Psychological tests are intended to measure individual differences. One of the first things most people associate with psychology is testing. You can find some kind of "psychological test" in popular magazines, which claim to measure everything from your intelligence or your personality to how good a lover you are. Such tests can be described as "pop tests." Most people have also heard of and many have taken formal, well-validated psychological tests that can predict behavior in a variety of situations. For example, the Minnesota Multiphasic Personality Inventory (MMPI) was developed to predict a variety of abnormal behaviors; the Stanford-Binet test and other related tests were developed to predict children's performance in school.

What tests predict are usually given names. For example, the Stanford-Binet and related tests are intended to predict "intelligence." Unfortunately, intelligence is only a name and not a theory, because there is no widely accepted, well-supported theory of intelligence. Two general interpretations of intelligence have been proposed: a g factor of general intelligence that affects many different aspects of mental functioning (Gottfredsen, 1998), and multiple intelligences (Gardner, 1998, Sternberg, 1998), each one for a different aspect of mental functioning. Neither of these ideas about intelligence is a well-developed theory, and neither has affected measurement. However, recent work (e.g., Engle et al., 1999) shows that IQ correlates highly with measures of efficiency in using working memory. This relation may provide a theoretical basis for intelligence and intelligence testing in the future.

Pop tests are fun, but they should not be taken seriously. They usually have (at best) face validity. The items are selected because they seem reasonable. The items on pop tests look like they reflect the process the test is supposed to measure, so answering them should provide a measure of that process. Unfortunately, this is not necessarily true.

To show that a test actually measures something, it must be carefully validated. This means that the test successfully predicts what it is supposed to measure. No psychological test comes close to predicting perfectly, but well-validated ones predict as well or better than do human experts. What items on a well-validated psychological test look like is irrelevant. The only thing that counts is whether an item helps the test predict. If it doesn't, it is removed.

Properly constructed psychological tests must have several features (Dahlstrom, 1995).

1. They use standard materials and test people under standard conditions (Testers must not "adjust" materials and conditions, because this will affect people's performance).
2. The examiner tries to establish optimum motivation.
3. They use standard scoring procedures. (Testers must not "adjust" scoring, because this will affect people's performance)
4. Scores are based on appropriate norms (scores from a large sample of the general population ("normal people").
5. They have established validity, which means the tests measure what they are supposed to measure.

Match the following features of a test with the kind of test they go with best [Hint: all items don’t need to be used.].

Q1A. the items (questions) look right and make sense
Q1B. a person's score is based on how a representative sample of people perform on the test
Q1C. the test measures the psychological process it's supposed to
Q1D. developed by using the experimental method
Q1E. developed using a well-accepted theory of intelligence

1. a feature of a properly constructed psychological test
2. a feature of "pop tests"
3. a feature of both
4. a feature of neither

The Weschler Adult Intelligence Scale (WAIS) and the Minnesota Multiphasic Personality Inventory (MMPI) are two of the most commonly administered psychological tests. Both have been carefully constructed and the developers (and many others) have demonstrated criterion or predictive validity and concurrent validity.

Criterion or Predictive validity means that scores on the test predict some behavior better than chance (guessing). For example, WAIS is a reasonable predictor of success in school. Its correlation with grades is about .3 or .4, not very high, but substantially better than guessing. Concurrent validity means that different tests of the same process give similar answers. For example, the WAIS and the Raven Progressive Matrices test (a supposedly culture free measure of IQ) give about the same results.
Well-validated tests do not necessarily have face validity, nor do they need to. The only thing that counts is whether an item helps the test predict what the test is intended to predict, regardless of whether it “makes sense” or not. Because non-psychologists often do not understand this, psychological tests receive criticism for the odd questions they may have: what has “I feel I have a soft spot on my head” have to do with mental processes? Some judges have barred the use of well-validated tests, because some items on the tests did not match their intuitions about what kind of things the tests should as (the items did not have face validity). These judges followed their intuitions rather than the data showing that the tests in fact measured what they were intended to measure.

Unfortunately, intelligence tests, like the WAIS, do not have construct validity. To have construct validity, a test must measure a theoretically defined process. However, there is no general agreement on a theory of intelligence, though research in cognitive psychology is beginning to point to some ideas in this direction.

Well-constructed tests are also reliable. This means that retesting an individual with an equivalent form of the same test will give about the same score. Most intelligence tests are quite reliable. The correlation between scores on different versions of the WAIS administered several weeks apart is about .85. The average difference between the two scores is about 5 points (100 is the population average).

Q2. The correlation between scores on an IQ test and school performance refers to the test’s____.

<table>
<thead>
<tr>
<th>A. factor validity</th>
<th>B. construct validity</th>
<th>C. criterion (predictive) validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. face validity</td>
<td>E. standard deviation</td>
<td>F. causality</td>
</tr>
</tbody>
</table>

Q3. The correlation between scores that the same people get on an IQ test taken at two different times is a measure of the test’s____.

<table>
<thead>
<tr>
<th>A. freedom from bias</th>
<th>B. predictive validity</th>
<th>C. reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. variability</td>
<td>E. norms</td>
<td>F. correlation analysis</td>
</tr>
</tbody>
</table>

The WAIS is administered individually. It has two parts, verbal and performance, and the test generates separate scores for them. An overall IQ score is calculated from the verbal and performance scores. Overall IQ appears to depend quite heavily on vocabulary. Scores on a simple 2-minute test that (indirectly) tests vocabulary correlate about .7 with IQ measured by full testing.

The verbal part contains questions like: On what continent is France? How many hours does it take to drive 150 miles at 50 miles per hour? How are a calculator and a typewriter alike? What does audacity mean?

The performance part requires the test-taker to do a series of tasks like: arranging a series of four pictures in order so they tell a story that makes sense (e.g., person digging a hole, planting a seed, watering the plant, and harvesting the plant); matching a pattern by arranging a set of blocks.

Q4. The following are kinds of items commonly found on IQ tests: Say what is missing in a picture; Arrange a series of pictures so they make a logical order; Arrange a set of blocks to match a sample pattern. These kinds of items measure

A. performance IQ
B. face validity of IQ
C. normally distributed IQ
D. interaction between performance and verbal IQ
E. dyslexic IQ [because it does not require reading]
F. A, B, C and D are all correct

A multiple-choice IQ test might contain questions like:

Jefferson is (was)
1. a rock singer
2. 3rd president of US
3. a kind of automobile
4. the capital of Virginia

Most Americans would have little trouble answering this question. However, many Americans would have to guess at the following question:

Kossuth is (was) ___.
1. a rock singer
2. leader of the 1848 Hungarian revolution
3. kind of automobile
4. capital of Rumania

Most Hungarians would easily answer the second question, but many would have trouble with the first.

Because it tests standard vocabulary, many speakers of standard American English can answer the following question:

Audacity means
1. nerve or boldness
2. loudness
3. fierceness or aggression
4. lying

However, because it tests urban ghetto vocabulary, many middle class Americans would have to guess at this question.
Running a game means
1. writing a bad check  2. looking at something
3. directing a contest  4. getting what you want from someone

Conversely, most people who have lived in the urban
ghetto can answer the second question, but may have
to guess at the first.

These two pairs of questions illustrate a fundamental
problem with IQ tests: they are culturally biased.
Scores that people earn on them depend at least
partly on having the same background as the test
constructors. A person may be quite intelligent as
shown by abilities in various practical situations but do
poorly on an IQ test because s/he does not have the
background that the test presumes.

Q5. IQ tests have items that ask about knowledge of specific information. If an IQ test question asked who was
Paderewski, many of you probably would miss it, whereas students in Warsaw, Poland, would identify him as
president of Poland between the World Wars and a famous concert pianist. This question
A. has face validity but not criterion validity  B. dependent on chronological rather than mental age
C. would be part of verbal IQ  D. is an illustration of cultural bias
E. A and B are both correct  F. C and D are both correct

To try to get around this problem, psychologists have tried to create "culture free" or "culture fair" tests, like the Raven Progressive
Matrices Test illustrated in Figure 1-5a.

In this test, the subject receives a set of eight patterns that vary on two dimensions. The
task is to choose the pattern that will fit
logically into the empty ninth space. This test
requires no vocabulary, and the dimensions it
uses are simple ones, like patterns. Yet it
seems just as culturally dependent as
are ordinary IQ tests, because it depends on
having experience with drawings and with the
idea that patterns can be organized logically.
The latter idea in particular is the kind of thing
that people learn in school.

Schooling provides a very important part of a person's
cultural and social knowledge, especially the kind that
IQ tests were originally designed to measure. So
schooling must also affect people's performance on IQ
tests. People without formal education have difficulty
understanding what a simple question of logic is asking.
The school experience emphasizes such abstract
skills, so a few years of school experience can mark-
edly improve a person's performance on such tasks.

