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Drug abuse and developmental psychopathology

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Abstract
Drug abuse research and theory has become much more sophisticated over the last 2 decades, and some of the advancements parallel concepts that are part of the developmental psychopathology approach. The application of the developmental psychopathology perspective to recent drug abuse research findings can provide a greater understanding of that information and point to important areas of future research. Among the drug abuse research areas discussed here and viewed from this perspective are antecedent and co-occurring psychopathological conditions and other problem behaviors; the diversity of the nature of, paths to, and processes and outcomes related to drug abuse; the role of intermediary influences; the interaction of individual and environmental predisposing and protective factors; the role of families and other social institutions in intervention; and developmental stage characteristics. Directions for future research are also discussed.

The modern study of drug abuse is a young field, and until relatively recently our understanding and ability to effectively intervene have been limited. Even today, many still believe that drug abuse is a moral or criminal choice rather than a chronic relapsing disorder based in psychopathological compulsive behavior and neurological dysfunction (Leshner, 1997). Despite great progress and considerable success, our ability to prevent and treat drug abuse requires further development.

Over the last 2 decades, our understanding of drug abuse has grown enormously. This is in part because of the explosion of research in the field but, perhaps more importantly, because of the greater sophistication of the science. It is only within the last 20 years that more rigorous methods and sophisticated concepts have been widely adopted by drug abuse research. Some of the increased sophistication parallels the concepts of developmental psychopathology (Cicchetti & Rogosch, 1999a).

Kazdin (1989) briefly defined "developmental psychopathology" as "the study of clinical dysfunction in the context of maturational and developmental processes" (p. 180). Developmental psychopathology started as an approach applying existing child development concepts and research methods to the understanding of the nature of and pathways to psychopathologies. However, as the approach matured and proved itself to be a superior model and a very productive research orientation, it evolved beyond its origins and has formulated its own distinct and powerful heuristics. (For more comprehensive expositions of developmental psychopathology, see Cicchetti, 1984; Cicchetti & Cohen, 1995a, 1999b; Cicchetti & Rogosch, 1999b; Luthar, Burack, Cicchetti, & Weisz, 1997; Richters, 1997; Sroufe & Rutter, 1984; Toth & Cicchetti, 1999.) Further application of develop-

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mental psychopathology concepts and related research methodology to investigations of drug abuse will lead to even further gains in our understanding of and ability to prevent and treat drug problems. Following is a discussion of some drug abuse research and related issues viewed from this perspective. (The reader is also encouraged to read other relevant discussions, including Cicchetti, 1999; Cicchetti & Rogosch, 1999a; Glantz, 1992; Patterson, DeBaryshe, & Ramsey, 1989; Tarter & Vanyukov, 1994; Tarter, Vanyukov, Giancola, Dawes, Blackson, Mezzich, & Clark, 1999; Weinberg & Glantz, 1999, Zucker, Fitzgerald, & Moses, 1995.)

Person–Environment Interactions

A great deal of research has been devoted to identifying factors that increase the risk that an individual will initiate drug use or will escalate to a level of drug addiction or a substance use disorder (Hawkins, Catalano, & Miller, 1992). For the most part, investigations of predisposing factors for drug abuse have focused *either* on individual *or* environmental factors, and the trend of recent findings has emphasized intraindividual influences. Developmental psychopathology emphasizes the critical role of person–environment interactions, the importance of considering individual differences in the context of their environments.

There are clearly differences in individuals' vulnerability to drug involvement and some of the predisposing factors seem to be present very early in a child's life. There is increasing information that certain temperaments and cognitive processes predispose some individuals to drug abuse and evidence that certain childhood psychopathologies can also contribute (Glantz, Weinberg, Miner, & Colliver, 1999). Research support of the importance of familial and very probably genetic transmission of vulnerability continues to grow. The genetic predisposition seems to be greater the higher the level of drug involvement (Kendler, Karkowski, Neale, & Prescott, 2000; Kendler & Prescott, 1998).

While familial, social, and other external factors seem to exert their greatest influence on lower levels of drug involvement (Glantz & Pickens, 1992), environmental factors play a critical role at all levels of drug abuse (Institute of Medicine, 1996). There is little question that drug abuse results from both intraindividual *and* environmental factors. For this reason, unidimensional models of drug abuse are invariably inadequate and multidimensional research and intervention approaches are necessary. For example, multidimensional treatment of drug abuse is more effective and has become common practice (Leshner, 1999). In fact, when new pharmacological treatments are tested for efficacy in clinical trials supported by the National Institute on Drug Abuse, it is a requirement that a behavioral treatment be part of the intervention.

Taking a multifactorial approach a step further, it is not just that drug abuse results from multiple factors, it is the interaction of those factors that determines the outcome, and it is the interaction of the individual with his or her environment that determines his or her vulnerability to drug abuse (Glantz, 1992). A number of studies have reported that the greater the number and severity of "risk factors," the greater the likelihood of drug abuse (e.g., Bry, 1989; Maddahian, Newcomb, & Bentler, 1988). There is probably some truth to the idea that the more a person is subject to predisposing influences for an outcome, the more likely that outcome is. However, this assumes that risk for drug abuse is a simple additive result of predisposing influences, and ignores the interaction of those factors or the influence of positive factors that might counteract the negative ones. Using a model that considers the interaction of the individual with his or her environment and studies the system of interactions between the predisposing and protective influences leads to a more valid and useful model. It also will give greater direction to the further development of interventions.

