

FUNDAMENTALS OF VOCATIONAL PSYCHOLOGY

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TO
MY FATHER AND MOTHER

PREFACE

THIS book is designed primarily to serve as a text-book for classes in vocational psychology. In the selection and presentation of material I have had in mind the fundamental problems of a psychological nature which confront both the employment manager and the vocational counselor. Although the former is chiefly concerned with the problem of selecting individuals fitted for given kinds of work, and the latter with helping individuals select the occupations for which they are best fitted, their main problems are essentially the same. Of equal importance to both are the ways in which individuals differ and the methods of detecting or measuring these differences. A knowledge of the cause of such differences is also of value in dealing with many practical problems in either line of work.

The emphasis has been placed more on general principles, methods, and technique, than on practical rules. Rules are given, but the reasons for the rules have been regarded as more important. More stress has been placed on the principles and methods to be applied than on their applications. The student of vocational psychology should realize that in this field he cannot be "practical" until he has mastered a great deal of what may at first appear to be needlessly theoretical and technical. He should see that all practice is based on theory, whether the practitioner realizes it or not; and that ordinarily it is better to examine the theory that is implicitly assumed if not explicitly recognized in any given practice. With an adequate background of fundamental principles he can evaluate new methods as they appear, and if necessary can devise new methods to meet his own particular

needs. With such a background he should also be better able to distinguish between what he may and what he may not hope to accomplish.

Although considerable space is given to tests of different kinds, this is not intended to be a manual of tests. Many of the tests are included mainly to illustrate general principles and methods. In most of the chapters dealing with tests, the primary but not the sole aim has been to furnish a foundation for the consideration or discussion of the various tests and their uses. Because so many of the popular and often superficial accounts of testing lead the readers to believe that testing and the interpretation of test-results are simple and easy, requiring no special training, I have given a few rather detailed descriptions of technique. By doing this, I hope also to emphasize the importance of care and accuracy, and the dangers to be avoided if accurate results are to be obtained and properly interpreted. I have assumed that the instructor will wish to supplement the text with other tests and test-results, being guided by the interests and needs of his class.

Matters of organization have been regarded as outside the scope of this book. It is not the business of psychologists to teach School Organization, Vocational Education, or Business Administration, but rather to supply to those working in these fields the facts regarding human nature that may be of value.

For one-semester courses of two or three hours a week the instructor will probably find it advisable to omit certain topics and select those which best meet the needs of his class.

I wish to thank Professor Pillsbury and the Macmillan Company for permission to use Figure 8, from *The Fundamentals of Psychology*; Professor Titchener and the Macmillan Company for the figures I have taken from the *Text-Book of Experimental Psychology*; Professor Rugg and the Houghton Mifflin Company for Figures 2 and 3; the War

Department for reproductions of directions for the Army Officers' Rating Scale and for the different Trade Tests, and for several figures; Professor Seashore, for Figure 32; and the C. H. Stoelting Company for the figures from their catalog. A few figures in this book have appeared without legends in several places, but as far as possible I have tried to give credit where credit is due. I am indebted to Professor Pillsbury for suggestions and information of various sorts; to the Macmillan Company for many valuable suggestions leading to numerous changes in the original manuscript; and to my wife for aid in preparing the manuscript for the printer, in the reading of proof, and in the preparation of the index.

CHARLES H. GRIFFITTS.

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FUNDAMENTALS OF VOCATIONAL PSYCHOLOGY

CHAPTER I VARIABILITY

THE study of vocational psychology is largely a study of the ways in which individuals differ. Until comparatively recent times psychologists studied mainly those aspects of mental life in which all individuals were assumed to be alike. At present it is probable that more time is being spent in the study of individual differences. One of the reasons for this change was the need of classifying school children according to their intellectual capacity. Another cause is to be found in the economic and industrial evolution of the last half century, with its demand for specialization, because specialization in the professional and industrial fields frequently calls for special abilities or capacities. This has given rise to what is known as vocational guidance and to the office of employment manager.

In the study of individual differences we are confronted at once with several questions: (1) Why do individuals differ? (2) How can the degree of variability be measured? This chapter deals with the answers to these questions. In the next chapter we shall attempt to answer the question: (3) To what degree do variations in different traits tend to go together, and how may such tendencies be measured? We shall then be ready to deal with the ways in which individuals

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differ, in connection with the methods that have been used to classify individuals according to their deviation from the average.

WHY INDIVIDUALS DIFFER: GENETIC FACTORS

Innate Variability.—There are two facts from the field of genetics of great importance for the student of individual differences. The first is a genetic reason for variability among individuals; the second, the fact that these innate variations tend to be transmitted to succeeding generations.

