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FEATURES OF INDIVIDUAL DIFFERENCES AND SIMILARITIES IN COUPLES OF TWINS

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ОСОБЕННОСТИ ИНДИВИДУАЛЬНОГО РАЗЛИЧИЯ И СХОДСТВА В ПАРАХ БЛИЗНЕЦОВ

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Annotation

The twin method is one of methods in the geneticist who is based on comparison of features of terms of twin couple: monozygotic and dizygotic twins. The study of the features of individual differences and similarities in couples of twins allows identifying the role of heredity and variation in humans. It helps to determine the relationship between the role of heredity and the environment in the formation of various signs, both normal and pathological. The analysis of concordance and discordance was carried out using the classical twin method. Difficulties arise with identification of a monozigotnost of twins. The recognition of monozygotic and dizygotic twins is made on the basis of similarity of genetically determined signs. The identity or the very close similarity is the proof of a monozigotnost. The obtained data can be specified during the research this method can be combined with clinical genealogical and population and statistical methods. All distinctions which are shown at the monozygotic twins having an identical genotype are bound to influence of external conditions. The concordance was determined in couples of twins by 22 signs. The similarity in couples of monozygotic twins was from 82% to 95.5%, similarity in couples of dizygotic twins – from 32 to 64%, similarity of sibs – from 18 to 27%. The twin method allows to solve not only genetic problems, but also to open the psychological maintenance of the concept "environment", feature of formation of the person depending on environmental social conditions.

Key words: monozygotic and dizygotic twins, sibs, concordance, discordance, heredity, environment.

Аннотация

Близнецовый метод является одним из методов в генетике, который основывается на сопоставлении особенностей членов близнецовой пары: монозиготных и дизиготных близнецов. Изучение особенностей индивидуального различия и сходства в парах близнецов позволяет выявить роль наследственности и изменчивости у человека для определения соотношения роли наследственности и среды в формировании различных признаков, как нормальных, так и патологических. Анализ конкордантности и дискордантности проведен с применением классического близнецового метода. Сложности возникают с идентификацией монозиготности близнецов. Распознавание монозиготных и дизиготности близнецов производится на основании сходства генетически детерминированных признаков. Идентичность или очень близкое сходство является доказательством монозиготности. Уточнения данных, полученных при использования близнецового метода, достигаются тем, что в ходе исследования данный метод может сочетаться с клинико–генеалогическим и популяционно–статистическим методами. Все различия, которые проявляются у монозиготных близнецов, имеющих одинаковый генотип, связаны с влиянием внешних условий. Определена конкордантность по 22 признакам в парах близнецов. Сходство в парах монозиготных близнецов составило от 82% до 95,5%, сходство в парах дизиготных близнецов – от 32 до 64%, сходство сибсов – от 18 до 27%. Близнецовый метод позволяет решить не только генетические задачи, но и раскрыть психологическое содержание

понятия «среда», особенности формирования личности в зависимости от окружающей социальной среды.

Ключевые слова: монозиготные и дизиготные близнецы, сибсы, конкордантность, дискордантность, наследственность, среда.

