

Chapter 1 Biological Influences

Bio-Medical Model

The bio-medical model views the locus of behavior problems as being within a child. The causes of these problems vary widely. A problem may have a genetic basis, as in conditions like schizophrenia and some forms of depression. The cause may have a neurological basis such as developmental lag. The resulting neurological immaturity causes greater distractibility and poorer impulse control than normally expected for a child's age. A problem may also be due to impaired biochemical functioning. Such impairments can result from toxic agents like lead, cocaine or alcohol and can result in conditions such as hyperactivity. Medication is often the treatment given to students who have conditions with biological antecedents.

Medication

Many students in public schools are taking psychoactive medications for behavioral conditions (Forness, Sweeney, & Toy, 1996). The most frequently given psychoactive medications are stimulants and tranquilizers (see Table 1.1). The most common medication is some type of stimulant prescribed for hyperactivity. Clearly, treatment by medication is outside the professional role of educators. Educators should never recommend, to parents or anyone else, medicating a student. Educators should never become involved in the administration of drug treatments except in strict compliance with official school system policies. However, educators do have a responsibility to students who are on medication. Educators should:

1. Know that a student is on medication.
2. Know what effects, positive and negative, to expect.
3. Know who to contact if a serious side effect occurs.
4. Watch students for effects.
5. Report to parents any observation of possible adverse effects.
6. Report to parents, if requested, any observation of possible helpful effects.

You should consider keeping data on file on each of your medicated students. The data needs to cover the points outlined above. A convenient way to keep this data is on a standard form (see Figure 1.1). An obvious source of information about a child's medication is a parent or guardian. If you do not know that a student is on medication but suspect he or she is taking medication, you should ask. Always ask about possible medications during initial parent conferences. An excellent source of information on medications is the Physicians' Desk Reference (Medical Economics, 1997). You can find this book in the reference section of any good library. There are also reference sites on the World Wide Web with similar information, e.g., (www.onlinepsych.com/treat/drugs.htm#3).

Table 1.1

The major categories of psychoactive medication. Their uses and common brand names associated with the category.

Antipsychotic Agents

Major Use: To reduce agitation, panic, severe anxiety, and psychomotor excitement.

Common Brand Names: Thorazine, Mellaril, Trilafon, Stelazine, Prolixin, Haldol, Moban, Clozaril, and Navane.

Common Side Effects: Sedation, rigid shuffling walk, lack of facial expression, hand tremor or repetitive hand motions, restlessness, rocking, fidgeting, dizziness, dry mouth, nasal congestion, and constipation.

Antianxiety Agents

Major Uses: To reduce situational stress or anxiety associated with an emotional condition.

Common Brand Names: Valium, Librium, Serax, Tranxene, Vistaril, Atarax, Equanil, and Miltown.

Common Side Effects: Tolerance, physical dependence, drowsiness, uncoordinated movement, impaired emotional and intellectual functioning, and lethargy.

Antidepressants

Major Uses: To reduce depressive mood, restore activity, reduce negative expectations, and reduce self-blame.

Common Brand Names: Tofranil, Norpramin, Pertofrane, Elavil, Aventyl, Sinequan, Vivactil, Triavil, Etrafon, Marplan, Nardil, Parnate, Endep, Pamelor, Ludiomil, Prozac, Zoloft, and Paxil.

Common Side Effects: Dry mouth, nasal congestion, constipation, dizziness, sedation, fine motor tremor, and muscular jerkiness.

Antimanic Agents

Major Uses: To reduce the occurrence and the frequency and intensity of manic and depressive episodes.

Common Brand Names: Eskalith, Lithane, and Lithonate.

Common Side Effects: Slight nausea, vomiting, sleepiness, thirst, dazed feeling, weakness, tiredness, muscular tremors, muscular rigidity, loss of appetite, and diarrhea.

Sedative-Hypnotics

Major Uses: Sedation, insomnia, reduction of inhibitions, and mood elevation.

Common Brand Names: Amytal, Seconal, Tuinal, Nembutal, Pentothal, Luninal, Placidyl, Doriden, Noludar, Noctec, Dalmane, and Quaalude.

Common Side Effects: Slurred speech, impaired intellectual functioning, impaired motor performance, passivity, tolerance, and physical dependence.

Stimulants

Major Uses: Suppression of appetite, narcolepsy, increased alertness, decreased sense of fatigue, elevated mood, improved motor performance, and reduction of hyperactivity in some children.

Common Brand Names: Benzedrine, Dexedrine, Methedrine, Desoxyn, Dexamyl, Ritalin, Cylert, and Perludin.

Common Side Effects: Loss of appetite, nervousness, restlessness, insomnia, tolerance, and psychological dependence.

Allergies

Both children and adults can have allergic reactions. Allergic reactions can cause such symptoms as: Hives, swollen eyes, nasal discharge, sneezing, coughing and wheezing. However, according to Doris Rapp (1980), it is less widely recognized that allergies can cause behavioral reactions. Some of these symptoms include: Restlessness, irritability, emotional lability, tenseness, sullenness, fatigue, lethargy and hyperactivity. These symptoms may occur along with complaints about aches, pains or general discomfort. Some of the common allergens reported by Doris Rapp include but are not limited to:

1. Foods: Milk, corn, wheat, egg, cocoa, sugar, coffee, food coloring, additives, preservatives, orange, grape, apple, tomato, pork, peanuts and cinnamon.
2. Chemical Agents: Tobacco smoke, perfume, phenol, natural gas, gasoline, chlorine, synthetic household fibers such as polyester or polyurethane, insecticides, aerosols and auto exhaust gases.
3. Biological Agents: Pollens, molds, mildew, dust mites, yeasts and pet or animal fur.

