

“Sources of Human Psychological Differences: The Minnesota Study of Twins Reared Apart” (1990), by Thomas J. Bouchard Jr, David T. Lykken, Matthew McGue, Nancy L. Segal and Auke Tellegen

In 1990, Thomas J. Bouchard and his colleagues published the paper “Sources of Human Psychological Differences: The Minnesota Study of Twins Reared Apart” in Science Magazine. The paper described the results of a study initiated in 1979 on the development of twins raised in different environments. The scientists conducted their experiment at the University of Minnesota, in Minneapolis, Minnesota. The researchers physiologically and psychologically assessed monozygotic twins or triplets who were reared apart, comparing the similarity of those twins to twins who were reared together. The research team found that identical twins who are reared apart had the same chance of being similar as twins who were raised together. Bouchard and his colleagues concluded that genetic factors have a large influence on behavioral habits demonstrating the influence of the genetics on development.

The research team, led by Bouchard, included David T. Lykken, Matthew McGue, Nancy L. Segal, and Auke Tellegen. The team conducted the study at the University of Minnesota, where Bouchard directed the Minnesota Center for Twin and Adoption Research. Bouchard, Lykken, McGue, Segal, and Tellegen studied different aspects of psychology and behavioral genetics. Many of those scientists had previously conducted twin studies. Often, twins are a subject of interest to scientists because identical or monozygotic twins share all of their genes, which allows for the control of genetic differences that is otherwise difficult to achieve with non-identical individuals.

Bouchard and his colleagues conducted their study to determine the origin of individual differences in ability, personality, interest, and social attitudes. As the researchers mention in their article, they studied monozygotic twins who were separated early in life and raised apart, because they provided a way to separate the influence of environmental and genetic factors on human characteristics. Monozygotic or identical twins occur when a single egg is fertilized and forms one zygote that later separates into two embryos. In contrast, dizygotic twins occur when multiple fertilized eggs are implanted in the uterus at the same time and develop into separate embryos. According to the Genetic Science Learning Center of the University of Utah in Salt Lake City, Utah, the strength of twin studies arises from the fact that monozygotic twins share all of their genes, while dizygotic twins on average share about 50 percent of them. Because of that fact, the authors conclude that individual differences between monozygotic twins who are reared apart should only be caused by the influence of the environment they live in. The occurrence of twins being reared apart is rare, but provides an effective way to compare the genetic and environmental influences on human characteristics. The study “Sources of Human Psychological Differences: The Minnesota Study of Twins Reared Apart” is part of the “Minnesota Twin Study,” an ongoing study of monozygotic and dizygotic twins since 1979 that involves more than one hundred sets of reared apart twins or triplets.

In the paper “Sources of Human Psychological Differences: the Minnesota Study of Twins Reared Apart,” the authors report on the individual differences between monozygotic twins who are reared apart. The authors break the paper into eight distinct sections. In the introduction, the authors start by describing the assessments the participants performed during the study and give a summary of their procedure, results and interpretations. The authors also detail their methods, data, and interpretations in different sections. In the first section, the authors describe the formula they use to

correlate the effects of genetic and environmental factors on twins. In the following section, the authors discuss the details and results of multiple tests and assessments that the twins performed during the study. In the third section, the authors explore the effects of similarities in the rearing environment on the IQ results of monozygotic co-twins reared apart. In the fourth section, the authors explore the correlation between monozygotic co-twins reared apart on their IQ results. In the fifth section, the authors discuss various similarities between monozygotic twins. Finally, in the last three sections the researchers discuss what they concluded about the effects of genetic and environmental factors in human development based on their study, and provide different possibilities that could explain the similarity between monozygotic twins reared apart.

In the introduction, the authors describe the twins in their sample and how they were recruited for the study. The authors mention the rarity of reared-apart twin and that the study involved over one hundred sets of twins recruited from many places around the world, including the US, UK, Canada, China, and Germany. The authors state that they recruited the twins in several ways. First, they established a way for friends and relatives of the twins, or the reunited twins themselves, to contact the Minnesota Center for Twin and Adoption Research (MICTAR) upon hearing about the project. In addition, members of the adoption community, social workers, and professionals who encountered reared-apart twins were able to serve as intermediaries between the twins and the researchers. Finally, the scientists were able to recruit individuals who were aware of having a separated twin and who had asked for assistance in locating them from the MICTAR staff.

The authors explain that the study sample consisted of adult twins, separated very early in life, reared apart during their formative years, and reunited in adulthood. The authors mention that they recruited both monozygotic reared apart and dizygotic reared apart twins, and identified their zygosity with extensive serological or body fluid comparisons, fingerprint ridge count, and anthropometric measurements.