Аңдатпа

Егіздік әдісі генетикадағы әдістердің бірі болып табылады, ол егіздер жұбының мүшелерінің сипаттамаларын салыстыруынды негізге алады: даразиготалы және қосзиготалы егіздер. Егіздердің жұптылығының жеке айырмашылықтар мен ұқсастылықтардың зерттеуі қалыпты және патологиялық әртүрлі белгілерін қалыптастырудағы тұқым қуалаушылық пен қоршаған ортаның рөлін анықтау үшін адамдағы тұқым қуалаушылық және өзгергіштіктін рөлін анықтауға мүмкіндік береді. Бағыттастық пен сәйкессіздікті талдау классикалық егіздік әдісімен жүзеге асырылды. Даразиготалы егізді сәйкестендіру кезінде қиындықтар туындайды. Даразиготалы және қосзиготалы егіздердің айырылып танылуы генетикалық белгілердің ұқсастығына негізделеді. Сәйкестік немесе өте жақын ұқсастық – даразиготалықтың дәлелі. Егіздік әдісті қолдана отырып алынатын деректерді айқындауылар зерттеу барысында бұл әдісті клиникалық– генеалогиялық және халықтық– статистикалық әдістермен біріктіруге болатынымен жеткізіледі. Бірдей генотипі бар даразиготалы егіздерде кездесетін барлық айырмашылықтар сыртқы жағдайлардың әсерімен байланысты. Егіздердің жұптарының 22 белгі бойынша бағыттастық анықталды. Даразиготикалы егіздердің жұптылығының ұқсастығы 82%–дан 95,5 %–ға дейін, қосзиготалық егіздердің жұптылығының ұқсастығы 32–ден 64%–ке дейін, аға–інілерінің ұқсастығы 18– ден 27%–ға дейін болған. Егіздік әдіс генетикалық мәселелерді шешуге ғана емес, сонымен бірге «қоршаған орта» ұғымының психологиялық мазмұнын ашып көрсету, қоршаған орта жағдайына байланысты тұлғаны қалыптастырудың ерекшеліктерін анықтауға мүмкіндік береді.

Түйінді сөздер: даразиготалы және қосзиготалы егіздер, аға–інілері, бағыттастық, тұқым қуалаушылық, қоршаған орта.

Introduction

Twins are one of the objects of scientific research in the solution of many genetic questions. The general frequency of the birth of twins is 1.1–1.2% of all births, from them 1/3 are monozygotic twins, and 2/3 – dizygotic twins. Frequency of the birth of monozygotic twins is similar in different populations, and the frequency of the birth of dizygotic twins differs in different populations. However, due to increased mortality among twins, compared with individually born children, the share of twins among the population is only 0.9% [1].

Difficulties arise with identification of a monozigotnost of twins. The recognition of monozygotic and dizygotic twins is made on the basis of similarity of genetically determined signs. The identity or the very close similarity is the proof of a monozigotnost. Monozygotic twins represent the genetic identity of different individuals.

Works on a research of couples of twins are carried out extremely seldom, and are of great interest. The twin method is the most widespread in genetics of behavior of the person. The twin method is widely used in the study of heredity and variation in humans and helps to determine the relationship between the role of heredity and the environment in the formation of various signs, both normal and pathological.

The aim of our research was to analyze the degree of similarity and differences in couples of twins using the classical method, as well as to analyze the characteristics obtained by an auxiliary method – comparison of twins and sibs.

Experimental

These 8 couples of twins were material for a research: 4 couples monozygotic and 4 couples of dizygotic twins having various social accessory, the material security and education level aged from 13 up to 25 years. Information on 16 relatives of the first degree of relationship that made related couples is studied: the brother – the brother 6, the sister – the sister 6, the brother – the sister 4. It was examined twins, concordant on sex (4 couples

monozygotic and 2 couples of dizygotic, only 12 people). Monozygotic are 4 couples (2 men's, 2 women's), dizygotic 4 couples (1 man's, 1 woman's, 2 couples – opposite– sex). Data for analysis was obtained by collecting information using the method of individual testing, which allows determining 50 biological and psychological characteristics.

The classical twin method was carried out in the following stages:

1) selection of groups of monozygotic and dizygotic twins;
2) definition of degree of similarity of twins in each of groups;
3) definition of a share of heredity and share of the environment in development of the studied sign.

The formula of Holtsinger is used to assess the role of heredity and environment in the development of the sign (1, 2):

$$H = C_{MT} - C_{DT} \ / \ 100 - C_{DT} \ (1);$$

$$E = 1 - H \ (2),$$

where H – heritability coefficient, a heredity contribution share to formation of the studied sign; CMB – coefficient of a concordance of monozygotic twins on the studied sign; CDB – coefficient of a concordance of dizygotic twins on the studied sign; E – an environment share in formation of the studied sign.

