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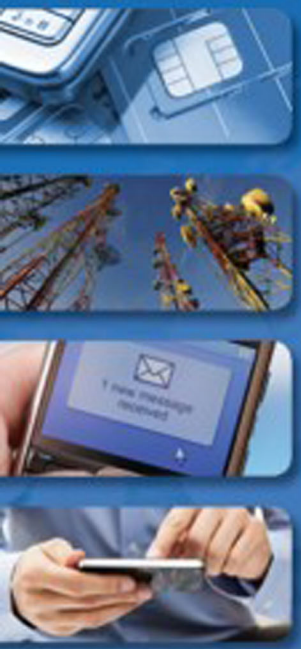

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CONTENTS

An Insight into Anthropometric Variations of Height and Weight among Monozygotic Twins

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Abstract

Comparisons between monozygotic (MZ) twin pairs have tended to centred on the similarities and resemblance between their phenotypic characters rather than differences. The aim of this study was to determine if there are prevalence of variance or discordant expression for the phenotypic characters of Height and Weight using Anthropometry. It was found out that there were variations in the height and weight among the monozygotic twin pairs though statistically insignificant. But the question which arises was why the differences of height and weight within the twin pair who share the same genetic composition. Various environment factors and different choice of lifestyle was the leading factor and also the epigenetic factors explain how phenotypic differences might occur despite their similar genotypes.

Key Words: Anthropometric variation, height, weight, monozygotic twins

Introduction:

Twins study has played an important part in the field of human genetics. In man isogenic strains are not available for the test of the effects of nature and nurture, nor it is possible in most cases, to control the environment in which the phenotypic properties develop. Identical twins (monozygotic) are isogenic and permits studies of the effect of different environments, while non identical twins (dizygotic) are genetically different as they are more or less like ordinary siblings in a family and permits studies of the effect of different genotypes in a similar environment.

Monozygotic twins have all their genes in common and provide a superb opportunity to help evaluate the relative roles of environment and heredity in the expression of a trait. (Rothwell, 1973). A truly unique opportunity is provided by identical twins that had been raised apart since infancy or early childhood. Since the environmental effects will be more varied on twins raised apart than raised together, the contribution of environmental factors to the expression of a trait can be revealed. Certain traits like blood group, eye colour, colour blindness would always prove to be the same regardless of the environment since the heredity component almost control their expression. The resemblance between a pair of monozygotic twin pair applies not only to their facial features but also to their general build, their deportment and facial expression.

The insight we gain from studying twins helps us to better understand how nature and nurture work together. Finding

similarities and differences between these sets of twins is the start to determining the degree to which nature and environment play a role in the trait of interest. Such studies can help pinpoint the molecular mechanism of a disease and determine the extent of environmental influence, potentially leading to the prevention and treatment of complex diseases.

There is a significant amount of research conducted using pairs of twins, particularly genetic studies. Identical twins or monozygotic twins are of particular interest because they share the same DNA. However, there can be rare, subtle differences like an occasional mutation occurring in one twin and not the other and sometimes these may cause disease to one of the twin pair. Such discordant twins**,** as they're called, are important because they have relatively few genetic differences so the cause might be easier to find. Twin study designs and statistical analysis methods are also constantly evolving and improving. The original twin study design has expanded to include studies of twins' extended families, longitudinal studies and other variations

Aim and Objectives:

The present paper tries to find out if there is any difference in the height and weight of monozygotic twin pairs that had been raised together in the same environment. If any significant differences are found, whether in height or weight, then the probable reasons for the dissimilarity or differences will be discussed.

Materials and Methods:

80 pairs of monozygotic twins consisting of 40 monozygotic males and 40 monozygotic females were taken for study. The height was taken by making the subject stand on a Frankfurt Horizontal plane and then the blade of the anthropometric rod was made to touch the mid sagittal plane of the subject head. After that the height of the subject (in centimetres) which comes to the anthropometric rod was recorded. For taking the weight, the subject was asked to be in minimum clothes and made to stand on the weighing machine. The weight of the subject which comes in kilogram on the weighing machine was recorded. Statistical method of paired t-test was employed for testing if there was any significant difference in the height and weight among the twin pairs.

