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Are There Inherited Behavioral Traits That Predispose to Substance Abuse?

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Research findings suggest that alcoholism and drug abuse may be predisposed by inherited behavioral propensities or temperaments. These inherited predispositions, through interaction with the physical and social environments, shape the development of personality. As discussed herein, there is strong evidence linking certain personality characteristics, specifically antisocial and neurotic traits, with the risk for substance abuse. Thus, personality and its precursor, temperament, comprise an important diathesis. However, an adverse outcome also depends on a variety of developmental and environmental factors.

The risk for developing a substance-abuse problem is not equally distributed in the general population. Numerous factors present in childhood augment the risk for the subsequent development of either an alcohol or a drug problem. Some of the most salient psychosocial risk factors include urban demographic status, low socioeconomic status, weak cultural–religious affiliation, easy access to drugs and alcohol, family history of alcohol or drug use, family discord, identification with a nonnormative peer group, alienation, and weak inculcation of normative social values (Bry, McKeon, & Pandina, 1982; Fialkov, 1985; Kumpfer, 1986; Newcombe, Maddahian, & Bentler, 1986). No single factor appears to cause the development of a substance-abuse problem. Rather, it is the total aggregation of risk factors that best predicts alcoholism or substance-abuse outcome. Of the numerous risk factors that have been identified, a positive family history of substance abuse appears to most strongly portend an adverse outcome (Goodwin, 1983; Kosten, Rounsaville, & Kleber, 1985).

The transgenerational pattern of substance abuse has been known since ancient times. However, only within the past three decades has systematic empirical inquiry been conducted to elucidate the relative contributions of heredity and environment in the etiology of substance abuse. The findings from these studies have not been entirely consistent, although the weight of the evidence has indicated that, at least for alcoholism, there is a strong genetic predisposition (Goodwin, 1983, 1985). Although there is a paucity of twin and family history research pertinent to other drugs, the limited available evidence also suggests a substantial heritable influence (Cadoret, Troughton, O'Gorman, & Heywood, 1986; Hughes, 1986; McClearn, 1983). It has also been argued recently that a common susceptibility underlies both alcoholism and drug abuse (Orford, 1985; Peele, 1985, 1986); however, the evidence is far from conclusive. Nonetheless, as we explore the psychological predisposition to alcoholism, we should bear in mind that the same characteristics may also be present in persons who are prone to drug abuse.

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Behavior–Genetic Perspective of Vulnerability

Genetic research has revealed that numerous behavioral processes have a strong heritable basis. These constitutionally endowed behaviors, or temperaments, have only recently been submitted to systematic empirical inquiry. In a recent comprehensive review and theoretical exposition, Buss and Plomin (1984) identified three fundamental temperament dimensions: activity level, emotionality, and sociability. Previous work by these authors (Buss & Plomin, 1975) argued for an additional temperament trait of impulsivity; however, this behavioral propensity has since been dismissed because its presence could not be demonstrated in the neonate or infant. A plethora of other temperament traits has been advanced, but they have not yet received substantive empirical confirmation. Thus, although the present discussion of behavior genetics vis-a-vis temperament is confined to only those traits identified by Buss and Plomin (1984), it should be recognized that this is a rapidly evolving area of research.

The following discussion examines the role of temperament in alcoholism and by extension in substance-abuse vulnerability by invoking only those temperament traits for which there appears to be sound empirical evidence. The existing data pertinent to substance-abuse vulnerability are readily accommodated by this behavior-genetic perspective. Furthermore, this research perspective provides a heuristic basis for elucidating the pathway to an adverse outcome in adulthood.

Evidence Linking Temperament Deviations to Alcoholism and Substance-Abuse Vulnerability

Buss and Plomin (1984), in an evolving program of research, identified three primary temperament dimensions: activity level, emotionality, and sociability. Although numerous other

temperament traits have been proposed, their heritable basis and their presence soon after birth have not yet been confirmed empirically. The following discussion reviews evidence linking deviations in these three temperament dimensions to the risk for alcoholism. The paucity of research relating psychological characteristics to other substance-abuse vulnerability precludes at this time a discussion of the role of temperament for those disorders.