The ability to read appears to do something quite
basic to mental processes and brain organization. In
Brazil, a substantial fraction of the population is
illiterate, because the people do not have access to
school. Brazilian victims of strokes (brain damage due
to a blocked blood vessel in the brain) are more likely
to suffer from aphasia if they are illiterate. Recently,
PET scans of illiterate and literate people have shown
differences in brain activation when they repeat
"pseudowords," strings of letters that follow the
phonetic rules of a language (like "fistle" or "choben")
but do not form a word. (A Castro-Caldas et al., 1998)

"Language" trained chimpanzees show something like the
same effect. Premack and Premack (1976) found that
chimpanzees trained on a "language" system were much
more successful than were untrained chimpanzees in logical
or relational tasks that did not even involve the "language"
system.

Q6. Prior experience like schooling affects performance on IQ tests. This fact shows that
A. different cultural and ethnic groups have different average IQs
B. schools teach children the items that appear on IQ tests
C. IQ tests don't predict school performance
D. IQ tests depend on experience as well as ability
E. vocabulary is enough to predict IQ accurately
Because of these cultural and social biases, IQ tests have a great potential for misuse, especially when used to select people for jobs that do not require the skills that IQ tests measure.

So if IQ tests are biased, what good are they? They do predict what they were designed to predict: performance in school. They also predict performance on tasks that depend on skills developed in school. Furthermore, despite their cultural bias they have shown that people whom interviewers had classified as having very low intelligence actually were in the normal range. This happened on a large scale during World War I, when a standardized test rated semi-literate immigrants as having normal intelligence when recruiters were classifying them as "mentally defective" (Hebb). Dahlstrom (1995) describes a case in which standardized testing showed that a child who seemed quite retarded to interviewers in fact had normal intelligence.

Q7. Despite their biases, IQ tests are useful, if properly used, for
A. teaching semi-literate people to read better
B. correcting for human judges’ expectations, opinions, and biases
C. predicting how well people will do in school settings
D. showing that low IQ causes people to have difficulty reading
E. B and C are both correct

Properly constructed tests are equal to or (usually) better than the best expert in predicting performance. The superiority of tests over experts has been demonstrated repeatedly in task ranging from reading chest X-rays to predicting the final diagnosis of a psychiatric patient (Dawes et al.).

Tests are more successful than human experts for several reasons:
! They treat all test takers alike
! They do not get tired
! They always give the same prediction for the same set of answers, because they follow a strict algorithm (specific set of rules for processing a set of data [see asgn3x]) for scoring the test.
! They are modified based on their successes and failures in predicting, which humans don’t do too well

In contrast, humans usually come up with different conclusions based on the same data. This happens because humans have a limited capacity working memory, so they cannot use all the information to make a decision. People seem unable or unwilling to use algorithms or to overcome their bias of looking for data that confirms what they want or expect to find. Instead they use various heuristics, like the availability heuristic (eg., basing judgment on easily remembered but unrepresentative cases) which can lead to wrong conclusions.

For example, Chapman and Chapman (1966) studied the Draw-a-Person Test. In this test, Clinical psychologists used the drawings a patient made to predict what kind of psychological problem the drawer had. The Chapmans found out why clinical psychologists kept using this test, even though its predictions are not valid. The psychologists' standard interpretations fit pre-existing biases about what kind of pictures people with different kinds of problems should draw. Undergraduates without any training made the same kind of predictions from a set of pictures as did experienced clinical psychologists. The undergraduates’ biases were quite difficult to shift. This experiment illustrates very clearly why objective methods are required for proper use of psychological tests.

Q8. [Mark EACH item True (T) or False (F)] Methods that makes predictions about patients using well-validated rules are always as accurate or more accurate than peoples’ judgments, even if they are highly trained and experienced. This is true because well-validated rules
T F A. are more reliable than human judgments
T F B. are unaffected by fatigue
T F C. use feedback on accuracy better that humans
T F D. combine lots of data because it has no memory limits
T F E. do not have (confirming) biases

Link to a website on the development of intelligence theory and testing, click HERE
Link to an article on the role of intelligence in modern society, click HERE.
To go to a text chapter describing intelligence tests in more detail, click HERE
Modern testing began when Francis Galton tried to measure intelligence with simple sensorimotor tasks like reaction times and sensory discriminations. He assumed that more intelligent people would respond more quickly than would less intelligent people (Boring, 1950).

He tested this idea using thousands of volunteers at the International Health Exposition in London. To his disappointment, people of the "lower classes" were not slower than people from the "better classes."

Recently, however, mental processing speed and efficiency in working memory has been found to predict IQ quite well, suggesting that this skill is an important part of IQ. Alfred Binet developed the forerunner of modern IQ tests. The French government gave him the task of identifying children's academic abilities, so that they could be assigned to the proper school track. To do this he collected tasks that he though reflected the psychological process important for doing school work (e.g., memory, attention, visual imagery, language comprehension, perception of relations, etc.).

Mark each item with a G for a Galton-type task or with a B for a Binet-type task.

Q1A. G  B speed and size of knee jerk reflex
Q1B. G  B speed with which a key is pressed in response to signal
Q1C. G  B meaning of words like "cavity" and "competent"
Q1D. G  B how accurately five random words are recalled after 20 minutes
Q1E. G  B how quickly and accurately beads are strung in a particular order

Binet arranged the test items in order of difficulty from easiest to hardest, based on the performance of a large number children of different ages. The easiest items were ones that even the youngest children he tested could pass. The hardest items were ones that only (some of) the oldest children he tested could pass. The performance of these children served as the norm against which the performance of individual children were compared.

All intelligence tests work this way. They compare an individual's score against the scores for a large, representative sample of the general population, which in Binet's case was all French school children. The performance of this sample served as the norm for the IQ test. An individual child’s score is compared with the norm to give a measure his/her performance. This means that intelligence tests give relative measures (measure is compared with the norming population), not absolute measures. (One feature of relative scales is that they have no theoretically defined ["true"] zero. For example, you can see that the Fahrenheit and Centigrade scales of temperature are relative measures, because zero and 100 are defined relative to some standard. On the centigrade scale zero = the freezing point of pure water, and 100 = the boiling point. The Kelvin scale for temperature is an absolute scale, because its zero is theoretically defined as the temperature at which all atomic motion stops.)

Tests must have their norms updated regularly, as performance changes, probably because of instructional procedures in schools. However, despite renorming, IQ measures have risen steadily over the last half century at varying rates in different countries. This finding also raises the question: What, if anything, does IQ measure? Link to a profile of James Flynn, who identified this effect.

Q2. IQ tests are scored by comparing them against the scores earned by a large comparison group of people tested to provide _____ for the IQ test. This fact shows that an IQ test score reflect a person's score _____.
A. Binet-Simon scales; on the comparison group's scales  
B. the heritability; as measure of genetic determination of IQ  
C. reliability index; on reliability  
D. correlations; relative to the variability of his/her score  
E. norms; compared with his/her peers' scores

Binet expressed children’s scores as their mental age. A child’s mental age equals the average age of the children of the norming group who did as well as s/he did. Later mental age was used to develop the Intelligence Quotient or IQ. IQ = mental age (MA) divided by chronological (calendar) age (CA) times 100 (IQ = (MA/CA) x 100). So an 8-year-old who performs on the test as well as the average 10-year-old has an IQ of (10/8) x 100 = 125.

Q3. If 10-year-old Traci passes items on an IQ test that the average child of 9 passes, then her mental age is ___.
A. 10  B. 100%  C. 9  D. 90%  E. not enough information provided
Q4. Traci’s IQ is _____.  
A. 10  
B. 100  
C. 9  
D. 90  
E. not enough information provided

Like most large samples, the scores used to norm IQ tests closely match the normal distribution, the so-called bell-shaped curve, shown in Figure 1-5b. (See Exercise asgn1n). Therefore, it is possible to fit a normal distribution to these scores.

The normal distribution is a mathematical curve with some special properties. Its horizontal axis is in standard deviation units. The area under the curve between any two points on the horizontal axis gives the % of the total area under the curve between those two points. For example, 34% of the area under the curve is between the mean and 1 standard deviation (SD) above or below the mean; 2.5% is between 2 and 3 standard deviations above or below the mean; 50% is below the mean.

The scores on the IQ test are adjusted so that the mean is 100 and the standard deviation is 15. This means that 34% of all IQ scores are between 85 and 100 (-1 SD and the mean), 68% are between 85 and 115 (-1 and +1 SD), and 95% are between 70 and 130 (-2 and +2 SD). A person with an IQ of 100 has a higher IQ than 50% of the population. A person with an IQ of 85 has a higher IQ than 50% - 34% = 16% of the population. People who score more than 2 SD below the mean are usually classified as retarded.