Results and Discussion:

Table 1: Paired t-test for Height Vertex among the MZ Males and MZ Females

Range of Variance	Calculated- t	Table t with 39 df at 5%	Inference
MZ Males 0.1-5.3 cm	0.637	2.02	No Significant difference
MZ Females 0.2-15.1 cm	0.801	2.02	No Significant difference

Table 1 shows the pair t-test of height Vertex among the monozygotic male and female twin pairs. In both the groups it can be observed that the calculated "t" (0.637) and (0.801) is lesser than the table "t" (2.02) at 0.05 level indicating that there is no significant difference in the height of the monozygotic male twin pairs as well as the monozygotic female twin pairs.

Table 2: Paired t-test for Weight among the MZ Males and MZ Females

Range of Variance	Calculated- t	Table t with 39 df at 5%	Inference
MZ Males 1.0-4.0 kg	0.921	2.02	No Significant difference
MZ Females 1.0-6.0 kg	0.605	2.02	No Significant difference

It can be observed from Table 2 that the pair t-test of Weight among the monozygotic male and female twin pairs has the calculated "t" (0.921) and (0.605) lesser than the table "t" at 0.05 level which again indicate that there is no significant difference in the weight of the monozygotic male twin pairs and also of the monozygotic female twin pairs.

Twin studies reveal the absolute and relative importance of environmental and genetic influences on individuals in a sample. Modern twin studies have shown that almost all traits are in part influenced by genetic differences, with some characteristics showing a strong influence e.g. height. Nevertheless, there is increasing evidence that MZ co-twins may differ due to post zygotic genetic, epigenetic, and prenatal environmental factors, hence challenging the assumption of genetic or epigenetic similarity that underlies the classical twin model. The interaction between environmental factors and phenotypic discordance within MZ twins has for obvious reasons been noticed many years ago Although it is observed that there is statistically insignificant difference in the height and weight among the monozygotic male and female twin pairs of the present study, it can be consider that the actual difference in height and weight might be due to preferred different types of physical activities which the twins choose to involve. For instance it is monitored that in a twin pair, one likes outdoor sports and get engage in outdoor games every day for certain hours while the other does not show the same interest. The same difference is also found in the choice of food habits, where the amount and type of foodstuff taken by the twin pairs are different. Even the time difference in the arrival of menarchy among the female twin pairs also lead to difference in actual height and weight. Although raised in the same environment, other minute environmental differences possibly might lead to the difference in the actual height and weight of the monozygotic male and female twin pairs.

Martin *et al.*1997 have described a wide range of genetic and environmental influences to explain why Monozygotic twin pairs might not be identical phenotypically. They list differential placental implantation and nutrition, as well as differential transplacental teratogens and infections as possible environmental effects. Post zygotic genetic effects could include differential imprinting, post-zygotic non-disjunction and differential trinucleotide repeat expansion. Molenaar *et al.*1993 have referred to 'a third source of developmental differences', in addition to genetic and environmental factors, that they propose accounts for phenotypic

differences in development. They argue that this third source consists of nonlinear epigenetic processes that can create variability at all phenotypic levels, both somatic and behavioural. There is increasing evidence of epigenetic modulation occurring early in life in response to environmental factors (Gallou and Junien, 2005). Poulsen, et al. 2007 also established phenotypic discordance in MZ twins is at least due to epigenetic factors that change over the lifetime of a multi cellular organism.

Conclusion:

It can be concluded that even though monozygotic twins may be born with the same genotype there is evidence of phenotypic differences at some point and nnevertheless, there is increasing evidence that MZ twins may differ due to postzygotic genetic, epigenetic, and prenatal environmental factors, hence challenging the assumption of genetic or epigenetic similarity that underlies the classical twin model.

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