This person–environment approach is comparable to an important principle of developmental psychopathology, the transactional model of development. Both concepts emphasize the dynamic mutual interactions between influencing factors as taking place in a nonlinear evolving organization and both

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emphasize the interaction of individual and environmental factors. An interactional approach is increasingly being advocated for and adopted in drug abuse research (Biglan & Hayes, 1996; Cicchetti, 1999; Cicchetti & Rogosch, 1999a; Glantz, 1992) and is proving to be a powerful heuristic concept (e.g., Cadoret, Yates, Troughton, Woodworth, & Stewart, 1996; Dishion, Capaldi, & Yoerger, 1999).

Developmental psychopathology also incorporates an ecological orientation that highlights the role of proximal and distal influences and levels of contextual influences. This perspective recognizes the developmentally important contributions of both the more distal influences of the culture and the community and the more proximal influences of the family and the individual characteristics of the individual. Also recognized is that the influences from each of the levels of the environment interact with and affect each other (see Cicchetti & Toth, 1997, for a comprehensive discussion of the ecological–transactional framework). Although not as prevalent in drug abuse research, this principle is a foundation of many drug abuse interventions. Multicomponent prevention programs, which often include school, family, community, or media components, are one example; residential drug abuse treatment communities are another.

The demonstrated importance of a multilevel framework points to an area of drug abuse research and theory that requires more attention. Drug abuse is a multilevel behavior. It can be seen to occur at the pharmacological, the neurochemical, the psychological, the psychiatric, and the gross behavioral levels. While research and theory related to understanding drug abuse at each of these individual levels is relatively sophisticated, little progress has been made in developing sophisticated integrative multilevel conceptualizations. In addition, there is a need for more research determining the mutual influences of the multiple levels and the characterization at other levels of phenomena associated primarily with one level. For example, craving is a well-established phenomenological event, but there are no adequate depictions of craving in terms of other levels.

Predisposing and Protective Influences

It is natural to think of the origins of a disorder in terms of harmful or "risk" factors. However, this view fails to take into account the importance of protective factors (see Glantz & Johnson, 1999). Even when a negative outcome does occur, it may have been moderated by positive factors. In addition, some negative outcomes may be more a product of missing or inadequate protective influences rather than being the result of otherwise resistible predisposing ones.

Recognizing the role of resilience factors and conceptualizing drug abuse outcomes as being the result of the interaction of predisposing and protective influences has major heuristic and practical implications. For instance, an important component of many successful drug abuse prevention programs is the strengthening of social resistance skills. (e.g., Botvin, 1999; Botvin, Baker, Dusenbury, Botvin, & Diaz, 1995). Nevertheless, resilience in relation to drug abuse has been insufficiently explored (Institute of Medicine, 1996). For example, although there is clear evidence of genetic contributions to drug abuse and neurological changes that foster both escalation to drug abuse and continuation, very little is known about even the possibility of increasing individuals' biological resistance to drug abuse. At this time, the only drug abuse prevention programs shown to be effective are socially based interventions.

Predisposition Is Not Destiny

Individuals vary in their risk for drug abuse. Even among the population of people who have used illicit drugs on multiple occasions, people apparently differ in their vulnerability to addiction. In fact, most people who have used illegal drugs do not escalate to addiction or develop a substance use disorder. Nevertheless, there is clear evidence that some individuals are at greater risk for drug abuse, in many cases before their first exposure to drugs. Twin and adoption studies implicate involvement of preexisting biological vulnerabilities to addiction for at least some people. Some may believe that this implies that the

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predispositions involved are virtually irresistible for those who are vulnerable. However, even twin studies reporting heritability estimates for drug abuse and dependence ranging from 60 to 80% have found that environmental factors play an important role (e.g., Kendler et al., 2000; see also Vanyukov & Tarter, 2000).

The developmental psychopathology perspective assumes that being at risk for a problem behavior is an interaction of individual and environmental predisposing factors that are compounded by inadequate individual and environmental protective or corrective influences. If the environment exercises ameliorative rather than exacerbating influences on children and adolescents at higher risk for drug abuse, then a more normal and healthy outcome is a reasonable expectation.

This means that individual predisposition is *not* destiny. Even children at seemingly higher individual risk have the potential to avoid a drug abuse outcome. However, the greater the individual predisposition and elevated risk, the greater the need for environmental "corrective" influences. Conversely, this concept raises a disconcerting implication. If particular environmental circumstances exist and there is ready availability of a range of drugs with high abuse liability, then vulnerability to drug abuse is likely to be more common than generally believed, perhaps even being a risk for the majority of people. This supports the importance of limiting the availability of abusable drugs and reinforces the necessity of vigorous societal prevention efforts.

The emphasis on individual tendencies and environmental influences in this discussion is not meant to imply that people are merely passive responders to environmental factors or even that they are helplessly controlled by their early experiences and predispositions. Individuals are active agents with awareness of themselves, the circumstances of their lives, their behaviors, and the directions they are heading. Even those individuals with strong personal and external influences directing them to persistent drug abuse are capable of self-direction and can change their futures by seeking help and making other choices that can lead them away from drug abuse. This highlights the importance of teaching children the values that will make them want to do this and teaching them the skills to help them accomplish it.