Q5. A child who has an IQ of 115 has a higher IQ than about ____% of her peers.  
A. 34  
B. 15  
C. 85  
D. 115  
E. 300

Many people will find it helpful to review asgn1q and r on behavior genetics

People have argued about the relative importance of heredity and environment for intelligence since long before researchers started trying to measure intelligence. I hope you understand that this is the wrong question to ask. The proper question is: How genetic and environmental factors work together to produce the behaviors we call “intelligent.” This question acknowledges that both factors always operate.

Those traits that we call “genetically controlled” are little affected by the range of environments that a developing individual normally encounters. For example, the human body normally develops arms, hands, and five fingers. However, this genetic program can encounter a very unusual environment, which disrupts expression of this program. For example, the fetus develops very abnormal hands and arms if it is exposed to the medication thalidomide very early in development.

Q1. Newly hatched chicks begin to peck at seeds almost at once. This behavior is described as “genetically determined” because ___.  
A. the chick’s genes produce wings instead of arms and hands because of abnormal environment  
B. the behavior reliably appears over the normal range of environmental variation  
C. it is instinctive, and instincts are inherited  
D. this is a behavior in which environment has no effect

If they make certain assumptions (which some scientists claim are wrong), behavior geneticists can calculate a statistic (~number) called heritability (h², “h squared”). Heritability estimates the proportion (%/100) to variation on a trait that depends on genetic differences among individuals. To calculate heritability of human psychological traits, behavior geneticists collect data from monozygotic (MZ, identical) and dizygotic (DZ, fraternal) twins and from adopted children and their biological (birth) and social (foster) parents.

This kind of analysis for IQ data indicates that about half the variation in IQ among people in North America is due to genetic variation. This value holds only for the specific population the subjects came from.
As a North American, this is not a surprising result. First, values close to this one have been reported repeatedly for many years. Second, most psychological variables turn out to have a heritability between 0.3 and 0.7, at least in North American and European populations, on which the measurements are made.

A heritability of .5 does NOT mean that half your intelligence is determined by your genes! The heritability of IQ (or anything else) is often misinterpreted this way for two main reasons:

1. There are NO genes for intelligence or any other behavioral process. There are genes that through several steps affect brain processes and structures that must be important in intelligence. We can only make some intelligent guesses what these processes might be.

2. Heritability is not a fixed number; it depends on the range of environmental variation under which it is measured.

Heritability of intelligence is particularly troublesome for several reasons, among them:

1. Intelligence is difficult to define theoretically, and people do not agree on its operational definition.
2. Intelligence can be a real "hot button" topic. Many people find very difficult to accept the idea that people vary in intelligence and that part of the variation among people reflects genetic variation. They find it far easier to accept such variation in, say, personality.

3. People don't realize that IQ is not a thing inside a person's head. It is a score on a specific test that predicts better than guessing performance in certain settings, particularly school settings. The score on an IQ test reflects only quite indirectly something about how a system (or systems) in the brain works.

To understand what heritability is and is not, remember this: Environmental and genetic variables interact to shape brain processes, which interact with an environment to produce all behavioral processes, including the ones people call intelligent behavior. REMEMBER: GENES ALWAYS EXPRESS THEMSELVES IN ENVIRONMENTS, and the environment can modify the expression of genes.

Unfortunately, people have a strong tendency to fall back on a "biology is destiny" explanation of differences in questions related to school achievement. For example, American parents believe that ability is the primary determiner of mathematics achievement. Japanese and Chinese parents (whose children do much better in mathematics) believe that hard work is most important, and indeed, children in those countries spend much more time working on mathematics than do children in the US (Stevenson et al., 1993). This tendency to accept uncritically genetic explanations for human behavior is a serious problem, which must be avoided. Link to a short essay on this issue.

Q2. Suppose that samples of American and Japanese high school students both show heritabilities of about 0.7 for a measure of math achievement, though their average performance is quite different. Which of the choices below is the best explanation [others not listed are also possible]

A. Environmental interventions can change math achievement by only 30%
B. A person's math ability is determined 70% by genetic factors
C. (most) children in Japan receive about the same exposure to math
D. (most) children in the US receive about the same exposure to math
E. A and B are both correct
F. C and D are both correct

Twin Studies

[Please review asgn1q.] Many studies have compared the similarity of MZ and DZ twin pairs on a variety of psychological traits, including IQ, "mental illness," and personality traits. MZ twin pairs show higher correlations, or concordances (a special form of correlation), than do DZ twins on many of these traits. The table in Figure 1-5c summarizes the twin studies on IQ and studies that compared other relatives (Data from Henderson, 1964). The higher correlation for MZ twins than for DZ twins is evidence for a genetic effect on intelligence. The higher correlations for DZ twins than ordinary siblings is evidence for environmental effects on IQ.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MZ (identical) raised together</td>
<td>.86</td>
</tr>
<tr>
<td>MZ raised apart</td>
<td>.75</td>
</tr>
<tr>
<td>DZ (fraternal) raised together</td>
<td>.62</td>
</tr>
<tr>
<td>Siblings (brothers, sisters) raised</td>
<td></td>
</tr>
<tr>
<td>together</td>
<td>.41</td>
</tr>
<tr>
<td>Siblings raised apart</td>
<td>.28</td>
</tr>
<tr>
<td>Parent and child living together</td>
<td>.35</td>
</tr>
<tr>
<td>Parent and child living apart</td>
<td>.31</td>
</tr>
<tr>
<td>Foster parent and adopted child</td>
<td>.16</td>
</tr>
<tr>
<td>Unrelated children raised together</td>
<td>.25</td>
</tr>
</tbody>
</table>

Figure 1-5c. Correlation of IQ as a function of closeness of relationship
Recent research points out that an additional factor plays an important role in the greater similarity of IQ for twins than for ordinary siblings (brothers and sisters): maternal prenatal environment. Twins share the same prenatal environment, whereas ordinary

siblings do not (Devlin et al., 1997). This analysis reduces the contribution of genetic factors to IQ, and it also suggests an additional reason for the striking similarity of MZ twins who grow up apart (see below).

Q3. A researcher compares the language skills (LS) scores of a group of MZ twins and a group of DZ twins.

Which of the following results would provide evidence that genetic differences contribute to individual differences in LS?

A. The mean LS for the MZ twins is higher than the mean LS for the DZ twins
B. The mean LS for the MZ twins is lower than the mean LS for the DZ twins
C. The correlation of LS for MZ twin pairs is higher than the correlation of LS for DZ twin pairs
D. The correlation of LS for MZ twin pairs is lower than the correlation of LS for DZ twin pairs
E. The correlation of LS for MZ twin pairs is higher than the mean LS for the DZ twins

Adoption studies can also demonstrate genetic and environmental factors in behavioral processes. An adopted infant receives genetic and prenatal environmental influences from his/her biological parents [Devlin et al., 1997]. S/he gets his/her social environment from the adoptive family.

Therefore, if adopted children show a higher correlation on a trait with birth parents than with adoptive parents, this is evidence for the role of genetic factors. Figure 2-5c summarizes data collected in several studies on IQ. The actual values used in the graph are made up, but the relations they show represent the results of several studies. Each filled box on this graph represents an adopted child. These data are made up, but they represent the results of several different studies.

Each filled box on this graph represents an adopted child. The horizontal axis is a measure of birth parents' IQ, and the vertical axis is a measure of the child's IQ. The filled boxes are scattered around a line that shows the correlation between these two variables. The correlation is about +.3, indicating a reliable but modest predictive relation between birth parents' and child's IQ. The correlation between adoptive parents' and child's IQ is significantly lower. This difference indicates a genetic contribution to IQ.

Recall what a correlation shows: it shows how accurately you can predict the value of one variable by knowing the value of another variable. The data show a higher correlation between children and birth parents than between children and adoptive parents. Therefore, this method of data analysis shows that the influence of the biological parents is greater than the influence of the adoptive parents.

Q4. If the personality trait of extroversion (~outgoing, friendly) has a genetic factor, then the extroversion scores of a group of adopted children will

A. be predicted better from knowing adoptive parents' extroversion scores than birth (biological) parents' scores
B. be predicted better from knowing birth (biological) parents' extroversion scores than adoptive parents' scores
C. be predicted better from knowing the combined total of adoptive parents' extroversion scores than from knowing only one score
D. not be affected by the adoptive family's extroversion scores.

You can look at the data from adoption studies quite differently. Compare the mean IQ of the birth parents and the adopted children (see the arrows on the horizontal and vertical axes on the graph). They show that the children's mean IQ (about 100) is about 10 - 15 points higher than the birth parents’ mean IQ. In contrast, the mean IQ of the children and the adoptive parents are about the same. It is as if adoption added 10 - 15 IQ points to the adoptive children’s IQs.
Q5. For a group of adopted children, IQ correlates better with birth parents' IQ than with adoptive parents' IQ. For the same group of children, the mean IQ is closer to adoptive parents' mean IQ than to the biological parents' mean IQ. What does this difference between the correlations and the means (averages) indicate?