Activity Level

An excessively high activity level, or hyperactivity in childhood, has been reported to be a risk factor for alcoholism. Morrison and Stewart (1973) and Cantwell (1972) found that hyperactive children were more likely than nonhyperactive children to have a biological father, but not an adoptive father, who was alcoholic. McCord and McCord (1960) and Jones (1968) have observed that alcoholics are often hyperactive as children. Goodwin, Schulsinger, Hermansen, Guze, and Winokur (1975) reported that adopted-out children who became alcoholic, most of whom (10 of 14) were sons of alcoholics, exhibited more childhood hyperactivity than control subjects.

In a 10–12 year prospective follow-up study, Hechtman, Weiss, and Perlman (1984) found that childhood hyperactivity was an important predictor of subsequent alcohol abuse; however, disrupted home life was also an important contributing factor. Primary alcoholics retrospectively reported 2–5 times more childhood hyperactivity and minimal brain-dysfunction features than did secondary alcoholics (De Obaldia, Parsons, & Yohman, 1983; Tarter, McBride, Buonpane, & Schneider, 1977).

In the study by De Obaldia et al. (1983), 17 of 22 primary alcoholics were classified as high in childhood hyperactivity and in minimal brain-dysfunction symptoms, whereas only 9 of 33 secondary alcoholics were so categorized.

In a subsequent study, De Obaldia and Parsons (1984) found that the retrospective reports of hyperactivity and minimal brain dysfunction were highly reliable across two testings and concurred with independent ratings of subjects' behavior by a parent or an older sibling. Alterman, Petrarulo, Tarter, and McGowan (1982), in their discussion of the responses on the childhood history questionnaire used by Tarter et al. (1977), observed that familial alcoholics retrospectively reported significantly more childhood hyperactivity than nonfamilial alcoholics. Gomberg (1982) noted that young, early-onset alcoholics were twice as frequently described as hyperactive as children compared with older, late-onset alcoholics. The former individuals were also more likely to have an alcoholic parent.

By contrasting subgroups of alcoholics according to their level of psychosocial maturity with the Essential–Reactive scale, Tarter (1982) found that socially unskilled, early-onset (essential) alcoholics reported significantly more features of childhood hyperactivity than did socially competent, late-onset (reactive) alcoholics. They also found that essential alcoholics more frequently than reactive alcoholics came from alcoholic families (Templer, Ruff, & Ayers, 1974).

Hyperactive adolescents are more prone than their nonhyperactive peers to misuse alcohol (Mendelson, Johnson, & Stewart, 1971). This propensity toward alcohol misuse cannot be explained by either general academic failure or the presence of a learning disability (Blowin, Bornstein, & Trites, 1978).

Adults in treatment for alcoholism have a high prevalence of documented hyperactivity and minimal brain-dysfunction symptoms as children or adolescents (Wood, Wender, & Reimherr, 1983). Indeed, stimulant medications have been shown to be therapeutic for certain alcoholic individuals (Wood, Reimherr, Wender, & Johnson, 1976).

Hyperactivity is commonly found in conjunction with conduct disorder. Recent preliminary studies have not implicated hyperactivity per se as the salient vulnerability feature but, rather, have implicated conduct disorder as a more important childhood risk factor for alcoholism (Tarter, Hegedus, & Gavaler, 1985). The reasons for this have not been submitted to empirical inquiry; however, hyperactivity and conduct disorder describe different domains of behavior. Activity level describes a dimension of behavior with a heritable basis, whereas conduct disorder describes a range of socially defined nonnormative behaviors. In view of the often-concomitant features of high levels of activity (e.g., restlessness, short attention, etc.), it can be readily seen how this trait in infancy and early childhood predisposes to the development of a conduct disorder. Thus, hyperactivity describes one dimension of behavior, whereas conduct disturbance describes a personality disposition.