At genetic determination of individual distinctions correlation size between partners of monozygotic twin couples has to approach 1.0, and between twins of dizygotic couples – to 0.5. At environmental determination of individual distinctions the size of correlations of both monozygotic and dizygotic twins has to approach 1.0, owing to community of the environment.

Results and discussion

The research of twins as couples – assumes a research of specific twin effects and features of the relations in couple.

Using information obtained by questioning twins, couples of monozygotic and dizygotic twins are identified. For identification, the polysymptomatic method is used, which consists in a detailed analysis of the external similarity of the twin couple partners. Criterions of diagnostics of a zigotnost type of twins are the phenotypical signs caused only by a genotype. In our study, we examined such signs as: blood type, Rh factor, eye color, skin color, hair color and structure, nose shape, auricle shape and size, presence of birthmarks, sex, and others. In total 22 signs on each couple of twins (Figure 1) were analyzed.

It is possible to note that couples No. 1 – No. 4 is monozygotic twins as the similarity is from 82% to 95.5%. Couples No. 5 – No. 8 are dizygotic twins, similarity in couples from 32 to 64%.

According to literary data monozygotic twins are concordant in 97–100% of cases, and dizygotic in 20–70% of cases, depending on sign [2].

Comparing a concordance of phenotypical signs among couples of monozygotic and dizygotic twins to couples of sibs the following data are defined. From 22 studied signs in couples of sibs it is similar:

– in couple No. 9 6 studied signs – 27% are similar,
– in couple No. 10 6 signs – 27% are similar,
– in couple No. 11 4 signs – 18% are similar,
– in couple No. 12 5 signs – 22% are similar.

The similarity in couples of monozygotic twins is from 82% to 95.5%. The similarity in couples of dizygotic twins is from 32 to 64%. The external similarity of brothers and sisters is from 18 to 27% (Figure 1).

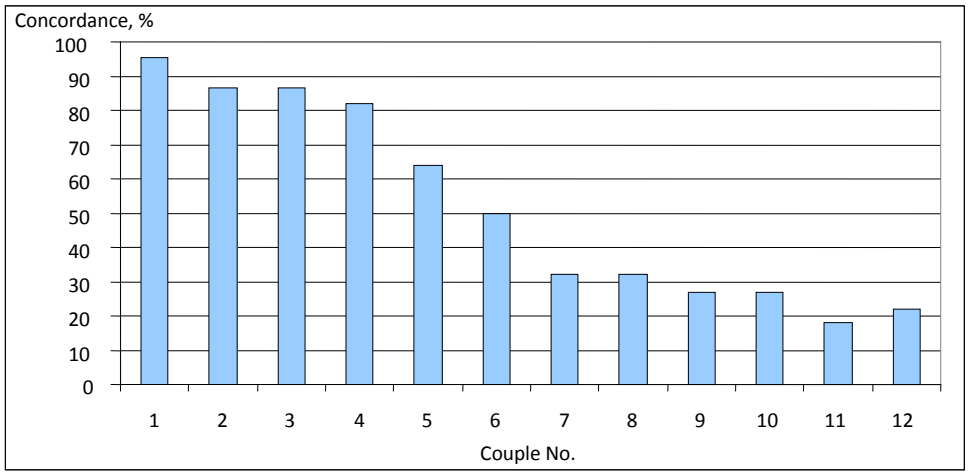

Figure 1 Concordance of signs in couples of twins and sibs

Average weight at the birth of the individual child is 3.2–3.5 kg. Average weight of the birth of twins is equal to 2.4 kg. Average weight of the birth of twins is 800 g. less, than at individually born child (literary data).

According to the data obtained during our research, the weight of individually born child is from 2800 to 3700 g. Average weight is 3210 g. A difference in weight is from 100 to 780 g. Weight at the birth at monozygotic twins was from 1.9 to 2.8 kg. Average weight is 2425 g. A difference in weight is from 0 to 200 g. At dizygotic is from 2.6 to 3.2 kg, average weight – 2887 g. A difference in weight is from 100 to 200 g. Average weight of the birth of twins, according to our data, on 554 grams is less, than at one individually born child (Figure 2).