In the first place, individuals differ because the germ cells from which they developed were different. When, however, we ask why germ cells differ, about all we can say with assurance is that they do differ. And, for our present purpose it is almost sufficient to begin with the statement that they do differ, without entering a long and technical but highly speculative discussion of the innate causes of variation. Yet there are certain problems that should be considered before we discuss the influence of heredity in causing differences between adult individuals.

One of the oldest disputes, and one of vital importance, is whether innate variations (differences between parents and offspring, or between offspring of the same parents) originate in the body or in the germ plasm. This dispute has been narrowed down to the possibility of the inheritance of acquired characters, i. e., whether the acquired variations of one individual are transmitted to his offspring. Most biologists answer this in the negative, although it is not yet a closed question. There is little or no evidence that cutting off legs, or forming new connections in the brain, can so affect the germ plasm as to cause a lack of legs in the offspring, or to enable the offspring to perform, without learning, acts which the parent had to learn.

Nevertheless, it is quite possible that we soon shall be

confronted with evidence that anything that profoundly affects the chemistry of the blood of the parent will have some effect on the supposedly chemical determiners of the germ cells. At any rate, whether strictly hereditary or not, as geneticists now use the term, it is well known that chemicals in the blood do affect the germ cells, and therefore are factors in determining what the offspring will be. If all heredity is Mendelian, if all heredity is through the presence or absence of specific determiners in the chromosomes of the germ cell, then such influences as chemicals in the blood will not be called hereditary by geneticists. The term *induction* has been used to signify these influences upon the offspring of the acquired conditions of the parent. While such phenomena, thus labeled, lose interest for the geneticist, they are important for those who are interested in the broader and more practical question as to what causes differences between individuals.

The present working basis of genetics is mainly to be found in the hypothesis of unit-characters, and specific determiners, for each of these unit-characters. A great many geneticists regard these as fixed, immutable, invariable. They are either present or absent. What appears to be blended inheritance is explained on the basis of multiple determiners, each contributing its specific effect on the offspring. The degree to which a trait appears in the individual depends therefore on the number of such duplicate determiners in the fertilized ovum. Apparent differences in the potency of the determiner, or what has been called plus or minus variations in the determiner, are explained as due to the addition of a new and distinct modifying determiner. However, there are some facts concerning the evolution of the different human races which many regard as evidence either that some kinds of acquired modifications are transmitted to the next generation, or that genes (determiners) are variable. Data secured by Castle and others were at one time accepted by some as

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evidence of the variability of determiners, but Castle now makes use of modifying factors to explain the same data.

For a further discussion of the mechanism of heredity the student must turn to the text-books on Heredity or Genetics. He must be warned before doing so, however, that in some books on heredity, what are in reality highly speculative hypotheses as to what may conceivably be true are presented as if they were established facts. When any science hits upon a new idea, like Mendelian heredity, there is sometimes a tendency to make it explain everything within the field of the science. Perhaps it is well in the long run that this is done, as long as those doing it realize what they are doing. But disputes regarding the mechanism of heredity must not mislead us into doubting the fact of heredity. If the ovaries of a black guinea pig are transplanted to a white guinea pig, the offspring born to the latter will be black. They are in reality the offspring of the black animal.

Variability is one of the results of sexual reproduction. If we cross short-haired black with long-haired white guinea pigs, in the second generation there will be long-haired white, long-haired black, short-haired white, and short-haired black animals. Sexual reproduction brings about almost innumerable combinations of separate determiners. If human beings were reproduced by asexual reproduction there would be less demand for vocational psychology, or for any other study of individual differences. At every "birth" there would be two identical twins.

If we keep in mind this experiment with the guinea pigs, and consider the large number of determiners required to account for all the qualities or characters in an individual, it becomes apparent that children of the same parents, unless identical twins, are not likely to have exactly the same heredity. In the case of the guinea pigs, of any given litter one may get hair length from one grandparent, and hair color

from another, while another in the same litter may reverse this, getting hair color from the first-mentioned grandparent, and hair length from the second. If, therefore, the vocational counselor or employment manager is to consider the heredity of the one with whom he has to deal, his investigation must go back at least as far as the grandparents of the individual.

In Genetics there is a tendency to restrict the term *variation* to differences between parents and offspring, or between offspring of the same parents. Yet the student of individual differences is interested in the variability between individuals just as we find them; and we find that individuals, chosen more or less at random, differ not only on account of factors which make them somewhat different from their parents, but also because they have different parents.

Innate Variations are Inheritable.—In the selection of employees as well as in vocational guidance it is frequently necessary to consider the individual's heredity, because we know that, within limits, an individual will tend to vary in the same direction from the average of the general population as do his parents or brothers. We can state the same fact in other words by saying that variability within a group is decreased by similar ancestry. We expect the sons of tall parents to be taller than the average; and the children of feeble-minded parents to be feeble-minded. But when we are asked to state definitely just how much similarity to expect between parents and children or between children of the same parents, we are confronted with a difficult problem.