In summary, evidence from diverse sources has indicated that childhood hyperactivity may be a risk factor for alcohol abuse in adulthood. Moreover, hyperactivity is often concomitant to childhood conduct disorder and may precede the development of this personality disposition. As will be discussed subsequently, the presence of conduct disorder in childhood augments the risk for alcoholism and substance abuse in adulthood.

Emotionality

Emotionality is defined, at the psychological level, as a susceptibility to become easily and intensely distressed (Buss & Plomin, 1975). At the physiological level, it can be defined as excessive autonomic lability. A high degree of association exists between physiological lability and psychological instability (Eysenck, 1983). For this reason, the temperament of emotionality will be discussed from the perspective of both physiological and psychological processes.

In considering the physiological evidence, Kissin, Schenker, and Schenker (1959) observed that alcohol had a normalizing effect on autonomic functioning in alcoholics. That is, alcoholic individuals who were initially low in sympathetic reactivity were stimulated by alcohol, whereas those who were high in sympathetic reactivity were sedated after the consumption of alcohol. Thus, depending on the individual's baseline physiological state, alcohol either increased or decreased autonomic arousal. Other investigators have reported that alcohol increases arousal (Docter & Bernal, 1964; Docter, Naitoh, & Smith, 1966) as well as reduces autonomic reactivity to external stimuli (Coopersmith & Woodrow, 1967; Garfield & McBrearty, 1970) in alcoholics.

Investigations of psychological functioning have also indicated that emotionality is a vulnerability feature of alcoholism. On the Eysenck Personality Inventory (EPI; Eysenck, 1967,

1983), a test examining the two orthogonal dimensions of neuroticism–stability and introversion–extraversion, alcoholics have often been found to score higher than nonalcoholics on the neuroticism–stability dimension but not on the introversion–extraversion dimension (for a review, see Barnes, 1983). According to Eysenck (1967, 1983), neuroticism is the behavioral manifestation of inherited limbic and autonomic overreactivity and lability. It has been estimated from twin studies that over 50% of the variance on neuroticism is contributed by genetics (Floderus-Myhred, Pedersen, & Rasmuson, 1980; Loehlin & Nichols, 1976).

Sieber and Bentler (1982) studied 750 nineteen-year-old men and retested them when they were 22 years old. They found that excitability, dominance, and aggressiveness were directly related to subsequent substance misuse. Neuroticism was found to be indirectly related to substance misuse. Tarter (1982) found that essential alcoholics scored significantly higher than reactive alcoholics on the EPI Neuroticism scale but not on the Extraversion–Introversion scale. Rosenberg (1969) found that alcoholics under 30 years of age scored higher on the EPI Neuroticism scale than alcoholics over 30 years of age, which led the author to conclude that young alcoholics have abnormally high levels of anxiety that they are unable to control or release in a suitably adaptive fashion. The finding that the young alcoholics, without a long-standing history of alcohol misuse, exhibited more neuroticism combined with the finding that their scores were higher than those of older alcoholics (contrary to what one would expect if this feature had developed as a consequence of alcoholism) suggests that the psychological and inferred physiological lability either predates the onset of problematic drinking or develops soon thereafter.

Evidence that these disturbances predate the onset of alcoholism was presented by Gomberg (1982), who observed that young alcoholics (30 years of age or under) showed numerous behavioral disturbances in childhood that were indicative of neurotic propensities. These features included nail biting, shyness, nightmares, phobias, tantrums, tics, stuttering, thumbsucking, and eating problems. Rydelius (1983b) observed that 18-year-old military conscripts who were heavy alcohol consumers (1,000–4,999 g of alcohol/month) were significantly more frequently described as irritable, restless, and tense on psychological examinations than were abstainers. In a second study, using a personality test developed at the Karolinska Institute, Rydelius (1983a) observed that heavy alcohol consumers also scored higher on scales measuring somatic anxiety, psychic anxiety, psychasthenia, irritability, and impulsiveness.

Persons who are high in emotionality characteristically react intensely to stimulation (Buss & Plomin, 1975). Petrie (1967) reported that alcoholics are stimulus augmenters; that is, they magnify the subjective intensity of sensory experience. In her studies, the kinesthetic aftereffect was measured; however, stimulus augmenting has also been observed in alcoholics by directly recording brain-evoked responses (for a review, see Barnes, 1983).