Treatment of student known to have allergies may include various medications, nutritional supplements, diet restrictions or environmental restrictions. You should also follow data collection procedures, like those outlined above for psychoactive medications, for students being treated for allergies.

Temperament

One biological antecedent that probably affects everyone's behavior is *temperament*. Stella Chess and Alexander Thomas (1986,1987,1991) studied the relationship of temperament to behavior problems. Temperament is an inherited response tendency or style. The response dimensions studied by Chess and Thomas include:

1. Activity level.
2. Biological rhythmicity.
3. Tendency to approach or withdraw from novel stimuli.
4. Ease of adaptability to changing circumstances.
5. Intensity of responding.
6. Threshold of responsiveness.
7. General quality of mood.
8. Degree of distractibility.
9. Length of attention span and degree of persistence at tasks.

Each of these responses has a normal range of variability. A given individual's typical response can be anywhere within the normal range of variability. The typical response can differ for each of the response types.

These dimensions have many possible combinations or patterns. No doubt, these temperament patterns represent one of the reasons for the considerable differences in normal behavior or individuality. Temperament is probably one of the reasons that you can't expect equal results from similar treatment of different students. Research has identified several temperament patterns. These include the *Easy Child* pattern, the *Difficult Child* pattern, the *Slow-to-Warm-up Child* pattern and *Mixed*. The patterns reflect various combinations of the nine response dimensions. Some typical descriptors for seven of the nine dimensions found useful in identifying temperament patterns are in Table 1.2. Two of the original nine dimensions, biological rhythmicity and threshold of responsiveness to sensory stimuli, will not be covered since there is little or no evidence about their significance for school functioning.

Each dimension of temperament appears to have a biological basis. However, temperament only represents response tendencies or predispositions. A predisposition does not absolutely determine behavior, rather it represents the path of least resistance. Predispositions can be modified by experience. Some appear more easily modifiable than others. The predispositions that are most resistant to change are *Activity Level* and *Approach to Novel Stimuli*. It is particularly important not to confuse high activity level (a response style) in this model with hyperactivity (a medical condition). Low to high on any of these dimensions alone is reflective only of a range of variation that can be expected in children.

Stella Chess and Alexander Thomas (1986) as well as William Carey and Sean McDevitt (1995) have discussed the effects of temperament on both school adaptation and social development. They point out that for a difficult child school entry can be a very stressful event and may be marked by loud and prolonged crying or other indications of distress. Such distress may be misinterpreted as an indication of immaturity. They found that a patient, sympathetic and consistent response from such a child's teacher usually led to an acceptable adaptation to school. However, there appears to be a greater risk of poor adaptation and continuing difficulties if such a child is not handled properly.

Likewise, the slow-to-warm-up child may also have difficulty in adapting to school entry and find the experience distressing. Such a child will usually react to this stressful event by withdrawing. This response can be misinterpreted by such a child's teacher leading to referral of the child for emotional problems. However, if positive and supportive guidance is given, there is a very good chance that a successful adaptation will be made. If a slow-to-warm-up child is mis-perceived as having emotional problems and the child is treated as such, there exists the possibility of the mis-perception becoming a self-fulfilling prophecy. That is, the child's behavior may come to reflect the teacher's expectations.

Both the difficult and the slow-to-warm-up child may experience particular difficulty with social relations in middle childhood. Social relationships during this period begin to become considerably more complex and are often distressing and confusing to children in both of these temperament patterns. This is most likely when such children have failed to develop the necessary social skills and coping behaviors needed to handle a more complex set of social situations. Behavior

Table 1.2

Seven of the nine response dimension in the Chess and Thomas temperament model with descriptive terms that might be used to describe an individual high or low on each dimension.

1. **Activity Level:**

 High: Restless, energetic, active
 Low: Relaxed, lethargic, passive

2. **Quality of Mood:**

 Positive: Enjoyable, helpful, playful
 Negative: Distressing, oppositional, serious

3. **Approach Tendency to Novel Stimuli:**

 High: Assertive, decisive, curious
 Low: Shy, hesitant, withdrawn

4. **Persistence at Tasks:**

 High: Tenacious, involved, diligent
 Low: Fickle, indifferent, impatient

5. **Intensity of Response to Stimuli:**

 High: Enthusiastic, loud, hyperactive
 Low: Calm, quiet, hypoactive

6. **Adaptability to Change:**

 High: Compliant, sociable, flexible
 Low: Reticent, anxious, rigid

7. **Distractibility by Intrusive Stimuli:**

 High: Distractible, impulsive, confused
 Low: Attentive, reflective, purposeful

problems can occur or previously existing behavior problems can intensify and possibly become more numerous. The difficult child's peer relations can become very conflicted resulting in social rejection and isolation. The slow-to-warm-up child will usually withdraw from and avoid social situations resulting in the child being viewed by peers as either a snob or as strange.

Chess and Thomas also discuss the special role of activity level in school adaptation, particularly after the initial adjustment period is past. A child with a normal but high activity level runs the risk of being mis-labeled as hyperactive. A child with a normal but low activity level might be regarded as a slow learner or even as retarded. Such judgments often become self-fulfilling prophecies because of the expectations that are set and the influence those expectations have upon teacher/student interactions.