Co-occurring Problem Behaviors

It is a frequent observation, replicated many times by a range of research studies, that problem behaviors often co-occur. This is certainly the case with adolescent drug abuse which frequently co-occurs with other problem behaviors including conduct problems and delinquency, precocious sexual activity, etc. (Glantz et al., 1999). Many parents are first alerted to their teenagers' other deviant and delinquent behaviors and then discover that their adolescent is involved in substance abuse or vice versa.

Both individual and environmental factors can contribute to the increased likelihood that adolescents involved with one problem behavior will be involved in others. There is considerable debate over the possible causal relationships among the problem behaviors and whether there is some primary underlying cause. Some feel that the co-occurring problem behaviors are to a large extent manifestations of an underlying common cause (e.g., Donovan, 1996; Elliott, Huizinga, & Menard, 1989; Jessor, Donovan, & Costa, 1991). Others believe that the cluster of problem behaviors are relatively independent and do not have a common cause (e.g., Loeber, Farrington, Stouthamer–Loeber, & Van Kammen, 1998; White & Labouvie, 1994). There is some evidence to support both positions. Understanding the relationship between frequently co-occurring problem behaviors is important for being able to intervene as early and as effectively as possible. Hopefully, further research will provide the needed data. In the meantime, some implications are clear.

Regardless of the ultimate resolution on the relations between problem behaviors, it is clear that when preteens or adolescents are found to be involved with one problem behavior, it is important to recognize that they are at increased risk for other problem behaviors, either currently or in the future. Families,

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schools, health care professionals, and those who provide treatment and other services to children and adolescents are not always as active in looking for and responding to the possibility of additional problem behaviors. Prevention and treatment programs targeting problem behaviors in preteenagers and adolescents need to recognize the interconnectedness and co-occurrence of these problems, providing broad-based interventions even when some of the behaviors are not evident.

Research supports the idea that at least part of the co-occurrence of problem behaviors comes from the facilitation provided by problem behaving peers and other environmental influences. This implies that grouping problem behaving preteens and adolescents into separate education and intervention groups may have the unwanted consequence of strengthening the severity and co-occurrence of problem behaviors. Grouping of adolescents with problem behaviors for the purposes of intervention and limiting the spread of peer influence has in some cases led to the seemingly paradoxical outcome of exacerbating the conduct problems. Dishion and his colleagues have explored the nature of this peer influence in a number of studies (Dishion, McCord, & Poulin, 1999; Poulin, Dishion, & Hass, 1999).

As important as it is to be concerned about the powerful effects that environmental experiences can have, not every bad event or circumstance is *necessarily* a determining risk factor for drug abuse. For example, most children raised in higher substance-abusing communities do not become substance abusers themselves. As another example, it is not *all* childhood victims of abuse and trauma who are at increased risk for later substance abuse but rather particularly those who develop a posttraumatic stress disorder (Chilcoat & Breslau, 1998; Kilpatrick, Acierno, Schnurr, Saunders, Resnick, & Best, 2000).

Antecedent Psychopathology

The co-occurrence of other psychopathologies with drug abuse is also a frequent observation and a replicated empirical finding (e.g., Greenbaum, Foster–Johnson, & Petrila, 1996; Kandel, Johnson, Bird, Weissman, Goodman, Lahey, Regier, & Schwab–Stone, 1999; Kessler, Nelson, McGonagle, Edlund, Frank, & Leaf, 1996). Here, too, there is debate on the relationship between the conditions with differing positions on which may be more causal or whether there is a primary underlying cause. In terms of comorbid psychopathologies, it seems unlikely that there will be a single or simple answer. In some cases, drug abuse may be more of a primary or determining condition, in others it may be more of a consequence, and in others the conditions may develop together, perhaps related to an underlying cause. Despite the well-established population-based research on the prevalence of comorbidity, relatively few studies can provide substantial information about the causal relationships involved (for a review of recent findings, see Glantz et al., 1999).

There is suggestive, although as yet limited, research indicating that some children are at higher risk for subsequent drug abuse, at least in part, because of antecedent childhood psychopathologies (see Weinberg & Glantz, 1999). The strongest empirical support for this type of causal pattern is in terms of conduct disorder (CD) and antisocial personality (ASP) disorder, which have been shown in longitudinal studies to be strong predictors of current and subsequent substance use and abuse. However, it is not known if these antecedent disorders are a specific cause of the later substance abuse or are a preceding manifestation of a common underlying cause and perhaps a facilitator of later drug involvement. At the very least, these disorders are useful predictors that can serve as signals of higher risk for later drug abuse. It is also reasonable to hypothesize that they may have at least an exacerbating influence on that later risk (for a further discussion, see Cicchetti & Rogosch, 1999a).

There is also some evidence that adolescents diagnosed with bipolar disorders are at greater risk for later drug abuse. On the other hand, although depression may play a role once a pattern of drug abuse is established, it has not been shown to be a strong antecedent predictor at least for adolescents. There appears to be greater variability of the order of

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onset and apparent causal direction of anxiety and alcohol abuse, with both sequencing patterns having been reported and with variability in terms of anxiety subtype; this is also likely to be found to be the case for drug abuse. Beside ASP, the only other personality disorder to have been shown to significantly co-occur with drug abuse is borderline personality disorder, though population-based data on sequence is lacking. The research on the relationship of attention-deficit hyperactivity disorder (ADHD) and drug abuse is complicated and inconclusive. At this time, it appears that if a subset of children diagnosed with ADHD is at higher risk for drug abuse, then it would most likely be those who have a CD diagnosis or related condition in addition.