One reason for the difficulty in determining the degree of resemblance resulting from heredity alone is that there is some correspondence between hereditary and environmental conditions and influences. The "best stock" will usually be found in the best environment. Then, too, most human heredity seems to be "blended"—whether due to multiple-

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determiners or not. This makes it impossible to classify individuals as either possessing or lacking such traits as height, weight, strength, intelligence, industry, ambition, cleanliness, or kindliness. We can, however, determine the degree to which children tend to vary from the group average to the same distance and in the same direction as the parents. For example, we can measure the height of a group of fathers, and the sons of these fathers, and compare both fathers and sons to the general average. Suppose we then put the names and the scores of fathers in one column, and opposite each father's name the name and height of his son. Then suppose we compare each score with the average, recording "+" if above the average and "-" if below the average. The degree to which the pluses and minuses go together in pairs (for father and son) would be something of a measure of the influence of heredity. If we wanted to refine this procedure, we could record not merely the direction (+ or -) of the deviation, but also the amount, and compare the distance and direction from the average, of each father's score, with the distance and direction from the average, of his son's score. Should we wish to go further and measure the degree of correlation, we can compute what is known as a coefficient of correlation. The method of doing this will be explained in the next chapter.

In general, taking the average of many different traits, we find that the average deviations of sons from the general average is in the same direction as the deviations of their fathers, and about .3 to .4 as much. The similarity between children of the same parents seems to be somewhat higher, averaging somewhere between .4 and .5.

NON-HEREDITARY CAUSES OF INDIVIDUAL DIFFERENCES

Non-hereditary or environmental influences begin before the ovum is fertilized, and continue till death. For con-

venience they may be divided into two main groups: (a) those which begin to operate before birth, and which may continue during the whole period of development or maturation; (b) those which operate only after birth.

Pre-Natal Influences; before Fertilization.—Strictly speaking, environmental influences may be present even before the egg is fertilized. Considerable experimental work on animals has shown that various drugs, such as alcohol, frequently affect either spermatozoa or ova so as to cause weak or abnormal offspring. Bardeen found that monstrosities are produced if the spermatozoa of toads are subjected to X-rays.

Pre-Natal Influences; after Fertilization.—*r.* There is still considerable uncertainty regarding the degree to which the development of the fertilized ovum is due to intrinsic causes, within the egg itself, and to what degree it is due to the extrinsic influences in its pre-natal environment. In any event most of them probably are chemical, although some interesting experiments have shown that by turning frog's eggs upside down, double-headed, or double-bodied individuals may be produced. Changes in the temperature or density of the surrounding medium may cause abnormalities in certain animals (Conklin). Such results suggest interesting possibilities regarding conceivable factors causing differences between individuals, but our knowledge along this line is as yet too meager to be of direct practical value.

2. The secretions of some of the endocrine glands are known to have remarkable influences on growth. Whether these secretions are needed until the glands in the foetus begin to function, or whether the presence of these in the blood of the mother is used until the glands of the foetus are developed, may be open to question. Nevertheless it is known that the size of some of these glands is influenced by the amount of the substances secreted by it, or even by other glands, in the blood. Hence an abnormal glandular condition in a mother

may be expected to have some effect on the glandular development of the unborn child, which may or may not be permanent. A brief discussion of the relations of the endocrine glands to growth and temperament will be found in Chapter IV.

3. Many other facts more or less familiar to the general practitioner in medicine are of interest to the student of the causes of individual differences. The physician knows that malnutrition, sickness, etc., may have its effect on the unborn child, although frequently the foetus seems to be strangely immune to some conditions in the mother. Some drugs, including some of those sometimes taken in unsuccessful attempts to kill the foetus, are likely to produce abnormalities in the child. Where we find such direct and profound effects produced by certain drugs, it is quite likely that almost any abnormal condition of the mother which affects the chemical composition of the blood has some effect on the unborn child. With proper care after birth some of these effects may prove transitory, others not. The temperament, as well as the vigor and general health of an individual, is probably dependent much more on his pre-natal environment than is generally realized.

Post-Natal Influences. — 1. Proper nutrition depends not only upon having enough to eat, but also upon having the right kind of food. Some of the worst cases of malnutrition are the result of an insufficient amount of some necessary element in the diet. Malnutrition affects not only the growth of the whole body, including the brain, but the temperament as well. The younger the child, the greater the possibility of regaining what has been lost, although it is not likely that even very young children are ever the same as they would have been with proper nutrition.

2. Certain diseases frequently result in permanent injury. In this connection we have only to mention the well-known