Further, a child with low persistence and high distractibility represents a troublesome combination. When these two traits occur together, the child's frequent failure to complete tasks can be interpreted as a lack of motivation or even willful resistance to instruction. This can lead to either giving up on the child or confrontation and conflict. Neither response to this combination of traits will be helpful. Finally, in social situations, a child with high persistence and low distractibility can be mis-perceived as too demanding or even as aggressive, particularly when his or her peers want to drop something and move to a new activity.

Roy Martin (1992, 1994), a school psychologist, has been particularly interested in the role of temperament in school problems. He, like Chess and Thomas, has emphasized the importance of how teachers interpret a child's behavior. Attributing problem behavior to incorrect causes can lead not only to inadequate responses to the behavior but can make the problem worse. Further, he thinks that it is equally important for teachers to recognize that behavior is not just the result of temperamental predispositions but rather the interaction of those predispositions with the environment. Knowing this can lead to designing appropriate environments, for children at risk, that minimize problems and facilitate appropriate development. An illustration of this approach is a study by Lauren Orth and Roy Martin (1994) that found a pattern in students with a particularly low task orientation to school work. I would call this the Difficult Child Pattern II. In an evaluation of standard teacher-directed instruction versus computer-directed instruction, they found that students with this pattern had significantly less off-task behavior with computer-directed instruction. If a temperamentally troublesome child is to make a successful adaptation to school, it is very important that teachers correctly identify the basis for the child's behavior and then make appropriate accommodations to it.

Teachers might find it useful to try to evaluate each of their students' response predispositions relative to the Chess and Thomas response dimensions. There are a number of informal rating scales available to do this, including scales developed by the Kaiser Permanente medical group and one by Keogh, Pullis, and Cadwell (1982) adapted from a Chess and Thomas scale. The results from such informal scales are merely suggestive, not diagnostic in nature. The results can be useful for either forming a working hypothesis to be tested through your use of it in planning for and interacting with

a student or as a screening instrument to indicate a possible need for further assessment.

Appraisal of a student's response tendencies can provide a teacher with useful information for planning activities. With this knowledge activities can be planned to take advantage of some response predispositions and to avoid potential problems associated with others. Knowledge of response tendencies can also help in efforts to modify troublesome predispositions. Knowledge of response tendencies can also help a teacher select his or her responses to a student. This is important because teacher responses can influence either desirable or undesirable behaviors in a student.

Personality

Another approach to temperament is illustrated by the work of the British psychologist Hans Eysenck (1967,1981, 1991). Eysenck's approach is based on a *biosocial* model that emphasizes the interaction of temperament and environment to produce *personality*. He, like Chess and Thomas, is concerned with biologically based behavioral styles. Whether the term temperament or personality is used, biological factors in behavior are the focus of their work. Eysenck has developed a personality test for three major personality dimensions, with a biological basis, that affect behavioral style. Eysenck's test is available in two forms. One form is for children (Junior version) and the other is for adults (Eysenck & Eysenck, 1975, 1993). A short form of the child version of this test has been developed for research purposes and could be used for classroom screening as well (Corulla, 1990).

The three behavior traits that Eysenck's work and tests focus on are represented by bi-polar scales (labeled the P, E, and N). An Easy Child temperament would be a child who is near average on all three Eysenckian scales. High N and low E Scale scores are analogous to the Slow-to-Warm-up Child temperament. High P and high E Scale scores are analogous to the Difficult Child temperament. As you will see later, Eysenck's three personality traits can be combined to produce a number of patterns other than the three patterns identified by Chess and Thomas in their work. The three bi-polar scales are presented in Figure 1.2. Extreme positions on these three dimensions predispose a person to certain types of behavioral styles and disorders (see Figure 1.2).

Monte (1995) reviews and summarizes Eysenck's theoretical model of personality based on temperamental source traits. The historical antecedents for the model can be found in Hippocrates' and Galen's classical temperament theory, Pavlov's conception of nervous system types, and Hull's theory of learning. Eysenck proposes several biological mechanisms for explaining his three source traits. Two of these traits, Extroversion (E) and Neuroticism (N), Eysenck clearly relates to arousal levels in the central nervous system. His explanation for the Psychoticism (P) trait is related to polygenetic influences on behavior. Characteristics associated with high levels of each of these traits are listed in Figure 1.3. Characteristics associated with low levels of these traits would be the opposite of the characteristics listed for high levels.

Eysenck thinks differences between people on the E trait are due to differences in the function of their *ascending reticular activating system* (ARAS). The ARAS stimulates the brain's *cortex* to

- | | | | |
|----|---|----------------------------------|---|
| 1. | Low Extroversion <----->
(Introverted)
[Shy]
{Phobia} | Descriptive
Style
Disorder | High Extroversion
(Extroverted)
[Gregarious]
{Hyperactivity} |
| 2. | Low Neuroticism <----->
(Rational)
[Deliberate]
{Obsessive/compulsive} | Descriptive
Style
Disorder | High Neuroticism
(Emotional)
[Spontaneous]
{Neurosis} |
| 3. | Low Psychoticism <----->
(Sensitive)
[Cautious]
{Depressive} | Descriptive
Style
Disorder | High Psychoticism
(Aggressive)
[Exploratory]
{Psychopathic} |