Other psychopathologies have also been found to frequently co-occur with drug abuse, but in most cases there is no clear relationship among the co-occurring problems. For example, although there is a very high occurrence of drug abuse among those with certain forms of eating disorders, no clear sequential or causal picture has emerged from the research (Holderness, Brooks–Gunn, & Warren, 1994; Wolfe & Maisto, 2000). Considering the research on the high prevalence of co-occurrences involving substance abuse, it is likely that the comorbidities are neither a product of the rates of occurrence of individual disorders in the general population nor a methodological artifact (Angold, Costello, & Erkanli, 1999). However, as important and probably informative as it would be to have an understanding of the nature of the relationship of substance abuse to other psychopathologies, that understanding awaits future research and theory.

The antecedent and probably contributive role of some childhood psychopathologies, at least in some cases, raises several important questions. If these disorders were to be successfully treated in childhood, would the risk of later drug abuse be reduced? Can current treatments for childhood disorders be modified or supplemented to increase the potential drug abuse prevention effect? Can current drug abuse prevention efforts be strengthened by having them include supplemental programs to screen for these disorders and refer appropriate candidates for mental health treatment? There is currently little research addressing these issues. These questions may be particularly relevant for children and adolescents whose behavior indicates CD or seems likely to develop into ASP.

Risk for drug abuse is not evenly distributed in the population. However, for the most part the majority of current prevention efforts are in the sense that they are universal (i.e., they target the general population of preteens and adolescents). Most programs are school-based curricula based on targeting social influence factors (Institute of Medicine, 1996). These interventions typically involve (a) resistance skills training to combat peer and other social pressure; (b) normative education, which includes information to correct misconceptions about the normative nature and risks of drug use; and (c) coping skills training, which may include decision making, goal setting, problem solving, assertiveness, decision making, social competency skills, and academic skills training.

While such programs have proven to be effective for many preteens and adolescents, they have not achieved the necessary level of success to prevent drug abuse on a comprehensive basis. One group that seems more likely to be unresponsive to these universal prevention programs is adolescents whose behavior demonstrates conduct disorder or antisocial personality disorder and perhaps more extremely rebellious or socially and familially detached teenagers as well. While further research will hopefully provide more information, there is currently no clearly effective approach for persuasively communicating prosocial attitudes to socially estranged groups.

Related to the subject of antecedent disorders, one other issue should be considered. Given that some childhood psychopathologies may precede and contribute to some individuals' development of drug abuse, it is also possible that subclinical forms of these or other disorders may also be contributors to or at least signals of a higher risk for later drug involvement (see Angold, Costello, Farmer, Burns, & Erkanli, 1999; Costello, Angold, & Keeler, 1999). When studied, this largely un-

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researched possibility may yield important information about many people's vulnerability to abuse and addiction. There is also a possibility that effective treatment for these less severe mental health problems may have a secondary drug abuse prevention benefit.

Even for those strong predictors of later drug abuse which have been identified, little is understood about the relationship of the predictor to drug abuse. While at least some of these predictors may be causal influences on later drug abuse, the mechanisms of that influence are also unknown. One issue is whether antecedent influences, particularly biological ones, have a direct effect on individuals' susceptibility to drug abuse and addiction or whether the causal link is more indirect.

Intermediary Influences

Findings from heritability and neurological studies leave little doubt that significant factors in drug abuse escalation are biological. As discussed above, some influences may be related to psychopathologies. There are likely to be other domains or avenues of influence as well. A critical question is, how do these influences effect drug abuse behaviors? Variations in direct response to the drugs themselves probably account for some of the effect. At least for some individuals, a significant part of the effect may be through behavioral intermediaries. Research has identified some potential candidates (see Glantz et al., 1999, for a more extensive discussion).

Executive cognitive function

Drug abusers and those with substance abuse disorders have been shown to demonstrate weaknesses in executive cognitive function (ECF; e.g., Giancola, Martin, Tarter, Pelham, & Moss, 1996; Scheier & Botvin, 1996). Impaired or less mature ECF is associated with poorer problem solving, information processing, self-monitoring, attention, planning, organization, abstract reasoning and concept formation, and self-regulation. Deficits in these abilities would likely facilitate further vulnerability to drug abuse.

While these decrements in function may in part be a consequence of drug abuse, some evidence is emerging that these weaknesses may also precede drug initiation (e.g., Aytaclar, Tarter, Kirisci, & Lu, 1999) and escalation (e.g., Deckel & Hesselbrock, 1996). ECF impairment as a mechanism contributing to drug escalation in at least some cases is supported by findings about prefrontal cortex anatomy and function. Structural findings of prefrontal deficits have been found in a number of diverse samples of individuals diagnosed with ASP disorder (e.g., Raine, Lencz, Bihrle, LaCasse, & Colletti, 2000) and other conditions associated with drug abuse.