A. Genetic and environmental effects cancel each other out
B. There must be an error in calculation
C. The correlation is evidence for a genetic effect; the average is evidence for an environmental effect
D. Adoption studies cannot be used to get evidence on genetic factors in human behavior

There is a reasonable explanation for the effects of adoption on mean IQ: For whatever reason, higher socioeconomic status (SES), measured by parents' job, income, and education, is related to parents' and to children's IQ. Most adoptions go from lower to higher socioeconomic status, so a child's adoptive family usually has a higher SES family than his/her biological family. Therefore, adopted children are likely to grow up in families with higher IQ than their birth families. This environment apparently affects the adopted child's IQ. It appears, then, that the changed environment as measured by SES increases IQ.

Recently researchers found a group of children whose adoption went from higher SES birth parents to lower SES adoptive parents. The average IQ of these children was lower, following adoptive parents. This kind of result indicates an environmental effect on IQ, even from the same data that suggest a genetic influence.

Q6. Adoption studies show environmental factors in IQ because

A. the IQ of a group of adoptive children correlates better with birth parents' IQ than with adoptive parents' IQ
B. the average IQ of a group of adoptive children is closer to the average IQ of adoptive parents than to birth parents' IQ
C. Socioeconomic status as measured by parents' income and occupation causes IQ
D. the slope of the line relating children's IQ to birth parents' IQ is steeper than the one relating children's IQ to adoptive parents' IQ
E. A and B are both correct
F. A, B, C, and D are all correct

Identical Twins Who Grew Up Separated

Four studies have combined twin and adoption methods. They identified the rare cases in which MZ twins grew up apart and compared them with MZ twins who grew up together. The largest and most recent study comes from the University of Minnesota. Bouchard et al. (1990) reported that twins reared apart share remarkably specific characteristics. For example, several married women with the same first names, chose the same breed of dog as pets, wore wrist watches in the same unusual way, etc.

Interesting as they are, such stories are very hard to interpret, because we don't know how frequently two people selected at random share unusual traits. A few years ago, I paired students in introductory psychology who did not know each other. They spent 15 minutes identifying things they shared. Almost all came up with common things, such as not liking to get up in the morning. However, several pairs discovered they shared some rather unusual traits, like drinking chocolate syrup directly from the can and running long distance track events in high school. Therefore, instead of interesting stories, careful, quantitative measurements must be made independently on each twin.

Q7. Deion and Aaron are identical twins who were adopted separately. When they met 30 years later they found several unusual traits they shared. They both wore pocket watches with hands than went backwards. They both preferred the same brand of beer. They both played handball, etc. These unusual similarities __.

A. show that specific behaviors and tastes are inherited
B. show that behavior can be affected by genetic factors
C. show that their adoptive families were very similar
D. are hard to interpret because we don't know how often they would occur by chance

The Minnesota research team collected a lot of quantitative data from the more than 100 twin pairs they studied. A different examiner interviewed and tested each twin of each pair separately on a battery of medical and psychological tests.

The twins had been separated before they were 8 months old and were separated for an average of 30 years before they were reunited. The average contact time after separation was two years. Three different measures of IQ were obtained. The average correlation for the twin pairs was 0.75, about the same result reported in three earlier studies on twins reared apart. The mean difference between IQs of all twin pairs was about 5 points, which only a bit less than the difference for the same person tested twice. In contrast, the mean difference between IQ’s of pairs selected at random from these twins was about 17 points. This is
a rough measure of the difference between two people taken at random from the backgrounds that the twins came from.

The interviews collected the twins’ reports about their families, to estimate the effect of environmental similarity. Environmental factors (such as family socioeconomic status [e.g., adoptive parents’ occupations], material possessions [clothes, house, car, furniture, books, etc.], and parental treatment correlated only weakly with individual twins’ IQ. Therefore, similarity of (adoptive) home environment could have contributed only weakly to the twin pairs’ similarity in IQ.

Finally, the correlations obtained from this set of twins were compared with correlations obtained from MZ twins reared together. Usually, the correlations were about the same or a little less. This finding is important because it suggests that being brought up in the same family doesn’t increase similarity much, a conclusion that has appeared in other studies on human behavior genetics.

### Q8. [Mark EACH item True (T) or False (F)]

- **T F** A. have correlations on IQ that are a little smaller than do MZ twins brought up together
- **T F** B. correlations on IQ that are considerably larger than do ordinary siblings (brothers, sisters)
- **T F** C. are not as genetically identical as MZ twins brought up together
- **T F** D. had family environments that apparently were not very similar

The data presented in this assignment make a strong case for a genetic effect on the psychological processes that affect scores in intelligence tests. What explains this effect, especially if there are no genes for “intelligence?” A plausible way is through genetic effects on the effective environment. The following summarizes this explanation.

1. **Genetic factors strongly affect general intelligence.** Studies on ME twins reared apart suggest that about 70% of the observed variance in IQ can be attributed to a genetic variance in this population. This number may be high, because these studies included very few individuals reared in real poverty, and none were retarded. Furthermore, it used a statistical model that did not include the role of maternal prenatal effects (see above). These data do not imply that IQ is unmodifiable, and they do not set a ceiling on environmental improvement.

2. **Genetic factors affect psychological and behavioral processes indirectly through their effect on creating people’s effective environments.** The environment has different niches (~parts). Most people stay in one or a few of these niches. The niches in which a person lives is that person’s effective environment. That person is not exposed to the rest of the possible niches, so they cannot have an effect on him/her.

   **Urban industrial life offer a wide range of potential effective environments.** Genetics has a strong effect on the effective environment an individual lives in through its effects on an individual’s preferences. Therefore, genetics affects specific behaviors indirectly through the effective environment it predisposes a person to find.

   For example, consider this scenario. TV watching has a genetic component, not because there is a gene for TV watching. The genetic effect operates through some general tendency, perhaps how active a person tends to be. People who prefer to be sedentary (~inactive) are more likely to watch TV than are active people, who prefer not to sit around. This scenario is reasonable because several studies have shown that the heritability of several traits is higher for people living in urban areas than in rural ones. It is higher because urban areas offer many more niches from which to choose, than do rural areas. In rural areas, most people live in similar effective environments, which limits the opportunity to express individual differences in preferences.

3. **Identical genetics makes the effective environment very similar.** For example, children differ in temperament, and these differences elicit (trigger) different reactions from parents and other care givers. Furthermore, people create their own effective environments. They seek out environments that fit their preferences and temperaments; they react to the same environment differently. For example, if you are a quiet person, you are free to spend your time reading by yourself; if you are physically active, you are free to spend your time doing athletics and other physical activities. Furthermore, quiet people and physically active people will react differently to the school situation. These two kinds of people will probably react to to recess and study time quite differently.

In summary, the direct (proximal) cause of most psychological variation is probably due to differences in experience, just as environmentalists claim. But the experience is largely self-selected, and that self-selection is genetically guided. People seek out experiences that fit their genetic predispositions.

This means that **the effects of nature [heredity] and nurture [environment] are best described as nature through nurture.** If this view is correct, then
environmental intervention can be quite effective, even for highly heritable traits. The interventions must, however, be tailored to each individual's own characteristics.

Q9. According to the model presented above, genetic factors produce (some of) their effects on intelligence
A. by controlling mental growth
B. with a specific set of genes which cause intelligence
C. by leading people to find environments that develop higher or lower IQs
D. in no way. The correlations are artifacts and cannot be used to measure intelligence

asgn5d -- "MENTAL" ILLNESS:
Schizophrenia as a Brain Disease I

A student once commented: “I don’t understand what causes schizophrenia.” If she did, she would be in line for the next Nobel Prize in Physiology or Medicine! Despite decades of research and clinical experience, and some progress in the practical treatment, the origins of this disorder remain obscure (Leff, 1991).

Little doubt remains that schizophrenia has a genetic component. Environmental stresses, especially before, during, and immediately after birth, often play an important role. Medications have been developed that relieve the more disturbing symptoms of schizophrenia, but they don't work or work well for many sufferers, and they do little to help the more subtle problems people with schizophrenia have. Little doubt remains that schizophrenia reflects abnormality in one or more neurotransmitter systems; dopamine is almost certainly involved somehow. But a more specific and detailed understanding has been very slow to come.

Schizophrenia is the most devastating of all the "mental" disorders. It can justifiably be described as Schizophrenia: Youth’s Greatest Disabler. Most obviously, it distorts and disrupts a sufferer’s ability to understand what is happening in his/her world. More subtly, it disturbs a sufferer’s ability to plan and organize even ordinary behaviors. Although many mental resources remain intact, he deficits a sufferer has more or less isolates him/her from much of the ordinary social interactions that are essential for normal living.

- [Link to a first-person descriptions of what schizophrenia is like.]
- [Link to a magazine article describing schizophrenia and its treatment.]
- [Link to a summary of causes, symptoms, and treatment of schizophrenia.]