Figure 1.2. The above illustrate the descriptive labels, response styles and possible disorders associated with each of Eysenck's three personality dimensions. The descriptive labels appear in (), style labels appear in [] and disorder labels appear in { }:

Psychoticism:	Extroversion:	Neuroticism:
<i>Aggressiveness</i>	<i>Activity</i>	<i>Low Self-esteem</i>
<i>Assertiveness</i>	<i>Sociability</i>	<i>Unhappiness</i>
<i>Achievement Orientation</i>	<i>Risk-taking</i>	<i>Anxiety</i>
<i>Manipulation</i>	<i>Impulsiveness</i>	<i>Obsessiveness</i>
<i>Sensation Seeking</i>	<i>Expressiveness</i>	<i>Lack of Autonomy</i>
<i>Dogmatism</i>	<i>Lack of Reflection</i>	<i>Hypochondriasis</i>
<i>Masculinity</i>	<i>Irresponsibility</i>	<i>Guilt</i>

Figure 1.3. Lists of characteristics associated with each of Eysenck's three temperamental source traits in personality.

activate its cells to produce a state of excitability. The cortex may in turn generate feedback to the ARAS, which either further increases its excitatory input or damps it down. This model suggests that the ARAS is responsible for cortical efficiency in learning, conditioning, wakefulness, and attention. The ARAS appears to mediate states of cortical arousal, ranging from sleep to extreme behavioral excitation. Eysenck suggests that the function of the cortex is to inhibit the activities of lower brain functions. Therefore, a highly aroused cortex would inhibit behavior. This, it is suggested, is why alcohol disinhibits behavior; i.e., it inhibits or suppresses the cortex. In the case of *extroverts*, high E, the base level of cortical arousal is normally low and less susceptible to stimulation. Thus, in extroverts behavior is less inhibited than in persons who have higher levels of cortical arousal. In the case of *introverts*, low E, the base level of cortical arousal is normally high and more susceptible to stimulation. Therefore, in introverts behavior is more inhibited than in persons who have lower levels of cortical arousal. The differences in base level arousal between introverts and extroverts is evident in research on their differential response to drugs. Introverts require more of a sedative drug than do extroverts to reach a specified level of sedation. Conversely, extroverts require a smaller dose than do introverts of a depressant drug to reach a specified level of sedation.

Hamer and Copeland (1998), behavior geneticists at the National Institute of Health, report that research has shown a connection between sensation and novelty seeking behavior and levels of the neurotransmitter *dopamine*. The higher one's dopamine levels the greater pleasure one experiences from novel and intense stimulation. Variation in a specific gene, *D4DR*, has been connected with inherited difference in dopamine levels. This research offers another perspective on the Extroversion trait. One may exhibit high E traits, in part, because of the increased level of pleasure generated by a high level of dopamine. Hamer and Copeland also point out the importance of environmental factors in the behavioral expression of dopamine influences. For example, someone with high dopamine levels who developed in an aversive social environment might learn to obtain pleasure from the stimulation produced by criminal activity while someone from a more supportive social environment might learn to obtain pleasure from the stimulation provided by hobbies like sky diving or an occupation involving intense stimulation such as being a member of a search and rescue team.

Extroverts may be of two types. In the first type, sociable, outgoing, and stimulus-seeking behavior predominates and susceptibility to *psychopathy* is similar to that in a normal personality. In the second type, impulsivity and an inability to inhibit antisocial urges and behaviors predominates and criminal or psychopathic behavior is likely. Psychopathic disorders are thought to stem from a failure to learn the anxiety-based inhibition that underlies "normal" socialization training. The extrovert who becomes a psychopathic personality does so because his or her cortical and emotional under arousal impedes the learning of anxiety-based self-restraint and moral or ethical inhibitions.

Differences between people on the N trait, it is suggested, are due to differences in *visceral brain activation* (VBA) which depends upon the *hypothalamus* and *limbic system*. The VBA system exerts its effects through the *autonomic or involuntary nervous system*. The range of neural effects extends from activation of glands and muscles to heart rate, respiration, and perspiration. The base

level and responsiveness of the VBA system can range from low to high levels of activation. Emotionally stable individuals, low N, are not very susceptible to emotional arousal. Such individuals can remain calm more easily when in emotionally stimulating circumstances. Their low VBA tendencies also make them more resistant to respondent conditioning. Emotionally excitable individuals, high N, are very susceptible to emotional arousal. Such individuals will become emotionally aroused in situations that most people would have little reaction to. Their high VBA tendencies also make them more susceptible to respondent conditioning. In states of extreme emotional activation, e.g., rage, sadness, or fear, the normal separation of functioning between the ARAS's arousal of the cortex and the VB's emotional activation of the autonomic nervous system breaks down. In effect, the E and N traits lose their independence when an individual is highly aroused emotionally.

Hamer and Copeland (1998) report research that connects the neurotransmitter *serotonin* with Neuroticism. These researchers report that there are significant differences in levels of such traits as anxiety, depression, and pessimism associated with serotonin levels. The mechanism appears to be an inherited variation in DNA that affects serotonin transport. The less efficient one's serotonin transporter the higher one's level of neurotic traits like anxiety. Since traits like anxiety are associated with the autonomic nervous system, it may be that serotonin plays a role in the emotional activation system suggested by Eysenck.