Behavior and affect regulation

Impulsivity, sensation seeking, and negative affectivity are qualities which are often observed in drug abusers. Findings about disorders and weaknesses in impulse, behavior, and affect regulation have been identified in longitudinal studies as antecedent risk factors for drug abuse (Chassin, Pillow, Curran, Molina, & Barera, 1993; Iacono, Carlson, Taylor, Elkins, & McGue, 1999; Tarter et al., 1999). Because a cardinal characteristic of drug addiction is an often uncontrollable compulsion to seek and use drugs despite the problems and harm that result, it is reasonable to speculate that impaired or less developed behavior or affect regulation contribute to drug abuse. In addition to the data from behavioral studies, supportive biological findings are beginning to be reported. For example, Tarter and colleagues (Dawes, Dorn, Moss, Yao, Kirisci, Ammerman, & Tarter, 1999) found a decreased salivary cortisol response to an anticipated stressor among sons of fathers having a substance use disorder. Lower preadolescent anticipatory cortisol responses also were associated with regular monthly cigarette smoking and regular monthly marijuana use during adolescence. Dawes, Tarter, and Kirisci (1997) reported that these same subjects demonstrate high rates of poor behavioral self-regulation (see also McBurnett, Lahey, Rathouz, & Loeber, 2000).

Temperament

Research does not provide empirical support for the often hypothesized "addictive person-

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ality" (i.e., the existence of a specific cluster of personality traits that "causes" addictive behavior). There is some evidence, however, that certain temperament characteristics are risk factors for later drug abuse. Although limited and preliminary, research on children whose temperaments are characterized by "behavioral disinhibition" and those falling in the category of Thomas and Chess' "difficult" temperament also appear to be at higher risk (Blackson, 1994; see also Glantz et al., 1999). Because these temperament patterns seem to reflect particular constellations of difficulties related to behavior and affect regulation, particularly characteristics that would predispose an individual to have interpersonal difficulties and to engage in problem behavior (e.g., Schwartz, Snidman, & Kagan, 1996; Shaw, Owens, Vondra, Keenan, & Winslow, 1996), it is not difficult to see how these temperament patterns could contribute to later drug abuse (Glantz, 1992).

If ECF, regulation, temperament, or other characteristics are intermediary mechanisms in the development of drug abuse, then children demonstrating these behavior patterns could be identified at an early age (i.e. at an early point in their development) as being at increased risk for later drug abuse. This would dramatically increase the potential for early, more effective, and probably less extensive intervention for at least a subset of individuals. Treatments and relapse prevention programs intervening with children and adolescents demonstrating these intermediary characteristics might be more effective if they addressed the problems inherent in these intermediaries. However, more research is needed on the nature of these intermediaries and their relation to drug abuse.

Multiple Paths and Patterns

Two important principles of developmental psychopathology are "equifinality" and "multifinality." Briefly, *equifinality* describes the concept that a given end point or outcome may be reached from multiple initial conditions and through multiple processes or paths. *Multifinality* describes the concept that a given initial condition, including ones involving adverse circumstances, may lead to different outcomes (see Cicchetti & Rogosch, 1996, for a more comprehensive discussion). These principles are important in understanding individual differences, different pathways to healthy and maladaptive outcomes, and the potential for overcoming earlier adverse, risk-promoting circumstances. The principle of multifinality is very relevant to the assertion that predisposition to drug abuse is not destiny and the principle of equifinality is relevant to considering the multiple pathways leading to drug abuse.

Having identified multiple antecedent and probably predisposing factors, the available research seems to imply that there are multiple paths to the development of drug abuse and probably multiple patterns as well. While this may be intuitively persuasive as well as being a model verified by clinical observation and empirical data, it is actually an unresolved question.

The factors that determine the initiation of drug-using behavior seem to be different from those that account for the escalation to drug abuse and to a substance abuse disorder. There seem to be many paths that can lead to drug use initiation, including drug-using peers, family problems, etc. The factors described above as antecedent predisposing influences and intermediaries might, among others, then play a significant role in the escalation of the behavior and establishment of a drug abuse or addictive pattern. Here again, the multiple influences and intermediaries support the idea that there are also multiple paths at this point in the course of drug abuse. Further support comes from the observed diversity of drug abusers, the different drugs they use, etc.

However, once a pattern of compulsive drug abuse has begun, it may be that the multiple paths leading to this point converge into a single disorder, perhaps one that is critically determined by common underlying neurological characteristics. Whether drug abuse is ultimately found to be a single basic disorder or whether there are also multiple paths and patterns at this later point in the course of drug abuse as well remains to be determined through research. Whether individual differ-

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ences in vulnerability to drug abuse and addiction are ultimately determined by the paths leading to the establishment of the pattern of abuse or are inherent primarily in a later convergent stage is also unknown. It is clear, however, that a comprehensive understanding of all points in the course of drug abuse is necessary for effective intervention. Further, even if drug abuse is in reality a single fundamentally homogenous disorder despite the behavioral variability, current science is far from developing a single generally effective preventive or treatment intervention.

Heterogeneity

For all practical purposes, then, current practice and further development of prevention and treatment must assume that there are multiple paths to drug abuse and that drug abuse itself is heterogeneous. It is important to recognize the diversity of paths and patterns, contributing factors, co-occurring conditions, and consequences associated with drug abuse. While most drug abusers are polydrug abusers and typically use a variety of drugs over time, many do have strong drug or drug class preferences. The implications of this diversity for understanding and effectively treating drug abuse are still unclear. Prevention and treatment must be responsive to these heterogeneities, targeting the diverse paths and patterns and responding to the different needs and circumstances of individuals and groups. For example, there is some evidence that drug addiction among African Americans is more associated with social and environmental factors and less associated with psychopathology than is the case for European Americans (Roberts, 2000; Ziedonis, Rayford, Bryant, & Rounsaville, 1994).