For more in-depth information:
[Link to a description of schizophrenia prepared by the National Institutes of Mental Health.]
[Link to a more extensive description prepared by Health Canada. Note: certain aspects in this report, especially police and legal intervention, differ from US practice.]
[Link to a recent major Surgeon General’s report on Mental Health in the US.]
[Link to a description of the failure of the legal, psychiatric, psychological, and social service systems in dealing with children suffering from psychiatric disturbances.]

People tend to avoid people with psychiatric disturbances, and the very label "mentally ill" has serious social consequences (O’Grady, 1988). This appears to be universal across cultures (Murphy, 1976). This is not surprising. People with schizophrenia don't act the way we expect people to act and don’t seem to respond to the usual social cues and consequences, so they can be very hard to deal with. (Recall Hebb’s [1953] claim that unexpected and unpredictable events are most likely to trigger emotional reactions, especially negative ones.)

Furthermore, many people believe that people with serious mental disturbance are prone to violence. People with severe mental disturbance are statistically more likely to commit violent acts than are people from the general population (Monahan, 1992). But these people differ in many ways from the general population, not just having severe mental disturbance.

A recent study has tried to control for these differences by comparing people who have been discharged from psychiatric facilities with others living the same neighborhoods (Steadman et al., 1998). Former patients who were not abusing drugs had rates of violent behavior equivalent to other people in the same community. Drug abuse raised the rate of violence in both former patients and others, and more former patients abused drugs than did others. In addition, more than 50% of the targets of violence...
were family members and 35% were friends or acquaintances. In fact, nonpatients were more likely to be violent against strangers than were the discharged patients. These data indicate that people with schizophrenia are no more likely that others in the same community to do harm to other people.

Furthermore, they are less likely to harm strangers and more likely to harm people they know.

Q1. Many people tend to avoid "schizophrenics" because
A. "schizophrenics" often don't behave the way you expect people to behave
B. "schizophrenics" really do target strangers for violence
C. people believe that "schizophrenics" are likely to harm them
D. Western tradition teaches fear of "schizophrenics," something absent in traditional cultures
E. A and C are correct
F. A, B, C, and D are all correct

Schizophrenia is a poorly understood disorder. It is a group of symptoms that have been given a common name because of historical reasons, and because they all reflect disorders of higher mental processes. The symptoms of schizophrenia are abnormal higher mental function, so they are very difficult to define clearly. Most diseases have clear, objectively physical signs that can be verified (checked) by lab tests or other physical measurements. Diagnosis of schizophrenia is based purely on psychiatrists' or psychologists' evaluations or on psychological tests. No physical sign or laboratory test is available to verify that diagnosis. Neither evaluations nor tests are very reliable or valid, though properly validated psychological tests usually do better than clinical judgment (see asgn5a).

Q2. Two psychiatrists examine Jeffry. One says he has schizophrenia; the other says he has schizotypical personality. This illustrates that
A. the doctors failed to do the chemical lab tests that would tell which
B. schizophrenia is not a real disease, but only a label of behavior
C. schizophrenia is often difficult to diagnose accurately
D. schizophrenia is a mental disease, which can only be diagnosed mentally

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (American Psychiatric Association, 1994), better known as DSM-IV, tries to provide more objective behaviorally based criteria (~rules) for diagnosing a person as having schizophrenia. The main criteria are:

! Deterioration in the ability do ordinary activities involved in work, social interactions, and/or self care

! Two of the following:
" Hallucinations (distorted perceptions of things that do not exist, such as hearing voices talking to or about the sufferer)
" Delusions (false beliefs, such as: "The Jesuits are after me." or "My thoughts can harm other people.")
" Incoherent speech, which jumps from topic to topic connected by very loose associations (see an example below)
" Grossly disorganized behavior
" Loss of normal emotional responses and social behaviors

! Absence of other possible causes like amphetamine or cocaine abuse (which can produce virtually identical symptoms), brain damage, other forms of "mental" illness.

More traditionally and more descriptively, the symptoms of schizophrenia can be grouped into five categories: thought disorders, abnormal affect (emotional response), delusions and hallucinations, mannerisms, and withdrawal.

Thought disorder is most dramatic in the language that some patients with schizophrenia use. The grammatical construction is appropriate, but the meaning is not. The speaker jumps from topic to topic, even within a sentence, using very loose associations to make the jump (e.g., shifting from the nucleus of a cell to the nucleus of an atom). The following is a short excerpt of such speech:

"Certain objects have to be tested to get their answers whether they are bad or good to increase. After certain objects have been examined their answers say they are bad to increase. Objects with solitude names of their own kind are bad for pluses. When it's 9:40 the small had is between the 9 and the 10 or it's 20 of 10 .... Two hands on 7 is just 6:35 and it will never have any more figures. This form of increasing is not plain. Most increasing is plain." (from Bernheim and Lewine, 1979)

Most patients with schizophrenia do not show anywhere near such a dramatic distortion of normal
language. Their thought disorder will appear in other ways, such as an inability to plan and direct action, distractibility from a task by attending to irrelevant information, inability to use basic logic, etc.

Abnormal affect may show up as the absence of emotion or as inappropriate emotion. Some patients may tell a horrible or terrifying story with no apparent emotion; others may laugh when most people would feel sad or cry; still others will be almost paralyzed with fear or anxiety, often brought on by their own delusions.

Delusion are deeply held beliefs, often about the patient's own importance, that are obviously false. These delusions are often paranoid, meaning that the patient has a vastly exaggerated sense of his/her own importance. S/he may believe that s/he is Jesus or Mother Theresa, that the CIA or the KGB or "the mob" is after him/her, or that s/he is writing the great novel of the century.

Hallucinations are perceptual distortions. Hearing voices talking to or about the patient are relatively common, but distortions in other senses also occur. Visually, patients report that colors seem unusually intense and vivid, edges unusually sharp, shapes distorted, etc. Also trivial features (e.g., the reflection on a car window) seem filled with deep meaning. The experience is something like the psychedelic experience that users of LSD and other hallucinogenic drugs often report.

Mannerisms are self-directed actions, like continuously twisting a lock of hair, jerking the head, or walking with a peculiar gait or posture. These mannerisms may be an attempt to control anxieties, much as normal people do on a small scale. Some of these "mannerisms" actually may be side effects of medications used to treat symptoms of schizophrenia.

Withdrawal may appear in many forms, such as reclusiveness (avoiding people), avoiding eye contact with people, or even sitting for long periods with the arms and legs drawn up to the body, and the head buried in the arms. Some psychiatrists and psychologists believe that this kind of symptom may also reflect an attempt to control overwhelming fear or anxiety. Many patients may do this as a result of general deterioration of brain function.

Link to an on-line model diagnostic procedure.

Match the following symptoms of schizophrenia with their names below

| Q3A. belief of being controlled by others, being extremely powerful and important |
| Q3B. laughing while describing being beaten by parent |
| Q3C. hearing voices; seeing colors, contours as abnormally intense |
| Q3D. avoiding eye contact, not responding to questions, avoiding people |
| Q3E. jumping rapidly and without connection from one topic to another |

1. withdrawal  2. inappropriate affect  3. delusions  4. hallucinations  5. thought disorder

Many patients do not show such dramatically abnormal behaviors clearly or consistently; their problems may be much more subtle, or they may be masked by other conditions, such as other psychopathology or drug addictions. So different psychiatrists and psychologists disagree on the diagnosis of patients. They may disagree on what kind of schizophrenia a patient has, or even whether or not s/he has schizophrenia, even when they try to apply modern "objective" criteria (rules) for making the diagnosis.

To some researchers, the difficulty in defining and diagnosing schizophrenia shows that it is not a real disease, but a label. That label is applied to a group of behaviors the majority doesn't like. The label is used to "marginalize" (push out of the main stream) people who show such behavior.

Labeling Theory was a motivation of a famous (or notorious) study, in which normal people went to mental hospitals and faked a single symptom vaguely related to schizophrenia (Rosenhan, 1973). They were all admitted. They then behaved normally. They did flush their medications down the toilet, but patients also do this (many of the medications that decrease the disruptive symptoms of schizophrenia also make people feel "lousy"). The staff failed to recognize any of the pseudopatients as normal (pseudo ~ false).

They were released from the hospital after a minimum of 8 days with the diagnosis of schizophrenia in remission (not now active). [Today, you can sign yourself out of a psychiatric ward or hospital, except if you have been committed by a court for being a danger to yourself or to others or if you are being held for observation.] Rosenhan and others claimed that these findings support the idea that schizophrenia is a socially-defined label more than a disease.
Q4. According to Labeling Theory, schizophrenia is a label that
A. affects how people interpret the behavior of people with that label
B. means a person is mentally ill
C. people give to a set of behaviors they don't like
D. mental hospitals use to confine people against their will
E. A and C are both correct

The label "schizophrenia" definitely colors people's attitudes and behavior toward a person with that label. For example, staff notes about one pseudopatient described taking notes as "compulsive writing" (Rosenhan, 1973). This kind of observation shows that the label "schizophrenia" does affect the way a person's behavior is interpreted. But the conclusion that schizophrenia is only a label is unwarranted. There are at least two reasons why this study does not really support this strong version of Labeling Theory.