There are two types of neurotics. First, there are individuals who are high on the N trait (emotional) who are susceptible to developing neurotic symptoms, such as phobias, obsessions and compulsions, and intense anxiety attacks due to their predisposition for high emotional arousal and increased responsiveness to respondent conditioning. Second, there are individuals who are high on N (emotional) and low on E (introverted) who are at even greater risk. Neurotic symptoms in these individuals are learned maladaptive responses acquired due to their predisposition for high cortical and high emotional arousal, which facilitates very rapid and strong anxiety conditioning

There are four possible combinations of high and low E and N:

Dimension Position	ARAS Arousal	VB Activation	
Normal Introvert	High	Low	
Normal Extrovert	Low	Low	
Neurotic Introvert	High	High	(Neurotic)
Neurotic Extrovert	Low	High	(Hysterical)

Siever and Frucht (1997) have proposed a two-factor model relating neurotransmitters to behavioral tendencies. This model looks at the interaction effects of *norepinephrine* and *serotonin*. Norepinephrine stimulates the focus of attention toward the external environment. This effect is exaggerated when one is over-reactive to norepinephrine. If one is under-reactive to norepinephrine the focus of attention is engaged with self or on internal states. Norepinephrine appears to be a possible contributor to any explanation for the extroversion trait. Serotonin suppresses impulses and

responses to stimuli. When one is under-reactive to serotonin, impulses and behavior are disinhibited and more difficult to control. When one is over-reactive to serotonin, impulses and behavior are inhibited and control is excessive. Serotonin appears to be a possible contributor to an explanation for the neuroticism trait.

		V	SEROTONIN	V
		Under-reactive Disinhibiting	<i>Neuroticism?</i>	Over-reactive Inhibiting
>	Under-reactive Internalizing	Detached Suicidal		Withdrawn Obsessional
NOREPI- NEPHRINE	<i>Extroversion?</i>			
>	Over-reactive Externalizing	Impulsive Aggressive		Anxious Phobic

Eysenck thinks that a strict conditioning model based on respondent or even on an operant model cannot explain satisfactorily why neurotic symptoms resist change in the face of punishing consequences. He now thinks that an adequate model of neurosis must include the possibility that some neurotic anxieties and fears are based on an inherited sensitivity to certain noxious objects or events. Conditioned neurotic fears rooted in any of these innate “survival” phobias would not readily obey the ordinary “laws” of learning, including extinction. Neurotics persist in self-defeating behavior because the negative consequences of their symptoms and the failure of dreaded outcomes to materialize cannot easily suppress or extinguish fears that have roots in evolutionary survival mechanisms. Hamer and Copeland (1998) also suggest that neurotic traits may exist and persist because of the survival value they have conveyed over the course of evolution. Eysenck hypothesizes that neurotic introverts would be the most susceptible, whereas the normal extrovert would be the least susceptible to developing neurotic symptoms.

Eysenck thinks P is mediated by a *polygenic* temperament source trait. Polygenic means that a large number of genes, each of whose individual effect is small, may be inherited by a person who will evidence a high degree of the trait they embody. Each of these “small effect” genes is additive, so that the total number inherited determines the degree of Psychoticism within the personality. Eysenck’s polygenic hypothesis receives some support in research cited by Siever and Frucht (1997) on the concordance for aggression between fraternal and identical twins that suggests multiple genetic factors rather than a single dominant gene contributes to aggressive behavior. Another group of genes, fewer in number than the first group and having “large effects,” determine the probability that a person will not only evidence the Psychoticism trait but will also suffer a fully developed psychosis. The person who is high on P has inherited a vulnerability to psychotic disorder but may not in fact

succumb to a psychotic illness. Instead a person who embodies a large number to the traits associated with P and who is also high on N and E may develop a pattern of antisocial and aggressive behavior. Aggressive behavior is associated with under arousal because a person with a relatively nonreactive nervous system does not condition or acquire the anxiety-based restraints of conscience as readily as do people with more highly aroused nervous systems.

Eysenck also proposes that high *androgen* levels have the effect of lowering the arousal levels in the brain's reticular system and contributes to a predisposition for aggression. The evidence for this hypothesis is tentative and controversial. A behavioral biologist (Sapolsky, 1997) points out that one of the androgens, *testosterone*, is frequently suggested as a cause of aggressive behavior. According to Sapolsky, the research evidence does not favor testosterone as a cause of aggression. Rather the evidence suggests that testosterone affects the intensity of aggressive responses that are already present. The aggression appears to be mediated by neuronal signals from the *amygdala* to the *hypothalamus*. Testosterone does not produce these signals but sensitivity to it does affect the strength or intensity of the signals.

Further, behavioral geneticists at the National Institute of Health (Hamer & Copeland, 1998) report that aggression is facilitated by low levels of the neurotransmitter serotonin. Genetic factors, as discussed earlier, play a role in serotonin mediated behavior through differences in the efficiency of the serotonin transporter. However, Hamer and Copeland state that the level of serotonin is also affected by environmental conditions. Specifically, they indicate that aversive and abusive environments or low social status tend to diminish serotonin production. Thus, an individual who has elevated levels of testosterone and lowered levels of serotonin and who has learned aggressive behavior as an adaptive response to his or her environment would be at greatest risk for exhibiting chronic antisocial and aggressive behavior.

Siever and Frucht (1997) also discuss the role of the cerebral cortex and the amygdala in regulating aggression. They point-out that animal research demonstrates that antisocial and aggressive behavior are associated with a low density of serotonin receptors in the cerebral cortex and in the amygdala. The cerebral cortex plays a role in regulating social behavior and decision making. A low density of serotonin receptors in this important brain area would tend to disinhibit antisocial behavior and emotional impulses. A low density of serotonin receptors in the amygdala may also explain Sapolsky's earlier point about the variable reactivity of the amygdala to testosterone. That is, with a low density of serotonin receptors in the amygdala one would expect a less inhibited response to a stimulative hormone like testosterone.