While drug abuse research and intervention practice has generally recognized that women, different ethnic groups, and other populations have differing circumstances and experiences which interventions must address, there is an additional "environmental heterogeneity" related to health disparities among groups. Both harmful consequences and obstacles to obtaining effective treatment may be greater for some individuals and groups, particularly drug-abusing females, racial or ethnic minority populations, and homosexuals. These individuals may face difficulties related to discrimination, limited resources, special medical circumstances, interventions that are not designed to meet their special needs, and other issues. Compounding these problems, drug abusers in these groups may be adversely affected in addition by the stigma of being a drug abuser. Despite federal government and other institutional efforts to reduce these health disparities, they still affect many people.

Another important aspect of heterogeneity is that drug abuse is a constantly evolving phenomenon, changing as new drugs and forms of drug administration are developed and with such factors as drug availability, drug manufacturing and distribution technology, cultural and other social changes, enforcement patterns, etc. It is also a local phenomenon in the sense that drug abuse patterns are local, varying with a wide variety of environmental circumstances. Research must be ongoing to maintain a current picture of drug abuse patterns, and interventions must adjust accordingly. One of the often neglected aspects of drug abuse heterogeneity is the issue of age and developmental stage.

A Life Span Approach

Not surprisingly, most prevention programs target preteens and adolescents and most treatment programs are designed for young and middle-aged adults. Given the epidemiologic picture, this is appropriate. However, drug abuse is a life-spanning problem, and research and interventions need to expand their focus. This is already happening to some extent. For example, more effort is being directed toward developing drug abuse prevention programs for college students and other young adults, and more treatment programs are being developed for adolescents. There is increasing recognition that as baby boomers age they are more likely to be involved in drug abuse than previous age cohorts have been. Hopefully the trend in expanding the age focus of research and intervention development will continue, and in fact this does seem likely. However, a more life-span-ori-

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ented or developmental perspective has other implications as well.

Most people's behavior problems and psychiatric disorders, including drug abuse, naturally wax and wane over time. Drug abuse behavior patterns often go through a variety of transitions, including periods of unaided abstinence or lower levels of use, relapses, and, for some, enduring recovery and discontinuation of drug use. While certain points in the course of the development of drug abuse have been intensively studied (e.g., initiation), other transitions have received little attention (e.g., relapses or the discontinuation of drug abuse without the assistance of treatment). Understanding of drug abuse would be greatly enhanced if more of its stages and transitions were studied and understood, particularly since different influences may have different contributions at different points. For example, analyzing data from the longitudinal Pittsburgh Youth Study of boys, Loeber, Stouthamer–Loeber, and White (1999) found that delinquency *and* internalizing problems predicted persistent drug use in preadolescents, but persistent delinquency predicted persistent drug use in adolescents.

Arnett (2000) has proposed that young adulthood (ages 18–25 years old) be reconceptualized as a distinct period of development. Characterizing this stage as "emerging adulthood," he presents evidence supporting the contention that this highly "volitional" period is different in important ways from both adolescence and young adulthood, particularly in industrialized societies. Arnett points out that the late teen years and early 20s are not simply an uneventful transition between adolescence and adulthood. This period is a time of significant change, new freedom, independent role exploration, and often the selection of long-lasting directions and the move into enduring adult roles. While this proposal is far from achieving consensual acceptance, it does recognize the unique and important development that occurs during this period, a stage of life that has received relatively little research or theoretical attention in general as well as in relation to drug abuse. One research project that has investigated this stage in relation to drug abuse has reported some important developmental findings.

Bachman, Wadsworth, O'Malley, Johnston, and Schulenberg (1997) reported on findings from the Monitoring the Future study, whose longitudinal research component followed 33,000 high school seniors into their late 20s and early 30s. Replicating the findings of many other epidemiologic studies, they found that their subjects were unlikely to initiate alcohol, cigarette, or illicit drug use after their late 20s and a large number discontinued or significantly diminished drug and alcohol use by their mid-20s. Related to the notion of emerging adulthood, the researchers found that the age-related changes in drug use were not a simple consequence of age-defined maturation. Rather, the changes were attributable to the impact of new roles, relationships, and living arrangements that are associated with the adoption of adult roles and activities. As mentioned above, a critical drug abuse phenomenon that has received little research attention is drug use decline–discontinuation without therapeutic intervention. Further research on emerging adulthood should lead to a much better understanding of a significant period for many drug abusers, a time of first escalation and then decline in use or discontinuation. Greater understanding should also emerge from the study of those who do not diminish their drug abuse during this period.

Drug Abuse Is Not the Final Outcome

Drug abuse is widely recognized as being a problematic outcome, one with serious consequences. However, one likely consequence of drug abuse is often not considered. In both theory and research, drug abuse is typically conceptualized as an end point—that is, as an outcome variable or an already established behavior (e.g., the starting point of a treatment study). But drug abuse is not a sudden occurrence; it is a behavior that develops over time, often during adolescence, a critical period of learning, maturation, experience, acquisition of skills, etc. It is helpful to view drug abuse from a nonlinear perspective and think of it as a behavior that has effects even as it develops,

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some of which may contribute to the continuation or escalation of the behavior.

A principle of developmental psychopathology is that significant behaviors that occur in the context of development are likely to influence the course of development with later consequences. This means that the consequences of drug abuse and other problem behaviors are likely to impair normal development. This will in turn have negative consequences that are separate from the direct effects usually associated with drug abuse. Some of these development-related negative consequences may in turn contribute to the continuation or the escalation of the drug abuse, as well as leading to more general harm in other areas of the individual's life. Considering that the typical age of initiation has lowered over time, this is an even greater concern.

