN HEALTH AND WEIGHT MANAGEMENT

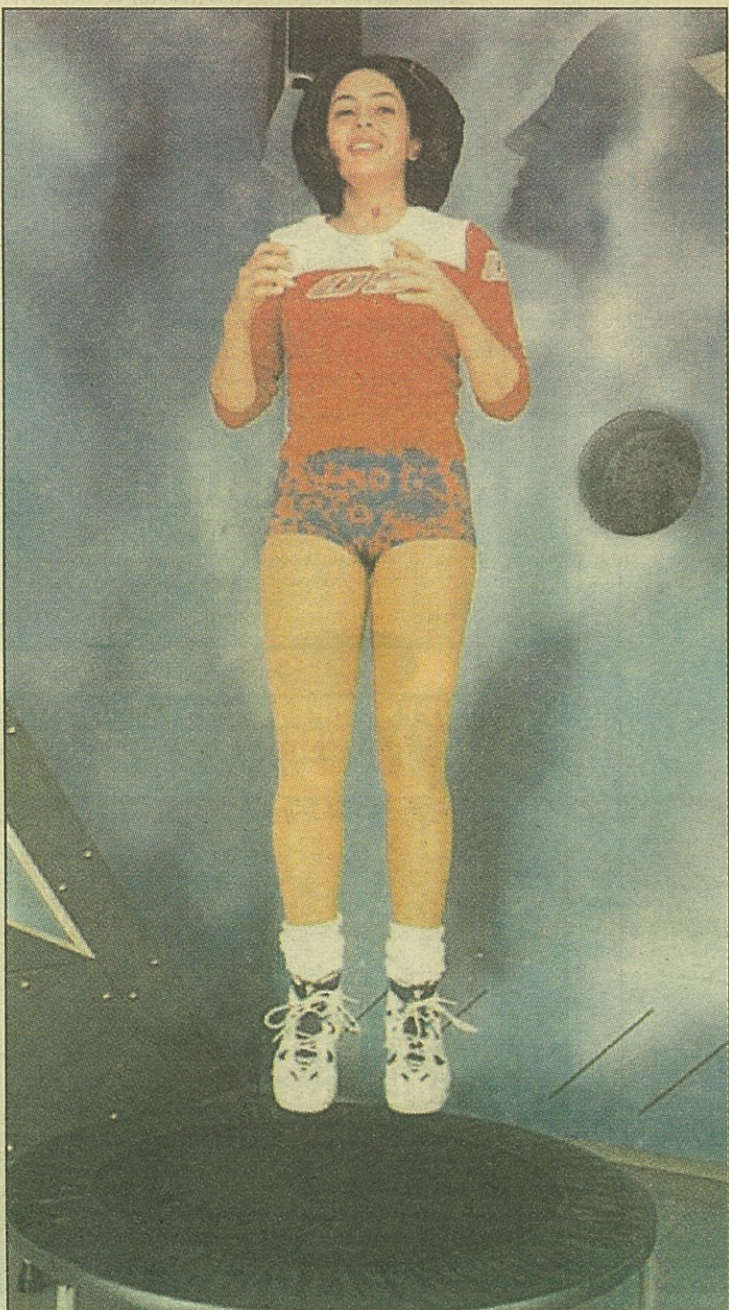
Did you know that the amount of calories consumed and the preference for certain types of foods appear to be influenced by genetics? Researchers have studied the effect of genetics on obesity in wide-scale investigations of families, twins and adopted children. From these studies it has been estimated that the effect of genetics on obesity is 2% to 40% (Bouchard, 1996).

Health measures such as body composition and predisposition to certain disorders, and lifestyle factors, such as smoking and drinking, are also influenced in varying degrees by genetics.

The pattern of body fat (tendency to retain fat in certain areas), the total body fat (subcutaneous and internal fat) and the size of fat cells, all have a high fat component. Genetics also plays a huge role in weight lost or gained, and the rate at which this occurs.

EXERCISE IMPLICATIONS

Results of extensive research show that different people, or phenotypes, respond differently to training. High responders tend to be in



the same families; similarly, low responders tend to come from the same families. It is determined that nearly 50% of the variation among subjects in response to exercise can be explained by genetics.

THE BOTTOM-LINE

Most health problems and degeneration in industrialised countries today are associated more with lifestyle than with genetics. For instance, the alarming rate of rising obesity over the past few decades can be attributed not to genetics, but to reduced physical activity and an increased dietary consumption.

However, even phenotypes considered to have low to moderate genetic effect, are to some extent influenced by heredity. Most phenotypes are extremely complex, and are influenced by many different genes. To add to this, there are a variety of interactions between genes, and even between those genes and the environment.

On a realistic level, we need to understand that not every individual will respond in the same way to exercise, or any other change in environment. Given that so many genes are involved, the fact that one person is a non-responder for one phenotype (e.g. reduced fat levels with a change in diet), does not mean that he or she is a non-responder for another phenotype (eg an improvement in lung capacity). Nevertheless, opposed to common belief, non-responders are not necessarily non-adherers.

Because of genetics, there will always be people who are slimmer, faster, stronger, with better endurance than others.

It is most important to truly

understand and accept that the process of being active and healthy is more important than the visual product of being fit.

Regularity of activity is the most important factor in reducing problems associated with various chronic and lifestyle diseases.

In the near future it may be possible to determine each person's individual genetic profile and through this to decide who is at risk for what diseases and who is a responder to exercise. This sort of profiling would allow medical treatment and advice on lifestyle changes to be individualised. For instance, it might be possible to determine that in a particular person it is possible to improve cholesterol levels and lung capacity, but not the ability to lose weight or improve blood pressure. With this information, routines can be tailored for maximum result, and other measures may be considered for areas where exercise may have little effect.

But please don't hold your collective breath waiting for this genetic utopia. As our health and fitness phenotypes are so complex, it is unlikely that genetic engineering will produce the magic potion anytime soon.

What is possible is that someday we will come to realise those traits that diet and exercise can change, and in turn come to accept those that they can't.

So, in the words of Ronald Naebuhr, among others, let us pray that God grants us the serenity to accept the things which we cannot change, the courage to change the things that we can change, and the wisdom to know the difference.

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