Costello (1981) factor-analyzed the Sixteen Personality Factors Questionnaire and found that 74 of 120 alcoholic subjects scored strongly in the direction of high lability. In contrast, only 17 subjects scored low on this dimension. Of additional interest was the finding that items measuring shrewdness and low superego strength clustered with high lability, illustrating the possible overlap between antisocial characteristics and emotional lability in alcoholics. The coexistence of heightened anxiety and antisocial behavior was also observed by Rydelius (1983a, 1983b) in his sample of 18-year-old military conscripts who were heavy drinkers.

A number of investigators have observed elevated anxiety levels in alcoholics (for a review, see Barnes, 1983). Of particular interest has been the demonstration that this is more characteristic of younger than older alcoholics, whether it is measured concurrently (Rosenberg, 1969; Rosenberg & Buttsworth, 1969) or retrospectively from reports of childhood behavior disturbance (Gomberg, 1982). High anxiety level has also been associated with impulsivity (Gray, Davis, & Tsultas, 1983), which is commonly thought to precede alcoholism (Jones, 1968; McCord & McCord, 1960). Investigations of persons at heightened risk to develop alcoholism have indicated that emotional instability is not merely a consequence of the alcoholism. The male offspring of alcoholics exhibit characteristics indicative of heightened emotionality. Saunders and Schuckit (1981) found that the nonalcoholic sons of alcoholics scored higher than the sons of nonalcoholics on the Minnesota Multiphasic Personality Inventory (MMPI) MacAndrew Alcoholism Scale. Lund and Landesmann-Dwyer (1979) found that the sons of alcoholics were rated as less emotionally controlled than were the children of nonalcoholics on the Devereaux Adolescent Behavior Rating Scale. Tarter, Hegedus, Winsten, and Alterman (1984), comparing delinquent adolescent sons of alcoholics and nonalcoholics on the MMPI, found that the former group scored higher than the latter on the neurotic triad (Hypochondriasis, Hysteria, Depression) scales but not on the other clinical or validity scales. Aronson and Gilbert (1963) contrasted the sons of alcoholics with classmates who did not have an alcoholic father. Teachers more frequently endorsed such characteristics as "emotionally immature," "unable to take frustration in stride," "sensitive to criticism," "anger open and direct," "impulsive," and "moody and depressed" in the sons of alcoholics. Inasmuch as the offspring of alcoholics are at an approximate fourfold risk to become alcoholic themselves, the available data suggest that there may indeed be particular personality traits in persons who are predisposed.

In her longitudinal study, Robins (1966) found a higher prevalence of nail biting in adolescents who subsequently became alcoholics. Block (1971) evaluated the outcomes of children who originally participated in the California (Berkeley and Oakland) studies of child development. Two types of personality configurations characterized the subjects who developed problem drinking. The first type tended to cry easily, to become angry readily, and to worry excessively even though they outwardly appeared cheerful, gregarious, and assertive. These individuals were classified as *anomic extroverts.* The second group of adolescents was described as extrapunitive, irritable, and hostile. They were classified as *unsettled undercontrollers.* Both of these personality profiles are characterized by disturbances in emotional regulation.

Emotional immaturity, low frustration tolerance, and moodiness have been described in the preadolescent sons of alcoholic fathers (Aronson & Gilbert, 1963). Goodwin et al. (1975) found that the biological adopted-out sons of alcoholics who them-

selves became alcoholics were more often than control subjects reported to be hot tempered, hypersensitive, and insecure as children.

In summary, there is emerging evidence indicating that a tendency to be easily distressed may be associated with the vulnerability to alcoholism. Furthermore, this psychological propensity is associated with a number of other behaviors such as impulsivity, irritability, and aggressiveness, and these behaviors in childhood have also been associated with an increased risk for alcoholism.