The role of environment in antisocial and aggressive behavior has also been discussed by a personality psychologist (Lykken, 1995). Lykken makes an important distinction between what he calls a *sociopath* and a *psychopath*. In the former case, he suggests that sociopaths are almost entirely the product of inadequate socialization. Inadequate parenting is at the root of this inadequate socialization and it tends to be neglectful of a child's needs, aversive, and abusive. Such parenting is also, according to Lykken, often conducted by individuals of low social status. A status

which is also conferred on their children. Such children are at great risk for developing a chronic pattern of antisocial behavior. In the latter case, he suggests that psychopaths are largely the product of a biological predisposition. A child with a difficult temperament will be resistant to socialization and not all parents will be up to the task. Lykken suggests that even adequate parents can fail with this type of child. He argues that such a child can be properly socialized and need not become a psychopath but it takes very competent parents committed to making the effort. Combine this type of child with bad parenting and one has the worst possible combination.

Eysenck argues that psychopaths are high on his P, E, and N Scales and are of two types. The first type is the primary psychopath and is the classic antisocial personality. The primary psychopath evidences little conscience, anxiety or guilt, poor judgment, and intense impulsivity. In this type, the level of P is predicted to be higher than the level of N. The secondary psychopath may engage in antisocial behavior but is highly conflicted and anxious about his or her conduct. In the secondary type the level of N is predicted to be higher than the level of P. Both types, however, are predicted to be high on E.

In summary:

- a. Being high E, the psychopath is under aroused, sensation-seeking, not easily conditioned, and lacks the restraints of conscience that are normally acquired through conditioning; and
- b. Being high N, the psychopath evidences moody, irrational, and intensely emotional behavior; and
- c. Being high P, the psychopath will lack empathy for other people, appear egocentric and impulsive, acting with poor judgment to gratify his or her needs.

Educational Implications

James Wakefield (1979) discusses Eysenck's three dimensions and their educational implications in his book Using Personality to Individualize Instruction. In his discussion of the dimensions, he covers each relative to behavior, *central nervous system* (CNS) arousal, learning, discipline, and achievement. The details of that discussion are too involved to cover here but are well worth reading. A summary of his recommendations for each dimension is included in this text. A fuller discussion of these recommendations can be found in his book. Further, Wakefield has worked out twelve of the possible combination scores that a student might get on the Eysenck instruments (see Table 1.3) and offers descriptions of and suggestions for working with students having these personality (temperament) patterns.

Table 1.3

Eysenck's P, E, and N combinations with descriptive labels from James Wakefield (1979).

PEN Combinations	Descriptive Labels
1. Low or Avg P, Avg E, Low or Avg N	Typical, The majority of children.
2. Low or Avg P, High E, Low or Avg N	Sociable and Uninhibited
3. Low or Avg P, Low E, Low or Avg N	Shy and Inhibited
4. Low or Avg P, Avg E, High N	Emotionally Over-reactive
5. Low or Avg P, High E, High N	Hyperactive
6. Low or Avg P, Low E, High N	Anxious
7. High P, Avg E, Low or Avg N	Disruptive and Aggressive
8. High P, High E, Low or Avg N	Extremely Impulsive
9. High P, Low E, Low or Avg N	Withdrawn and Hostile
10. High P, Avg E, High N	Frequently Agitated
11. High P, High E, High N	Very Disruptive and Aggressive
12. High P, Low E, High N	Very Anxious and Agitated

1. Typical Profile (Low or Avg P, Avg E, Low or Avg N)

This profile represents the majority of students. Because there is a considerable amount of variability on the PEN scales, within the normal range, these students represent a diverse group. The closer to a deviant score on any one of the PEN scales or EPQ profiles an individual student is, the more appropriate the suggestions for students deviant on that scale or with that profile.

These students are usually fairly well adjusted and perform up to their capacity in school. When they exhibit problem behaviors in school there is usually something in the home or school environment that makes these problem behaviors adaptive. Once the environmental influences are corrected their behavior will usually correct or respond well to corrective interventions. As a result, students with the Typical Profile, who develop behavior problems, have a good prognosis. When these students have average to superior intelligence, they usually perform well in school and exhibit few problems. When these students have below average intelligence or a specific disability, they will perform less well and are more prone to develop behavior problems, especially, if they are pushed beyond their ability and have a lot of failure experiences, their motivation or effort is questioned, or their performance is ridiculed.

2. Sociable and Uninhibited Profile (Low or Avg P, High E, Low or Avg N)

These students are usually fairly well adjusted and seldom develop emotional or behavioral problems. In fact, they may appear better adjusted than students with a Typical Profile. They do have a tendency to talk loudly and to respond impulsively.

3. Shy and Inhibited Profile (Low or Avg P, Low E, Low or Avg N)

These students are usually fairly well adjusted with few emotional or behavioral problems. They do not, however, respond well to being the center of attention, particularly unexpectedly or frequently. Teachers often mistake this type of student for a student with emotional problems.

4. Emotionally Over-reactive Profile (Low or Avg P, Avg E, High N,)

These students have a high incidence of emotional problems, e.g., phobias. They seldom show disruptive behavior, but may have emotional outbursts in stressful or threatening situations. Their behavior is usually easy to control and may become over-controlled.