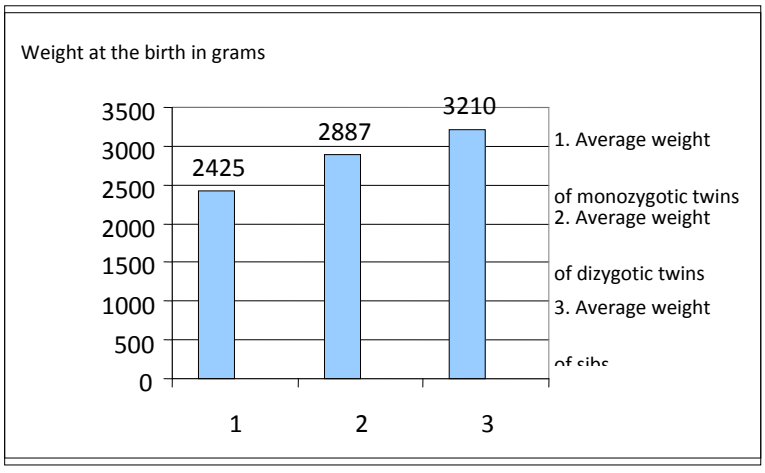

Figure 2 Average weight of monozygotic, dizygotic twins and sibs at the birth

Individually born children weigh more twins. Formation of sign happens under the influence of factors of the external environment with genetic predisposition.

Having compared average weight of twins to individually born children at the time of carrying out questioning, we defined as far as differences in weight at the birth remain now. It agrees to the researchers conducted by us earlier a difference in weight among twins from 0 to

33 kg. A difference in weight among sibs is from 2 to 40 kg. Formation of sign happens under the influence of factors of the external environment and with genetic predisposition.

The average intra pair difference of body height in couples of monozygotic twins is from 0 to 2 cm, in couples of dizygotic twins is from 6 to 15 cm, among sibs there are differences in height from 5 to 19 cm.

One more compared factor determined presence of chronic diseases among monozygotic twins, such as catarrhal diseases, gastritis, pyelonephritis, cystitis and others. Among monozygotic couples of twins the susceptibility to catarrhal diseases is observed in 50% of cases, among dizygotic twins in 75% of cases. The ordinal value at the birth doesn't play any role, regularity in ordinal value and frequency of incidence isn't revealed. The sign is formed under the influence of factors of the external environment.

Among sibs the susceptibility to catarrhal diseases is observed in 50% of cases. The ordinal value at the birth doesn't play any role, regularity in ordinal value and frequency of incidence isn't revealed.

According to literary data among uniovular twins there are more lefthanders, than among diovular twins [3]. Proceeding from biographical particulars, among four couples of monozygotic twins – a lefthander isn't any member of couple. Among four couples of dizygotic twins there are all terms of couple of right– handed person. Among four couples of sibs there are all right– handed persons.

Among monozygotic twins in 100% of cases of preference in the choice of food is identical. Among dizygotic twins in 25% of cases of preference in the choice of food are similar, in 75% of cases are various. Only 62.5% of twins show identical preferences in food. Among sibs in 75% of cases of preference in food are various, in 25% of cases of preference in food are similar. The sign is caused by heredity, and doesn't depend on factors of the external environment.

The value of one twin for other twin since the birth is so high that the relations in twin couple can be characterized as symbiotic. If at individually born child the main problem is overcoming symbiotic communications with mother, then twins have to solve one more not less serious problem, limit themselves from the partner in twin couple, and, than the similarity is more, especially the difficult task it becomes [4].

None of relatives or acquaintances confused sibs among themselves, they don't consider themselves identical, they don't need to use distinctiveness, or on the contrary to hide differences, they already aren't similar at all.