Sociability

Commenting on the characteristics measured by a high score on the MacAndrew Alcoholism Scale of the MMPI, Finney, Smith, Skeeters, and Auvenshine (1971) stated that alcoholics are "bold, uninhibited, self-confident, sociable people who mix well with others" (p. 1058). Nonalcoholic young adults who expressed these traits experienced a greater stress-dampening effect from alcohol consumption than did control subjects (Sher, 1984). These findings, taken together, suggest that alcohol consumption may be particularly reinforcing for individuals who score high on the MacAndrew Alcoholism Scale. Further support for this conclusion is provided by the observation that prealcoholics (Hoffmann, Loper, & Kammeier, 1974) as well as the offspring of alcoholics also score high on the MacAndrew Alcoholism Scale (MacAndrew, 1979; Saunders & Schuckit, 1981). Furthermore, Jones (1968) reported that the prealcoholic is talkative, expressive, and prone to initiating humor in interpersonal situations.

Although these findings could be interpreted to suggest that the prealcoholic or the person at elevated risk is more sociable than others, closer examination of the qualitative aspects of the behavior indicates that this is not the case. Of the follow-up studies that have been conducted, all except Vaillant (1983), whose findings have been challenged on a variety of counts (Zucker & Gomberg, 1986), have reported that antisocial tendencies (to a greater or lesser extent) predated the alcoholism (Berry, 1967; Jones, 1968; McCord & McCord, 1960; Robins, 1966). In addition, Robins reported that sadism and school truancy, as well as theft and other serious offenses, were common among prealcoholics. Prealcoholics were also found to be more sadistic than their peers by McCord and McCord (1960). Weak peer loyalty (Berry, 1967) and a negativistic outlook (Jones, 1968) have also been reported. These studies have all demonstrated that prealcoholics are marked by social nonconformity and delinquency.

Thus, these studies have indicated that antisocial propensities characterize prealcoholics. It is likely, therefore, that what appears as sociability is, in actuality, the expression of a highly active, disinhibited, labile, and impulsive disposition. The finding by Jones (1968) that the prealcoholic is inconsiderate of others and unaware of the impressions created on others also points to superficial interpersonal relationships in which insight and empathy are lacking. Thus, it is noteworthy that secondary school students who score high on the MacAndrew Alcoholism Scale are more likely than their peers to have a history of drunkenness, crimes against property, and physical aggressiveness (Rathus, Fox, & Ortins, 1980). A high score on this scale, measuring a rancorous and disinhibited behavioral disposition, indicates that the risk for alcoholism exists conjointly with antisocial behavior in adolescents. Moreover, adolescent problem drinkers were more likely to sustain their drinking if they were inclined toward problem behavior, had poor self-control, and were not involved with church or school (Donovan, Jessor, & Jessor, 1983). Teenage heavy alcohol consumers also scored lower than abstainers on scales measuring socialization, aggression, suspicion, and impulsivity (Rydelius, 1983a).

Additional support for the argument that the prealcoholic is not normatively sociable is derived from the observation that alcoholics do not obtain elevated scores on the Extraversion scale of the EPI (Barnes, 1983). Rather, what seems superficially to be sociability is more accurately described as disinhibitory behavior, which is characteristic of hyperactive children who not coincidentally are more likely than their peers to misuse alcohol as teenagers (Blowin et al., 1978; Mendelson et al., 1971). Difficulty relating to people, aggressiveness, and superficial emotional contact also characterize teenagers who are heavy consumers of alcohol (Rydelius, 1983a, 1983b).

Thus, although alcoholics and prealcoholics may, at first glance, appear to be extraverted or gregarious, this behavioral style does not reflect a true sociability but instead stems from an inability to exercise inhibitory control. However, it must be emphasized that social behavior is exceedingly complex, and a functional, prospective analysis of these processes as they relate to the risk for alcoholism has not yet been systematically undertaken. Furthermore, it may be methodologically difficult to distinguish social behavior that is motivated by affiliative needs from that motivated by a more fundamental disinhibitory inclination. Significant in this regard, however, is a neurologically mediated inhibitory deficit that has been invoked to explain the etiology of alcoholism (Gorrenstein & Newman, 1980). This propensity toward behavioral disinhibition has also been linked to a functional disorder of neural systems lying along the frontal midbrain axis (Tarter, Alterman, & Edwards, in press). How disinhibitory tendencies interact with or affect affiliative needs remains to be clarified.