The researchers continue the introduction to describe what tasks the participants performed during the experiment. As part of the study the twins underwent approximately fifty hours of medical and psychological assessment. The authors explain that they used multiple test instruments from each major domain of psychological assessment, including personality traits, occupational interests, and mental ability tests to ensure adequate coverage. The authors also explain that an assessment was performed to determine the influence of the rearing environments on the psychological development of the twins involved in the study. The authors state that separate examiners administered IQ tests, life history interviews, psychiatric interviews, and sexual life history interviews with all the twins in the study. The twins also independently completed questionnaires, under supervision from the staff member. The authors do not mention any details about the questions they asked twins during those examinations.

In the first section after the introduction, "Components of Phenotypic Variance," the authors provide a formula they used to correlate between the effects of genetic and environmental factors that can lead to variability between individuals. The authors explain that they used the formula to determine which of the two factors had a larger effect based on the data they collected.

IQ tests that the twins performed. As the authors explain, the twins performed three different intelligence quotient (IQ) measurements, including the Wechsler Adult Intelligence Scale (WAIS), which involved administering a set of six verbal and five performance subtests to the twins at the same time in different rooms. According to the authors, the twins also completed the Raven, Mill-Hill composite measurement, which involved nonverbal measurement of problem-solving ability, vocabulary tests, and multiple-choice word knowledge tests. Finally, the authors administered the first principal component (PC) measurement to measure the cognitive and comprehensive ability of the twins. These tests were done to examine if the twins had significant individual differences in their IQ scores, or if they were mostly similar. Based on the results the authors obtained from the examinations, the authors conclude that the IQ scores of monozygotic co-twins reared apart were similar.

Bouchard and his colleagues continue to analyze the data they collected on the rearing environments of monozygotic twins in the third section, titled "Do Environmental Similarities in Rearing Environments Explain MZA IQ Similarity?" The authors compare the similarity of the rearing envi-

ronment of the monozygotic twins to the similarity in the twins' IQ scores. Based on that comparison, the authors conclude that rearing environments had no significant effects on the IQ scores of monozygotic twins raised apart.

In the fourth section, titled "Has Pre- and Post-Reunion Contact Contributed to MZA Twin Similarity in IQ?" Bouchard and his colleagues analyze the effects of contact between co-twins on the similarity of the IQ scores. After comparing the frequency of contact between different pairs of co-twins and the IQ scores of those co-twins, the authors concluded that contact has no effect on the similarity between monozygotic twins raised apart.

In the fifth section, titled "Similarity of MZA Twins on a Variety of Dimensions," the authors describe different types of similarities between monozygotic twins. The authors explain that certain similarity measurements were more stable than others. The authors argue that physical similarities like fingerprint ridges are usually more consistent between monozygotic co-twins, while psychophysiological similarities such as blood pressure can vary from time to time. The authors use those measurements to examine if monozygotic reared apart co-twins were more different than monozygotic reared together co-twins.

In the last three sections, the authors move on to explain the results of their study. According to the authors, the monozygotic reared apart twins showed similarities in behavior, interests, religion, and intelligence regardless of their rearing environment. The IQ scores were also consistent between the monozygotic reared apart twins. Bouchard and his colleagues compare the correlation of IQ between monozygotic reared apart twins and the correlation of IQ between monozygotic twins that are reared together, and found that those values were similar. That similarity led them to conclude that rearing monozygotic twins together or apart has no significant effect on IQ. Based on that comparison, Bouchard and his colleagues conclude that monozygotic twins reared apart were just as similar as monozygotic twins reared together.

Finally, the authors state three different possibilities that could cause the similarity between monozygotic twins reared apart. First, the authors state that the genetic factors strongly influence the behavior and general intelligence of individuals and accounts for about 70 percent of the variation in IQ. Second, the authors claim that environmental factors did not have a significant effect on the development of monozygotic twins when they were reared apart which caused them to be similar in social attitude due to the genetic factor. Finally, the authors state that genetic factors control the effects of environmental factors. That means the even if environmental factors had a significant effect, the genetic similarity between the monozygotic reared apart twins might have influenced the twins to focus on, and retain similar environmental influences and, as a result, the twins become similar.

The Minnesota twin studies has been cited over 1500 times. It also raised many questions about the importance of heredity and the environment in shaping human behavior. The evidence that Bouchard and his colleagues provided through their study supported the argument that genetic factors and inheritance play a large role in the development of individuals and the interests and characteristics they show.

Sources

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