However, the conclusion that schizophrenia is only a label is unwarranted. There are at least two reasons why this study does not really support this strong version of Labeling Theory.

Q5. Rosenhan concluded from his pseudopatient study that you cannot tell a sane person from someone with "mental" illness. This conclusion is not necessarily correct because
A. the pseudopatients can be detected when observed closely
B. people cannot behave normally in a mental hospital
C. the pseudopatients did not show real symptoms of schizophrenia
D. sane people don't try to get into a mental hospital
E. A & D are both correct
F. A, B, C, & D are all correct

In contrast to patients, staff spends little time interacting with patients; the high status staff (psychiatrists, psychologists) spend the least. This is not too surprising, because a staff psychiatrist may be responsible for several hundred patients.

Furthermore, much of the little contact that staff members have with patients is very superficial. Rosenhan described an encounter a pseudopatient had with the psychiatrist when he walking came into the ward. The pseudopatient asked the psychiatrist when he would be released. The psychiatrist gave him a very brief non-answer without breaking stride. Rosenham contrasted this behavior with that of a faculty member on campus who was asked how to get to a building on campus. He stopped and spent several minutes explaining how to get there.

The Rosenhan study really shows two things, both of which are important.

Deciding whether someone has schizophrenia is often very difficult; "Normal" and "abnormal" behavior blend into each other. The patients used in videos or texts to illustrate symptoms of schizophrenia are chosen because they made such clear illustrations of the major symptoms. Many patients with schizophrenia act reasonably normal on casual contact.

Staff members get a very small, unrepresentative sample of patients' behavior, partly because they spend little time with patients and partly because patients act differently in their presence. What time staff members do spend with patients is colored by the label the patients have. Staff often assume that whatever a patient may be saying or doing is a reflection of the disease.

[Mark EACH item True (T) or False (F)] The reason that staff members failed to identify the pseudopatients is that

Q6A. T F many real patients look quite normal when casually observed
Q6B. T F staff spent little time with patients
Q6C. T F the diagnosis of schizophrenia affects what staff notice and how they interpret it
Q6D. T F there is no such thing as schizophrenia
Labeling Theory states that many "disorders" are considered abnormal only because a culture labels them so. This theory is basically correct: what we call an illness or a disorder is socially defined. This can be called the "weak version" of labeling theory. The meaning of labels change. For example, alcoholism used to be considered a moral weakness, and homosexuality a disease.

However, this "strong version" of Labeling Theory states that there is no objective basis for calling something an illness or a disease -- it is all a matter of social convention. So the strong version of Labeling Theory predicts that schizophrenic symptoms will be valued positively in some cultures. Supporters of this theory point to cultures with shamans as a fundamental part of their traditions.

Shamans are men and women whom Westerners would call "witch doctors." This is a bad name, because "witch" usually implies something bad and threatening. A better name would be "traditional healers." They are highly valued members of their culture. The shamans' healing goes beyond physical illness to include helping control social conflict as well.

Except for their specialized traditional knowledge, shamans are often ordinary people, whose special powers are called on only when they are needed. Then they take on the role of shaman and act vaguely like patients with schizophrenia. Unlike the patients, shamans show these behaviors only under specific socially expected conditions.

Murphy (1976) tested the prediction that schizophrenia is highly valued by their cultures. She studied three widely separated groups: an Eskimo group, the Ojibwa (a Native American group), and the Yoruba (the major group in Nigeria [West Africa]). All have shamanism as a central part of their traditional belief systems.

Murphy showed that all three groups sharply distinguish between shamans and people whom Western medicine would diagnose as schizophrenic. The shaman is highly valued; "schizophrenics" were negatively valued, avoided, or restrained. Murphy clearly showed that the psychological and behavioral symptoms that Westerners call abnormal in schizophrenia are also considered abnormal and highly undesirable in cultures that have shamanism. This finding disproves an important prediction from the strong version of Labeling Theory.

Q7. The strong version of Labeling theory proposes that cultures that practice shamanism (traditional healing or "witch doctoring") will value people with schizophrenia highly as shamans. Murphy showed that shamans
A. live in societies that have no concept of mental illness
B. act sort of like people with schizophrenia only when healing people
C. are avoided except when they are needed to heal people
D. are like people with schizophrenia and would be hospitalized here.
E. all of the above are correct.

Link to a comprehensive summary of current understanding of schizophrenia.

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asgn5d -- MENTAL ILLNESS: Schizophrenia as a Brain Disease
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asgn5e -- MENTAL ILLNESS:
Schizophrenia as a Brain Disease

Please learn and understand the following terms and ideas about schizophrenia as a brain disease:

! Medications that block receptors for the neurotransmitter dopamine (DA) can relieve symptoms of schizophrenia in many patients (see asgn2g).
! Drugs that stimulate dopamine receptors can produce symptoms that are indistinguishable from paranoid schizophrenia.
! Brain anatomy is abnormal in many patients with schizophrenia. The brains measurements are made directly from brains after death and indirectly from brain scans, like CT and MRI (see asgn2a).
! Brain function as measured by brain scans like PET and functional MRI show abnormalities especially in frontal and left temporal lobes.
! Genetic effects have been identified in schizophrenia with twin and adoption studies.
! The Diathesis-Stress model of schizophrenia states that a genetically predisposed (= diathesis) individual will develop schizophrenia only if environmental stress occurs at appropriate times.

Most researchers and many clinicians (psychiatrists, psychologists, and others who treat patients) now accept the idea that schizophrenia is a brain disease. Some, however, strongly disagree, claiming that a psycho-dynamic approach is more effective and less harmful than the medications that most people with...
schizophrenia get (Karon, 1999). Other psychoanalysts propose a more modest role (Gabbard et al., 2002).

The model of schizophrenia as a brain disease is a return to the 19th century view of this disorder, when it was called dementia praecox (meaning early or premature loss of mental functioning). At that time the idea was rapidly developing that disease is the result of pathology (abnormal function) in some part of the body. Researchers looked for and found brain abnormalities consistently associated with some forms of disturbed mental function.

One such disease was "general paresis," a late stage of syphilis that affects mental and behavioral functions. Another was the mental disturbance resulting from heavy metal (mercury, lead) poisoning. However, repeated attempts to find consistent abnormalities in the brains of patients who had schizophrenia were unsuccessful with the techniques then available.

Because of this failure and because of the influence of Freudian and related "dynamic" theories, the concept of "functional psychosis" (psychosis, "mental illness") developed. By definition, "functional" psychoses, like schizophrenia and affective disorders (depression, manic depression), were believed to have no specific brain abnormality, in contrast to organic psychoses, which result from syphilis, heavy metal poisoning, or other processes that did cause reliably observable brain damage. Instead, functional psychoses were blamed on "bad programming" by the environment. Parents, especially mothers, received much of the blame for the origin of psychoses.

In the last 40 years, most researchers and many clinicians have come to accept the fact that the "functional" psychoses are also based on abnormal brain function. There are several lines of evidence that support this idea. These include:

- The effectiveness of specific medications to relieve symptoms in many patients
- The ability of drugs to mimic the psychological symptoms of psychoses
- The discovery of abnormal patterns of brain activity and abnormalities in brain anatomy, including evidence for an old virus infection and shrinkage due to cell loss.
- The repeated demonstration of a genetic factor

Q1. Functional psychosis was the name given to schizophrenia because
A. it had no consistent sign of organic brain damage  
B. the functioning of the mind was disturbed
C. it can be treated by medications that change brain function
D. it was a function of bad parenting  
E. A, B, and D are all correct

Medications are effective against symptoms of schizophrenia

In the early 50's a French surgeon, Henri Laborit, was looking for ways to decrease surgical "shock". Because histamine, a chemical released by cells under various conditions, lowers blood pressure, he tried antihistamines. (The rules for testing new medications were much less strict than they are today.) Although they did not prevent fall in blood pressure, they had other desirable effects, including a sedative action (make you feel sleepy) that made patients "genuinely suffer less". He then tested related chemicals and found one that was especially good a calming patients before surgery (Swazey, 1974).

Two psychiatrists, Jean Delay and Pierre Deniker heard of this medication and gave it to a few patients with schizophrenia. It did calm the agitation, and it also relieved many of the other symptoms. This medication was chlorpromazine (trade name Thorazine), the first effective treatment for symptoms of schizophrenia.