In summary, there is mounting evidence, drawn from diverse sources, to implicate marked deviations from the population norm in the temperament of individuals who are at heightened risk for alcoholism. The research has been confined primarily to men; hence, caution should be exercised in drawing conclusions that are generalizable to the entire population. Furthermore, research has not yet been conducted on drug abuse other than alcoholism. These limitations aside, the available research has illustrated quite strongly that the investigation of heritable behaviors provides a potentially fruitful means for clarifying the characteristics of persons who are at heightened risk for a substance-abuse disorder.

Diathesis–Stress Model

By what process do heritable behavioral dispositions promote the development of alcoholism or drug abuse? Although certain inherited behavioral propensities may be necessary components of the vulnerability, it is unlikely that these behaviors in infancy are sufficient by themselves to cause substance abuse in adulthood. Many intervening factors undoubtedly play

important roles in influencing the ultimate likelihood of an adverse outcome. Although there is a dearth of research, some of the factors that have been identified include parental rearing style, peer affiliation, learned habit patterns of coping, and cultural and social sanctions.

Thus, both the nature of the physical and social environment and socialization experiences play a critical role in either exacerbating the risk or in protecting the vulnerable person from an adverse outcome. This relation between the person and the environment is both dynamic and reciprocal. A child with a certain behavioral disposition not only reacts to the social environment but also strongly influences the pattern of interactions in the social environment. For example, the young child who is highly active, easily excited, emotionally intense, and not especially sociable effects a pattern of interpersonal interaction that is different from that effected by the child who is emotionally and behaviorally controlled and socially affable. The constellation of temperament traits in the former example comprises the characteristics of the difficult child (Thomas & Chess, 1977) and is more likely to result in a mismatch or poor fit with the environment. The point to be underscored, however, is that very early in life there is substantial individuality in behavior and responsiveness to the environment and that these behavioral propensities themselves influence the behavior of others in the social environment.

The social environment, therefore, which reciprocally interacts with the child who has a particular configuration of temperament traits, determines the acquisition of complex behavioral and habit patterns. These complex behaviors, having both a heritable and a social-learning basis, are proposed herein to comprise personality.

Psychological research has focused on the extent to which personality traits underlie alcoholism rather than on the precursor temperaments from which personality disposition develops. Nonetheless, personality can increase the risk for an alcohol or substance-abuse problem. For example, the young child with poor behavioral and emotional regulation is particularly inclined toward developing a conduct disorder; this personality disposition is associated with an increased risk for alcoholism in adulthood (McCord & McCord, 1960; Robins, 1966). Children who by temperament are highly active, for example, are more likely to have mothers who are submissive, negative, and unaccepting (Webster-Stratton & Eyberg, 1982). Such parental attitudes militate against effective supervision and role modeling. It is also salient that hyperactive boys are more likely than their peers to have alcoholic fathers. The sons of alcoholic fathers more frequently experience physical and sexual abuse and craniocerebral trauma and suffer the various adverse consequences of living in a family with chronic discord (Tarter et al., 1984). In such families, the use of punishment legitimizes and reinforces aggressive behavior in the child. Furthermore, a conduct disorder predisposes to generalized deviancy in which the excessive use of licit and illicit drugs is but one component of nonnormative behavior. In addition, the misbehaving child in school is more likely to have lower educational achievement, to have conflicts with authority, and to experience alienation from peers; these factors also propel the child to a nonnormative peer group and to a socially deviant style of adjustment. Not surprisingly, poor school adjustment has been reported in the offspring of alcoholics (Knop, 1985). In sum, an examination of both normative and nonnormative reference groups inclines one to expect that the conduct-disordered child will behave deviantly.