5. Hyperactive Profile (Low or Avg P, High E, High N)

These students are outgoing and uninhibited as well as anxious and over reactive. These students will often be diagnosed with learning disabilities. These students' performance improves when aroused by stimulating materials and activities or by stimulant drugs but may exhibit an emotional over reaction. Thus, you should stimulate these students with materials and social

interaction rather than emotional stimulation.

6. Anxious Profile (Low or Avg P, Low E, High N)

These students are emotionally over reactive, but usually are quiet and extremely cautious. They are often too aroused to perform well in school and anything that reduces their anxiety will improve their performance. They frequently try to avoid things that most children find enjoyable and are particularly susceptible to school phobia. Because of their quiet reserved demeanor, teachers often do not recognize that they need special attention.

7. Disruptive and Aggressive Profile (High P, Avg E, Low or Avg N)

These students are likely to exhibit disruptive behaviors in the classroom. They may also try to dominate classmates through aggressive behavior. They are difficult to control through either reward or punishment and often engage in sensation seeking behavior. Sometimes a skillful teacher can use their sensation seeking behavior to enhance academic performance. Students with this profile who have above average intelligence can be very creative but even so will not be pleasant to work with. Students with this profile who are of lower intelligence have more difficulty directing their behavior toward productive ends.

8. Extremely Impulsive Profile (High P, High E, Low or Avg N)

These students' impulsive behavior is often directed toward other people and is often violent. These students will work in order to be stimulated. Stimulation is useful both during work and following work in order to get optimal performance. They respond better to rewards than punishment but don't respond well to either.

9. Withdrawn and Hostile Profile (High P, Low E, Low or Avg N)

The hostile behavior in these students is usually directed at things rather than people. Vandalism is more common than fighting. Their behavior is likely to be unpredictable and to swing between impulsive and cautious responding both of which are detrimental to school performance. Thus, the recommendations for High P and Low E may at times be contradictory and you must be careful when employing recommendations from one area that you don't push the student to the other extreme. Stimulation during work periods will usually interfere with their performance. However, stimulation following work, as a reward, will increase the amount and quality of future work. Once they become stimulated, it is necessary to get them settled down before any they can productively resume work. The best times for stimulating activities is during breaks, lunch, recess or at the end of the day. Students with this profile who have above average intelligence can be very creative, particularly in the areas of science and technology. Even so, they will not be pleasant to work with. Students with this profile who are of lower intelligence have more difficulty directing their behavior toward productive ends.

10. Frequently Agitated Profile (High P, Avg E, High N)

These students typically have a combination of emotional and behavioral problems. They often engage in sensation seeking activities without regard for consequences. They also often over react to the emotional stimulation that results from their activities. This feedback keeps them in an almost continuous state of over stimulation and anxiety. They usually don't do well academically and often don't have the foresight to successfully commit serious misdeeds. You must constantly work to avoid over stimulating these students or allow them to over stimulate themselves. Students with this profile who have above average intelligence can be very creative, particularly in the area of the arts. Even so, they will not be pleasant to work with. Students with this profile who are of lower intelligence have more difficulty directing their behavior toward productive ends.

11. Very Disruptive and Aggressive Profile (High P, High E, High N)

These students are the most disruptive of all students. Techniques used to stimulate students high on E and to reward students high on P can be used as long as they don't involve stressful or emotional components. A teacher talking loudly or yelling at one of these students is likely to produce an emotional over reaction and physical aggression, probably directed at the teacher. Managing the behavior of this highly unusual type of student requires a constant effort. Students with this profile who have above average intelligence can be very creative, particularly in the area of the arts. Even so, they will not be pleasant to work with. Students with this profile who are of lower intelligence have more difficulty directing their behavior toward productive ends and is the profile with the worst prognosis . Criminal behavior is highly likely for a student with this profile who is of average to lower intelligence.

12. Very Anxious and Agitated Profile (High P, Low E, High N)

These students are likely to be more fearful and anxious and likely to be less openly aggressive than students in Profile Ten. More attention should be given to reducing anxiety than to controlling aggression. Their behavior is often erratic, swinging between emotional outburst and withdrawal, and ineffective. Stimulation during work should be avoided even as a consequence for good work because they may become too aroused (stimulated) for optimal performance.

Here are some general suggestions, from Wakefield, for working with students having high or low scores on the Eysenck instruments. The suggestions are for each of the three trait scales and are sub-divided along several dimensions of concern. The suggestions generally apply to students high (1+ standard deviation above the mean) and low (-1 standard deviation below the mean) along a single dimension. One must consider interaction effects when a student is extreme on more than one of the three dimensions. The suggestions may also be helpful for students who score at the high or low end of the normal range.

Behavior

E Scale: Students who are low E tend to work slowly and make few errors. Students who are high E tend to work quickly and make careless errors. A low E student will appear to be very motivated and attentive on most tasks and will persist at them. A high E student will appear under-motivated and easily distractible and will get easily bored with most tasks.

N Scale: Students who are low N tend to have very mild or no reaction to emotional stimuli. They are unlikely to become upset and if they do will quickly recover. High N students are very sensitive to emotional stimuli, have strong reactions to them, get upset easily and are slow to calm down. High N students will often attempt to avoid situations that are apt to be emotionally charged.