Leadership among sibs is observed in 100% of cases, and is bound to a birth order. Leaders marked out the elder children, in three cases leadership belongs to the woman, in one case the man. Leadership is observed among monozygotic and dizygotic twins with the probability of 75% to 100%, but among dizygotic leadership is shown more often, and among discordant couples belongs in 50% cases to the man, in 50% cases the woman. The similarity in the leader relations between sibs and dizygotic twins can be explained them with dissimilarity where everyone will seek for leadership or to concede it.

Division of duties among sibs is present in 100% of cases whereas among twins division of duties is present in 50% of cases.

Twin situations create also other difficulties for twins. We note that in some respects it is easier for twins, than ordinary children. Their close proximity attracts other children therefore they easily strike up new acquaintances. One of the reasons of it is that since early years they developed feeling of empathy which they transfer also to the relations with the friends [5].

According to biographical particulars, not one of sibs didn't feel the changed condition of the second sibs though among twins in 50% of cases both twins of couple felt change of a state, in 25% of cases one twin of couple noted the changed state, in 25% the condition of both twins of couple didn't change. Among sibs in 0% of cases it is noted that change of the brother/sister is transferred, and is felt as them.

The progress of monozygotic twins is surprisingly similar in the majority of objects while dizygotic twins gave preference to different objects and differently succeeded in them. Differences between monozygotic twins appeared twice less, than between dizygotic. Monozygotic twins have a tendency to receive identical marks. While at dizygotic there is no such trend [5].

The data analyzed by us showed that the progress of monozygotic twins and the choice of school objects are similar. The progress is similar in 75% of cases, similarity in the choice of objects of 100%. Monozygotic twins have a tendency to receive identical marks while at dizygotic twins the tendency to receive different marks, and to give preferences to various objects is observed. The progress is similar in 25% of cases; the preference in the choice of objects is similar in 50% of cases. In couples of sibs the progress is similar in 0% of cases, similarity in the choice of objects of 0%.

The analysis of professional preferences showed that, among monozygotic twins in 75% of cases both twins have an identical profession, and studied together. In 100% of cases preference in the choice of subject matters at the university were similar. In couple No. 2 twins studied in the different cities and received different professions, but gave preference to one subject – physical culture. Among dizygotic twins of a profession and professional preferences are various in all couples. Among sibs of a profession and professional preferences are various in all couples.

The analysis on preferences in clothes showed the following results for couples of monozygotic twins: in all couples it was noted that the clothes were identical with the twin only in the childhood. In couples of twins with occurrence of a teenage age there was a tendency to emphasize the distinctiveness by means of clothes. Among dizygotic twins only in 25% of cases both twins put on equally still. In 50% of cases among discordant dizygotic couples of twins the clothes were always different. In 25% a case of dizygotic twins dressed equally only in the childhood. From the analysis of questionnaires of sibs obtained the following data: the clothes were always different in 75% of cases.

Conclusion

Signs and properties of organisms develop under monitoring of heredity. The similarity in couples of monozygotic twins is up to 95.5%. Similarity in couples of dizygotic twins is up to 64%. Similarity of sibs is up to 27%

Researches of twins allow to estimate not only that how individual distinctions are caused by genetic variations, but also as far as these distinctions are caused or the aspects of an environment, general for family members, for example, by socioeconomic position of family, or those its aspects which at family members are various, for example, a circle of friends out of family.

Thus, it is necessary to rethink value of the environment, in view of that its impact on each child even in one family is unequal. Between families, naturally, there are distinctions, the bound to economic and social situation, education of parents and style of education of children. These factors are identical at the children growing together; they don't influence development of behavior. It will allow to establish, how exactly features of external influences to which children are exposed, are bound to their individual distinctions. As in differences between brothers and sisters makes the contribution and heredity, the specifics of

influence of the family environment on each child define differences in behavior of children. Behavior genetics methods – researches of couples of monozygotic twins help to reveal these interrelations.

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