By adolescence, the conduct-disordered youngster, having already established a socially nonconforming style of adjustment, is more likely than his or her peers to drink excessively or to use drugs despite negative social sanctions. In addition, the deviant behavior pattern is associated with a broad range of other socially nonnormative behaviors, including criminality, irresponsibility to family, poor work motivation, promiscuity, gambling, and so forth.

This scenario describes a developmental process or pathway by which the temperament make-up of the difficult child predisposes to behavioral disorder. In childhood, this is expressed as a conduct disorder and in subsequent adulthood, as an antisocial disorder. Several longitudinal studies have shown that an antisocial personality is a robust predictor of alcohol and drug abuse (McCord & McCord, 1960; Robins, 1966; Vaillant, 1983).

Heuristic Advantages of the Temperament Approach

A detailed discussion of temperament theory and of its applicability to alcoholism and substance abuse lies outside the scope of this discussion. For a detailed examination of these topics, the reader is referred to Buss and Plomin (1984) and Tarter, Alterman et al. (1985). The following points, however, illustrate the value of a behavior–genetic research strategy.

1. Temperament traits are present in all members of the population; hence, the elucidation of the vulnerability to alcoholism or other substance abuse can proceed within the multivariate framework of the psychology of individual differences. For example, hyperactivity has been viewed generally to reflect a clinical disorder, but it can also be understood as a deviation from the population norm for the temperament trait of activity level.

2. Temperament traits are measurable very soon after birth and remain relatively stable during the course of development.

3. Temperament both underlies and precedes the development of personality. Certain personality traits, specifically antisocial and neurotic traits, appear to precede the onset of alcoholism (see Tarter, Alterman, & Edwards, 1985 for a review). Furthermore, there is substantial evidence indicating that certain personality traits are themselves heritable (Cattell, 1982; Eysenck, 1983; Göttesman, 1963).

4. Tentative evidence has suggested that the children of psychiatrically disturbed parents (Cadoret, Cunningham, Loftus, & Edwards, 1975), including the offspring of alcoholic parents (Werner, 1986), exhibit marked temperament deviations. These findings have indicated that there are early signs of behavioral disturbance that may constitute the vulnerability for subsequent maladjustment in adulthood. Because temperament is identifiable and measurable in the neonate or infant, it is possible to investigate the behavioral dispositions early in life that may interact with environmental influences to produce an adverse outcome.

5. Consistent with the diathesis–stress model of psychopathology, the goodness of fit between the child's temperament and social environment is presumed to determine the likeli-

hood of adjustment problems (Thomas & Chess, 1984). That is, neither the behavioral disposition nor the environment is by itself presumed to be sufficient to produce an adverse outcome; rather, the outcome is produced by the interaction between these two sets of variables. Consequently, many biobehavioral vulnerability factors are presumed to interact with both micro- and macroenvironment stressors in a dynamic fashion to determine the risk for an adverse outcome.

Role of Personality in the Development of Substance Abuse

Based on the available evidence, there is reason to suspect that certain heritable behavioral dispositions (or temperaments) are associated with the vulnerability to alcoholism. However, temperament traits are not immutable. Rather, they are modifiable and are shaped by the physical and social environment, by socialization experiences, and by learning. Ultimately, the developmental process culminates in the complex constellation of behavioral propensities that collectively comprise the individual's personality. An issue of central empirical importance concerns the process by which these inherited behavioral propensities develop into complex personality dispositions. For example, it was discussed earlier how the child with the difficult temperament is susceptible to making a social adaptation that is characteristic of the conduct-disordered child or the antisocial adult. Similarly, it is readily apparent that high emotionality as a temperament trait predisposes to the personality trait of neuroticism. Thus, in addressing the question of whether personality factors play a role in alcoholism and substance abuse, it is important to recognize the role of temperament traits as antecedents of personality.

As to personality disposition per se, strong evidence from prospective and high-risk studies has revealed an association between conduct disorder in childhood and adolescence and a propensity for the subsequent development of either alcoholism or substance abuse (McCord & McCord, 1960; Robins, 1966). Although not all persons with an antisocial personality disorder develop problems with alcohol or drugs, such a personality substantially enhances the risk for such an outcome. Some evidence has also been accrued suggesting that the personality traits of neuroticism (Barnes, 1983) and sensation seeking enhance the risk for alcoholism and drug abuse (Zuckerman, 1972).