P Scale: Students who are high P are often solitary and viewed as unsocialized. Such students frequently like odd and unusual things and have a marked disregard for danger. They also tend to be defiant and aggressive. Low P students are usually very sociable, friendly and seldom exhibit hostility or aggression. Unlike the high P student, low P students are not very susceptible to serious psychological disorders.

Arousal

E Scale: Students who are low E perform more poorly under external stress, while students who are high E improve their performance when under external stress (e.g., time limits). Arousal from stress relative to the E trait is primarily related to external stimulation, e.g., noise and cognitive challenge, e.g., problem-solving. The optimal level of arousal for these two types of students is also influenced by task difficulty. The optimal level of arousal for each goes up for easy tasks and down for difficult tasks. However, the relative difference will remain the same. That is, on an easy task a high E student's optimal level of arousal will be higher than on a difficult task but will be higher in both cases than for a low E student.

N Scale: Students high on the N trait tend to be more easily aroused by emotional stimuli and often perform poorly on tasks because they are overly aroused or motivated. On the other hand, a student who is low on the N trait often performs poorly on tasks, as well, but for the opposite reason. That is, they are insufficiently aroused or under-motivated. Students high or low on N respond to external stress in about the same way as do students high or low on the E trait. That is, external pressure can be used to enhance performance in low N students, but will further erode the performance of high N students. Task difficulty also interacts with the N trait. A relatively high arousal level is best for easy tasks and relatively low arousal is best for difficult tasks. High N students are particularly susceptible to "test anxiety" and the importance of tests should be down played with them.

P Scale: High P students find high levels of stimulation enjoyable and are prone to engage in exciting and dangerous activities without regard for the potential consequences. Such a student may seek confrontations and even punishment simply for the stimulation value such situations hold. Students low on the P trait do not find high levels of stimulation particularly enjoyable and therefore will tend to less stimulating kinds of activities and will have greater regard for the potential consequences of their behavior.

Learning and Achievement

E Scale: High E students tend to learn major points that are emphasized better than minor points, while low E students will learn both types of material. High E students learn best with continuous reinforcement or feedback, while low E students perform best under conditions of intermittent reinforcement or feedback. Recall of learned material also varies for these two types of students. High E students recall material better after a short delay between learning and testing, while low E students recall material better immediately following learning or after a long delay. Typically, high E students do better in elementary school, while low E students do better in high school.

N Scale: Low N students tend to approach learning in an exploratory style while high N students approach learning in a more rigid and compulsive manner. High N students can study for long periods on a regular basis, while low N students study best for shorter periods broken up by other activities. Low N students do better in elementary school and high N students in high school.

P Scale: Students high on the P trait do not learn as easily from experience as low P students and may be characterized at times as being "hard headed." High P students also have more difficulty maintaining attention and concentrating in learning situations and tend to respond impulsively. These students appear to be more original in their thinking and may be labeled creative. When high P is coupled with above average intelligence it tends to incline the student toward productive endeavors. When high P is associated with average to below average intelligence, this combination can incline a student toward destructive activities. Low P students do better in school at all levels than high P students. Teachers find low P students more "teachable" and less troublesome than high P students even when the high P student is more intelligent and original than his or her low P counterparts.

Discipline

E Scale: Students at both extremes on the E trait respond to reward and punishment. However, low E students are more sensitive to punishment and threats of punishment, while high E students are more sensitive to rewards and reminders about potential rewards that are available. One should not adopt one strategy or the other with students who are at different extremes on the E trait. Rather, one should use both approaches but shift the emphasis a bit depending of the type of student.

N Scale: High N students tend to be more responsive to punishment and low N students to reinforcement. Both reward and punishment should be low key for the high N student. Both reward and punishment need to be somewhat more intense to affect low N students and less intense for high N students. One must pay attention to how reward and punishment are used with students at both ends of this dimension. Failure to differentiate may lead to some students being over-controlled and some who are unruly.

P Scale: Punishment and emotional displays are often counterproductive with high P students. That is, not only may such responses fail to inhibit their behavior, it may actually stimulate the misbehavior. Unlike their low P counterparts these students tend to be both disruptive and difficult to discipline. Highly structured environments employing both mild reward and punishments have the best chance of managing the behavior of high P students.

Activities

1. Select a psychoactive medication that you have, have had or might have a student taking while in your class. Write a brief review of this medication based on the description for it in the Physician's Desk Reference.
2. Complete a Medication Data form or modify this form for Allergy Data and complete it on a real or hypothetical child.
3. Obtain and complete a temperament scale on a student in your class (or a child that you know well).
 - a. Which response tendencies or traits are high and which are low?
 - b. Does the student fit any of the patterns?
 - c. Which response tendencies are potentially useful? How can they be used?
 - d. Which response tendencies are potentially troublesome? How might they be troublesome? What could you do to minimize these potential problems?
4. Which of Wakefield's suggestions for Eysenck's traits might be applied to Chess and Thomas' temperament patterns?
5. Obtain and complete the Junior EPQ on a student in your class (or a child that you know).
 - a. Which personality traits are high and which are low?
 - b. Does the student fit any of the Wakefield patterns?
 - c. Which personality traits are potentially useful? How can they be used?
 - d. Which personality traits are potentially troublesome? How might they be troublesome? What could you do to minimize these potential problems?
6. Select one of the personality dimension combinations from Wakefield that have extreme scores on two different dimensions. Using the guidelines provided for each dimension, work out what you think the combined implications are for the profile selected.

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