Many other effective medications, like haloperidol (HAL, trade name Haldol) have since been identified. They vary in potency and in side effects, but they have in common the fact that they block dopamine receptors. Figure 1-5e shows that the more tightly a chemical binds to and blocks these receptors, the smaller the effective therapeutic (treatment) dose. This finding strongly suggests that the therapeutic effects of these medications is related to their ability to block transmission at (certain) dopamine-using synapses.
Q2. Medications that block symptoms of schizophrenia
A. all have chlorpromazine in them
B. block dopamine receptors
C. are used for surgical anesthesia in larger doses
D. work by making patients sleepy
E. are really placebos, because schizophrenia is a functional psychosis

Unfortunately, medications don't work (or work well) for many who suffer from schizophrenia. They also have side effects, some of which are quite unpleasant, disturbing, or even dangerous, sometimes even worse than the symptoms of the disorder itself. For example, potent antipsychotic medications, like haloperidol [trade name Haldol] tend to make people feel "bad", apparently because it also blocks the dopamine-using reward system as well as the system that affect symptoms of schizophrenia. In rare cases, it can produce extremely high fever. Most antipsychotics also can produce motor problems: tremor and, after years of use, uncontrollably disturbed coordination of movements.

Clozapine (trade name Clozaril), a medication that became available in the U.S. a few years ago, has helped many people who do not respond to other medications. It also avoids the serious side effects that other anti-schizophrenic medications have on motor control. But clozapine has a rare (~1%), but potentially fatal, side effect on white blood cells. For this reason, patients using clozapine must have a weekly blood sample taken. In addition it also fails to work for quite a few people. Other similar medications (such as risperidone [trade name Risperidol] and olanzapine [trade name Zyprexa]) that do not have the side effect on white cells have recently become available, and others be will be available soon. Unfortunately each has its limitations as well, so no magic bullet against schizophrenia is yet available (and may never be). For more information about medications used to treat the symptoms of schizophrenia click HERE or HERE

Despite their limitations these medication are primarily responsible for the dramatic reduction in hospital beds for psychiatric patients. In 1953, the year chlorpromazine was introduced, about 1/2 of all hospital beds in the US were for psychiatric patients. Mainly because of these medications, most patients can live in the community, sometimes in group homes, sometimes with family, sometimes independently. But most still need considerable assistance, because people with schizophrenia often have a lot of difficulty dealing with simple practical things in life, especially ones that require some organization and planning. These problems reflect decreased functioning of the frontal lobes.

Q3. Existing anti-schizophrenic medications
A. must be used in hospitals because of their side effects
B. all cause side effects, some of which can be quite serious
C. don't help everyone with schizophrenia
D. are mainly responsible for letting patients live in the community
E. B, C, and D are all correct

Drugs can produce symptoms of schizophrenia

Stimulant "recreational" drugs, most notably cocaine and amphetamine can produce symptoms indistinguishable from paranoid schizophrenia (see below for a definition). Sometimes abusers of these drugs start to show these symptoms after several days of frequent use. These recreational drugs work by increasing the amount of dopamine released at synapses that use it as the neurotransmitter. So anti-schizophrenic medications, which block dopamine receptors, should counteract the effects of the cocaine or amphetamine. They do.

The ability of amphetamine in producing symptoms of schizophrenia have also been demonstrated in the laboratory. In one study (Griffith et al., 1972), experienced users of amphetamine were recruited. Those with no sign of psychiatric disturbance were admitted into the study. They received a moderate dose of amphetamine every two hours. After a couple of days they began to become withdrawn and soon they showed the standard symptoms of paranoid schizophrenia, which disappeared as soon as the drug had washed out of their bodies. These data on further support the idea that effective treatment of many symptoms of schizophrenia are related to blocking (certain) dopamine-using synapses.

Q4. Cocaine and amphetamine can produce symptoms just like paranoid schizophrenia. This finding is important for understanding schizophrenia because __.
A. it shows that they normally cause real schizophrenia
B. they activate the same system that is blocked by anti-schizophrenic drugs
C. their effects appear to fit the dopamine explanation of schizophrenia
D. A, B, and C are all correct
E. B and C are both correct
Abnormal brain anatomy and function

Careful study of the brains of patients with schizophrenia have demonstrated several abnormalities. Many patients have enlarged ventricles (the "tubes" in the middle of the cerebral hemispheres and brain stem shown in Figure 2-5e) due to shrinking in the thalamus and cerebral hemispheres. Their brains also have a shrunken cortex. This is a sign of abnormal loss of brain cells. Microscopic study of brain tissue from patients with schizophrenia indicates that they often have signs of an old brain infection. This may reflect a viral infection the mother caught during the early development of the baby's brain. Increased frequency of viral infection in the winter months may explain why babies born in spring are more likely to develop schizophrenia.

PET and fMRI scans measure metabolic activity in the conscious brain. They show that many patients with schizophrenia have abnormally low metabolism in the frontal lobes, especially when it is measured while patients are doing a task that requires frontal lobe function. A recent study has shown that clozapine indirectly increases dopamine activity in the frontal lobes. This may help explain why clozapine is more successful than are traditional antischizophrenic medications. PET scans have also identified cases in which activity is abnormally high in the left amygdala deep in the temporal lobe.

Link to information about abnormal brain circuits in schizophrenia.

Q5. The brains of (many) patients with schizophrenia show
A. more than a normal number of neurons       B. signs of an infection long ago
C. decreased activity in the frontal lobes when they should be active
D. shrinkage compared to normal brains         E. B, C, and D are all correct

Genetic factors in schizophrenia

Evidence for a genetic factor comes from studies of adopted children, pedigrees (family trees), and mono-zygotic (MZ, identical) and dizygotic (DZ, fraternal) twins.

Pedigrees: If you randomly pick people from the general population, about 1-2% will show symptoms of schizophrenia. If you pick relatives of people with schizophrenia, you will find that the closer the relation, the higher the chance of finding another person with schizophrenia. Nevertheless, a majority of cases occur in people with no known close relatives with the disorder.

Table 1-5e gives the chance that a person will develop schizophrenia, given that a relative has it. The data in this table show that the chance of developing schizophrenia increases as the closeness of relation to a person with schizophrenia increases. Note also that if both parents have schizophrenia, then the child also has a 50% chance of developing the disease. These findings are necessary to demonstrate a genetic factor in schizophrenia, but not sufficient, because genetic and environmental factors are confounded. Most people get both genetic and environmental effects from their families. Studying twins and adopted children helps remove this confound.

| Chance of Developing Schizophrenia of a Relative has this Disorder |
|---------------|---------------|---------------|---------------|---------------|---------------|
| NO RELATIVE  (General Population) | 2nd DEGREE RELATIVE (cousin, aunt) | 1st DEGREE RELATIVE (father, sister) | DZ TWIN (fraternal) | MZ TWIN (identical) | BOTH PARENTS |
| 1-2%       | 2-4%       | 5%      | 10%     | 50%       | 50%          |

As the right half of the table shows, the concordance ("agreement") between DZ (2-egg, fraternal) twins is about twice the concordances for siblings (brothers, sisters), whereas the concordance between MZ (1-egg, identical) twins is five times higher. These data more strongly support the role of genetic factors.

Adoptions: If an adopted child has a biological parent who suffered from schizophrenia, his/her chance of developing schizophrenia is about 5-10%, the same as for a non-adopted child. If an adoptive parent develops schizophrenia but neither biological parent develops it, the adopted child's chance of developing it is 1-2%, the same as in the general population.
The concordance for identical twins is **well below** 100%. This means that environmental effects contribute a lot. Discordant MZ twins (one identical twin develops schizophrenia; the other does not) provide an especially useful way to study possible environmental contributions to schizophrenia by looking for possible contributions to the appearance of schizophrenia in the one twin.

The twin that develops schizophrenia is likely to weigh less at birth. That twin is also more likely to have suffered from complications, such as apnea (stopping breathing) or head injury, during delivery. Retrospectively (looking back in time), differences between discordant twins can be detected quite early. There may have "soft" neurological signs, like somewhat abnormal movement, awkward gait, unusual posture, etc. Untrained observers can pick out the twin that developed schizophrenia from home movies of the twins as young children. Experienced specialists in development can pick out that twin about 80% of the time.