Based on the developmental psychopathology principle of viewing drug abuse from a more systems or developmental and interactive perspective, it is reasonable to hypothesize that adolescent drug use might lead to lower levels of later autonomy, competence, and internally based coping. Empirical support for this hypothesis has been reported by Chassin, Pitts, and DeLucia (1999), who used data from a longitudinal study of children of alcoholics and matched controls to test the relationship between adolescent alcohol and drug use and later psychosocial outcomes. They found that adolescent drug and alcohol use were associated with lowered levels of young adult autonomy, positive action, and competence. Findings of these effects remained significant even after controlling for a variety of adolescent risk factors, concurrent young adult drug use, and preexisting levels of young adult outcome variables. It is not hard to see that impaired or less developed autonomy, positive action, and competence are likely to facilitate further drug abuse, impair an individual's potential for drug use discontinuation and avoidance of relapse, and limit the accomplishment of a healthier and satisfying life independent of the problems caused by drug abuse.

Among the many frightening implications of the trend in lower age of drug use initiation is that the younger the age of the person, the naturally less mature and effective ECF and affect–behavior regulation are. Therefore, not only (a) will younger people have lower resistance to drug initiation and less of a "brake" on escalation of use, but also (b) drug use may interfere with the development of mature and competent ECF, effective behavioral and affect regulation, and other critical aspects of development. Further, given that the human brain continues to develop at least through early adolescence (Giedd, Blumenthal, Jeffries, Castellanos, Liu, Zijdenbos, Paus, Evans, & Rappoport, 1999; Thompson, Giedd, Woods, MacDonald, Evans, & Toga, 2000; see also Cicchetti & Cannon, 1999), the potential for lasting harm which drug abuse can have on development is even greater. At this time, very little information is available on the ways in which illegal drugs affect brain development.

The importance of prevention of preteen and adolescent drug abuse is increased even further by these developmental concerns. The specters that are raised are, first, the possibility that even less severe patterns of drug abuse in adolescence may have lasting negative effects and, second, the possibility that developmentally related impaired competence resulting from adolescent drug abuse may continue to affect abusers for the rest of their lives, even if they discontinue drug abuse. Not only do these concerns reinforce the necessity of early intervention, but also they suggest developing postinitiation drug abuse prevention programs to prevent continuation and escalation, and perhaps treatment components to address the developmental immaturities that may result from adolescent drug abuse.

Early Onset

There is considerable debate over the significance of early onset of drug use initiation. Research has found that it is clearly related to more severe levels of later drug abuse (Anthony & Petronis, 1995). However, some see it as a marker of an already existing and manifesting higher level of risk and dysfunction. Others see it as a contributor to risk by itself

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and conclude that delay of onset is a powerful preventive intervention and a necessary program goal (e.g., DeWit, Adlaf, Offord, & Ogborne, 2000). Many prevention programs are based on this concept. Although there is some research evidence on both sides, there is no resolution and both points of view probably have some validity. Regardless of the point of view that is taken, at the very least early onset should be prevented, and its occurrence is a signal that immediate intervention is needed. Unfortunately, it is very difficult to detect early initiation.

Early Identification and Early Intervention

The earlier in its course that any problem behavior is prevented or treated, the better. This is obviously true for drug abuse. Although universal or general population prevention programs can and should be developed and implemented for most age groups, it is not practical or appropriate to implement on a broad population basis more intensive programs designed for children at higher risk. It is difficult to identify those who have recently initiated drug use or who are at the early stages of drug abuse. For this reason, it is common for adolescent drug abusers not to be identified as having a problem until the drug abuse is an established behavior already beginning to have harmful visible effects. Relying on already developed drug abuse and its emerging negative consequences as the signal that intensive intervention is needed is far from ideal. The only alternative is to use identifiable predictors, known antecedent factors, and observable common co-occurring conditions and intermediaries as the signal that interventions for children and adolescents at higher risk for drug abuse are needed.

Families

Having determined that drug abuse is the result of the characteristics of the individual in the context of each person's interaction with their environment, and given the importance of early identification of problems and early intervention, the potential for intervention of the more powerful environmental factors must be considered. One of the most important influences in a child's life is the family. This is true in general and also in relation to an individual's vulnerability to drug abuse. Family influences may directly decrease *or* increase children's risk for drug abuse. Families may also increase a child's vulnerability by failing to facilitate the development of the normal resilience and coping skills which parents usually help to impart and which serve as protective mechanisms for drug abuse resistance.

Children's environments in general can have a protective or exacerbating influence in relation to drug abuse, and the first and usually the most formative environmental factor is each child's family. Infants start their lives with their families. As the child grows older, they continue to have intense relationships with family members who provide primary care, support, and guidance and who, for the most part, know the child best and care the most about him or her. The family is the child's first social group and can be the first sentinel detecting early signs of later possible problems. Parents are most likely to be responsive to the individual characteristics and circumstances of each child, both observing and trying to influence them, correcting them when necessary. As mentioned earlier, familial environmental factors seem to have more influence earlier in the course of the development of drug abuse. This does not imply, however, that family influence is ultimately less important. If anything, it may be more important, because the family influence is greatest at the time when there is the greatest potential for early identification of vulnerability to drug abuse and early intervention.