More recently, Cloninger (1987) argued for two subtypes of alcoholism based on the configuration of three personality traits: novelty seeking, harm avoidance, and reward dependence. Significantly, these traits have a high degree of heritability, appear closely linked to three neurochemical systems (dopamine, serotonin, and norepinephrine), and encompass the domain of motivation to include the mechanisms underlying behavioral activation, behavioral inhibition, and behavioral maintenance. These findings suggest that certain personality traits are associated with an increased risk for alcohol and drug abuse. This, of course, does not imply the presence of an alcoholic or addictive "personality."

Figure 1 illustrates the diathesis–stress model of psychopathology with reference to the risk for developing alcoholism or a drug-abuse disorder. A genetic trait can be expressed across multiple levels of biological organization and, thus, can manifest as a morphological, biochemical, or physiological characteristic. Emerging evidence has linked various genetically determined biological mechanisms to the risk for substance abuse (Cloninger, 1987; Tarter et al., 1985); however, such discussion lies outside the scope of the present discussion. Children in the population vary in genetic vulnerability, which is expressed behaviorally as temperament deviations from the population norm. Extreme deviations from the population norm (high activity level) or certain configurations of traits (e.g. difficult child) predispose the young child to develop certain personality dispositions. Most personality development occurs during the first few years of life, when family environment and interactional patterns are critical influences. The personality of the child subsequently influences the process of adjustment in school and the selection of the peer group. A nonnormative peer group increases the likelihood that the individual will engage in a range of deviant behaviors, including alcohol or drug consumption. Educational, social, and occupational goals and values are inculcated by late adolescence and are strongly influenced by peer group. A deviant style of social adjustment may well be established at this time. One immediate manifestation of this is occupational status. Certain occupational groups are more likely to drink problematically than others, and unemployment due to either low motivation or poor skills augments the risk of drinking problems (Slattery, Alderson, & Bryant, 1986). Within the social macrosystem, social mores and cultural values and rituals as well as demographic and socioeconomic variables also influence the likelihood of alcohol or drug abuse. At each phase of the developmental process, the environment to which the person is exposed exerts either a risk-enhancing or risk-attenuating effect on the person. Thus, the risk for developing an alcohol or drug-abuse problem should be viewed as an ongoing dynamic process of interaction between the individual and the environment. Hence, an adverse outcome can be

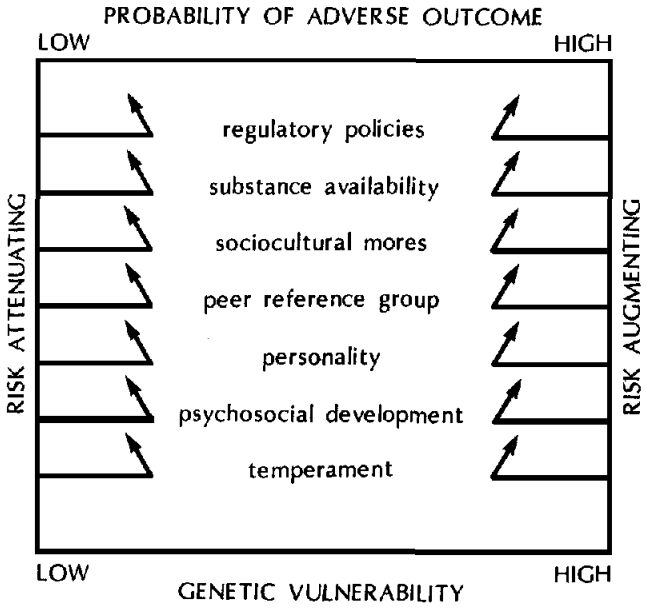

Figure 1. Factors influencing the pathway to an alcoholism or a substance-abuse outcome.

arrived at via many pathways and can potentially occur between late childhood and postretirement.

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