Q7. If one monozygotic twin develops schizophrenia, the other twin has a 50% chance of being normal. This fact shows that

- A. more than one gene must be involved in developing schizophrenia
- B. environmental factors play an important role in developing schizophrenia
- C. our ability to diagnose schizophrenia is not very good
- D. "soft" neurological signs cause schizophrenia
- E. evidence for a genetic factor is not reliable
- F. A and D are both correct

### asgn5f -- MENTAL ILLNESS: A Model of Schizophrenia

**Diathesis-Stress Model of Schizophrenia**

No one has been able to identify any one "cause" for schizophrenia. *Nothing has been identified as necessary (required) or even sufficient (enough) to cause this disorder.* This suggests that:

1. **There is more than one kind of schizophrenia,** and/or
2. **Schizophrenia is the result of two or more processes acting together.**

The **diathesis - stress model** states that both genetic vulnerability and environmental stress are be required for a person to develop schizophrenia. *Environmental factors modify in many ways the expression of genes in behavior.* Recall that genes directly cause only one thing: the production of specific protein molecules, many of which are enzymes (biological catalysts that make specific chemical reactions go). Figure 1-5f outlines the major steps between genes and behavior. The arrows indicate where environmental effects can act to modify the gene's expression at any step.
Q1. According to the diathesis-stress model of the development of schizophrenia, diathesis refers to the ___ and stress refers to the ___.
A. chemical transmitters in the brain that stress activates to produce symptoms of schizophrenia; the social stress that activates the transmitters
B. genes having potential to express symptoms of schizophrenia; environmental events that trigger the expression of this potential
C. the recreational drugs that make the brain susceptible to schizophrenia; the stress that activates the symptoms of schizophrenia
D. the anti-schizophrenic drugs that block the symptoms of schizophrenia; the developmental stress that triggers those symptoms

Although the presence of environmental stressors appears to be associated with schizophrenia, none seems consistently associated. Most people exposed to such stressors do not develop schizophrenia. As mentioned above, in the 50% of MZ twins that are discordant for schizophrenia, the twin that did develop schizophrenia was more likely to have had birth complications. Effects of birth complications can be found in single births as well: People who develop schizophrenia are more likely than normals to have been born of a pregnancy or a delivery that had some kind of difficulty (McNeil et al, 1994).

Infection may also be a stressor that increases the chances that a person developing schizophrenia. People with schizophrenia are more likely to have signs of infections involving brain tissues than are normals. However, many brains from patients do not show such signs, and brains of some normal people also show this sign. Torry (2002) has proposed that an unknown virus is a major cause of schizophrenia. The claim is based on data he interprets as showing that schizophrenia has increased steadily over the last 400 years.

The stresses of childhood (eg., starting school), adolescence and young adulthood (eg., sexual, social maturation) may have a triggering effect. However, most normal people also have the same stresses, and many patients with schizophrenia had no obviously unusual stress during development.

Schizophrenia reflects an abnormal developmental path. Retrospectively, many people who develop schizophrenia showed subtle signs of abnormal development as early as age two or three. For example, untrained observers viewed home movies or videos of identical twins discordant for schizophrenia. They could pick out which twin developed the disorder 70% of the time. Experts picked out 80% of them.

Mark the following symptoms of schizophrenia with the form of schizophrenia they match best
1. associated with paranoid schizophrenia
2. associated with non-paranoid schizophrenia
3. not a symptom of schizophrenia
Q2A. IQ below 70
Q2B. not speaking or speaking very little and doing very little
Q2C. little emotion or pleasure
Q2D. avoiding contact with other people
Q2E. believing the CIA is after you or you are head of CIA
Q2F. hearing voices talking to or about you

Schizophrenia may be more than one disorder. Some researchers refer to “the schizophrenias.” Several modifying names, like undifferentiated, catatonic, are used, but they are only labels for symptom patterns. However the distinction between paranoid or Type I and non-paranoid or Type II schizophrenia seems to describe differences in response to treatment and perhaps in possible causes as well. [“Paranoid” means more than feeling someone is out to get you; it also refers to delusions of great power and importance.]

Paranoid schizophrenia has mostly “positive” symptoms (psychological states, like hallucinations and delusions, which are not present in normals). Non-paranoid schizophrenia has mostly “negative” symptoms (absence of mental states and behaviors, like social contact, which are present in normals). Patients with paranoid schizophrenia are more likely to respond to medications and improve or recover completely. Patients with non-paranoid schizophrenia act more like patients with brain injury or infection, and their brains show such pathology more often.

For a brief description suggesting two different developmental routes to schizophrenia, click HERE
Many factors complicate treatment of schizophrenia.

! Medications are not very effective in controlling symptoms for some patients (No medication "cures" it).

! The side effects of medication can be quite distressing, leaving the patient the choice of relieving psychotic symptoms but having side effects. These side effects include feeling bad, feeling "slowed down," movement problems. 

! Many patients are "non-compliant." They refuse treatment because the disease disrupts the patient's abilities to make judgments. They cannot be forced to take medication except by court order when the patient is likely to harm him/herself or others. They may be refusing because of the disease, or they may be refusing because many of the effective medications have very unpleasant side effects. An editorial in a psychiatric journal urged all psychiatrists to take a dose of the medication, to see how bad if can feel. It is not surprising that many of these medications make people feel bad. They also work to block the action of the "reward system" in the brain.

Q3. Schizophrenia is difficult to treat because
A. many people with schizophrenia do not respond well to any existing medication
B. many patients will not take their medication
C. the medications have unpleasant and/or dangerous side effect
D. A, B, and C are all correct

Most patients with schizophrenia have been "de-institutionalized" in the past 25 years. They now live in the community rather than in a psychiatric hospital. In principle, this is a good idea. It is less costly, and it helps patients become more independent. However, it works only a) if the patient is compliant and takes medication as needed, and b) if adequate social, psychological, and medical support is available to help him/her take care of normal obligations, like paying bills, cleaning house, buying and cooking food, etc. These two conditions are often not met. There are many non-compliant patients, and a large fraction of them are homeless. Furthermore, if patients are not in psychiatric hospitals, then it is easier to cut money for services to them. Link to more information about an innovative approach to rehabilitation for people with schizophrenia.

Q4. Living outside a psychiatric hospital or half-way house works only if the person with medication
A. takes the medication regularly.  B. receives appropriate assistance in handling tasks of daily living.
C. is helped to avoid becoming homeless.  D. all of the above are correct.

Even when medication is successful in relieving the most disturbing symptoms, patients are not well equipped to take care of his/her own needs. 

! Many patients have "lost" the years of late adolescence and young adulthood, when people make important changes and develop new life skills. Patients must make these changes and learn these skills late, so they are even more difficult to make.

! Treatment may relieve only symptoms that are particularly distressing. The medications may bring the patients back in contact with "reality," but the disease process, probably in the frontal lobes, may prevent normal functioning in many adult roles.

Recovering patients need considerable support from family and/or from medical and social services to manage the transition and to remain adequately functioning in the community. Even when medication works well, many people with schizophrenia have a lot of trouble planning, organizing, and carrying out ordinary activities. They have trouble keeping track of money, paying bills, buying household supplies, taking care of their homes, working without close supervision to keep them on target, etc.

There is a good reason for this kind of problem. Recall that medications that block dopamine receptors relieve the main symptoms of schizophrenia and drugs that activate the dopamine system can produce symptoms of paranoid schizophrenia or make them worse. These data suggest that the dopamine system of the brain is not functioning normally. One of those systems regulates the functioning of the frontal lobes, which in many patients with schizophrenia appear to have abnormally low activity. The frontal lobes are essential for planning and organizing behaviors. So if a person's frontal lobes are not working right, then s/he will have difficulty carrying out these functions. For some descriptions of the costs of inadequate treatment, click HERE or HERE.
Q5. Medications can relieve the most obvious and disturbing symptoms of schizophrenia but not affect more subtle deficits. These deficits are in
A. long term memory function  B. frontal lobe functioning  C. planning and organizing
D. control of thinking  E. B, C and D are all correct

Cohen and Servan-Shreiber (1992) have modeled the effects of frontal lobe dysfunction (abnormal function) with neural network computer models. The models simulated (imitated) three different tasks that people with schizophrenia do poorly. The tasks have a basic similarity: selecting the response to make based on “guiding information,” which tells the subject what kind of response is required, but not which specific response to make.

One of the tasks is the Stroop task, described in asgn3o. Observers see color names, like “red,” printed in different color, say green, like this:

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YELLOW GREEN RED BLUE
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On some trials the observer reads the color name; on others s/he reports the color of the letters. Responses on the latter trials are much slower than on the former. The guiding information is the instruction of what to report: the word or the color. Such guiding information is supposed to depend on the functions of the frontal lobes.

First the neural network model has to “learn” the required performance -- reading “red” or saying “green” (this is not programmed into the model). After the model reproduced the performance of normal individuals on these tasks, schizophrenic functioning was modeled by weakening the guiding information by 40%. Under this condition, the model reproduced quite accurately the extra slowing people with schizophrenia show when required to report the ink color. By weakening the guiding information by 40%, the models of the other two tasks also reproduced the deficit patients with schizophrenia show on them. These results indicate that a deficit in this frontal lobe function is a plausible explanation of (some of) the cognitive deficits people with schizophrenia.

Q6. The neural network model described in the preceding paragraphs
A. proves that the frontal lobes are not working normally in people with schizophrenia
B. models tasks in which the correct response depends on information that tells what kind of response to make but not which response to make
C. models the performance of normal people and people with schizophrenia
D. shows that decreasing the strength of “guiding information” makes the model perform the way patients with schizophrenia perform.
E. A, B, and D are all correct
F. B, C, and D are all correct