Although clear research findings are limited, there is some evidence that good parenting, characterized by high levels of emotional support, consistent noncoercive rule enforcement, monitoring of child behavior, and parent–child involvement can serve as a protective influence for children in general (Institute of Medicine, 1996). On the other hand, there is evidence that poor parenting and family function problems are associated with a range of negative outcomes, including higher rates

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of drug and alcohol abuse (Anderson & Henry, 1994; Ary, Duncan, Duncan, & Hops, 1999; Chilcoat & Anthony, 1996; Clark, Neighbors, Lesnick, Lynch, & Donovan, 1998; Dishion, Kavanagh, & Kiesner, 1998; Griffin, Botvin, Scheier, Diaz, & Miller, 2000; Hoffman, 1993; Mayes, 1995; Petraitis, Flay, Miller, Torpy, & Greiner, 1998; Steinberg, Fletcher, & Darling, 1994; Wills & Cleary, 1996; Wong, Zucker, Puttler, & Fitzgerald, 1999). This raises the question of whether family and parenting intervention programs could be effective "universal" drug abuse preventions. Many prevention programs involve the family as a medium of communicating anti-drug-abuse messages, and this seems to be a useful component in comprehensive drug abuse prevention programs. Other programs emphasize improving parenting as a means of intervention and attempt to develop parenting skills and family communication as a means of protecting children. Broad-based parent skill development and family support programs seem to have benefits for both the quality of parenting and healthy child behavior but have not as yet been shown to be effective in producing lasting effects on children's drug use (Institute of Medicine, 1996). Programs that also include high-quality preschool environments and are provided for multiple years may be more effective (Yoshikawa, 1994), as may programs which specifically target improving the skills of good parenting mentioned above (Kazdin, 1987; see also Ashery, Robertson, & Kumpfer, 1998). Many attempts to further develop family-based drug abuse prevention programs are now in progress, and it is reasonable to expect that further improvement of their effectiveness will result.

Three family-based intervention approaches may have particular potential. The first is a more targeted intervention for families in which at least one of the parents is a substance abuser, particularly a drug abuser. A family history of drug abuse is one of the most powerful predictors of the development of a drug disorder, and this familial aggregation appears to involve not only genetic factors, but familial–environmental ones as well (e.g., Kendler et al., 2000; Merikangas, Stolar, Stevens, Goulet, Preisig, Fenton, Zhang, O'Malley, & Rounsaville, 1998). Even allowing for those instances where fetal drug exposure and other related factors are involved, some of the familial effect is very likely to relate to the parenting and related circumstances of the parents' drug abuse. Studies of drug-abusing parents support this (e.g., Burns, Chethik, Burns, & Clark, 1997; Chilcoat, Breslau, & Anthony, 1996; Mayes, 1995). Parenting and family support programs specifically designed for families with substance-abusing parents may have the potential of preventing drug abuse by the children in those families. While research is needed for further program development and effectiveness testing, this approach holds promise for producing programs that can positively affect a great many children.

When the number of children growing up in substance-abusing families is considered, the importance of recognizing this as a danger signal and effectively intervening becomes even more compelling. According to the National Longitudinal Alcohol Epidemiological Study (NLAES), 9.6 million children live with alcohol-abusing or -dependent adults (Grant, 2000). The Department of Health and Human Services estimates that 8.3 million children in the United States (i.e., 11% of U.S. children) live with at least one parent who is in need of treatment for alcoholism or drug abuse. Of these children it is estimated that 2.1 million live with at least one parent whose primary problem is with illicit drugs and 2.4 million live with a parent who abuses alcohol and illicit drugs in combination, (department of Health and Human Services, 1999). Huang, Cerbone, and Gfroerer (1998) analyzed data from the 1996 National Household Survey on Drug Abuse (NHSDA) and estimated that 4 million children (6% of the estimated 75 million children in the U.S.) had at least one parent who was in need of treatment for illicit drug abuse. The (NHSDA) data also indicated that 3 million children (4%) lived with at least one parent who was dependent on illicit drugs and that 6 million (8%) lived with at least one parent who was dependent on alcohol. The authors further estimate that 11 million children (14%) lived

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with one or more parents who reported past-year use of illegal drugs, while more than 8 million (11%) lived with at least one parent who reported past-month use. In addition, 38 million children (50%) lived in a household where at least one parent reported cigarette use in the past month, which provides a parental model and tacit sanction of using a health-endangering drug despite public health warnings; for some children exposed to higher levels of tobacco use by a parent, it provides a model of tolerable if not acceptable drug dependence. These different attempts to measure exposure to parental drug abuse show that a great number of children are growing up in homes with substance-abusing parents, and these findings do not include homes where siblings or other household members are abusers of alcohol or drugs.

Children growing up in nonintact or dysfunctional families may also be at increased risk for developing drug abuse (Griffin et al., 2000; Petraitis et al., 1998). Intervention for these families and children are a second targeted family-based prevention possibility. In at least some cases, family-based prevention may be accomplished by changing the ways in which these families, nonnuclear family arrangements, and other alternative or surrogate families function. Family functioning would be the target of the intervention. Treatment programs based on this idea have been shown to be effective (Stanton & Shaddish, 1997), but this approach has been applied to prevention in only a small number of programs (see Ashery, Robertson, & Kumpfer, 1998, for an extensive discussion of family-based drug abuse prevention programs).

Assuming that children growing up in families with certain severe problems are at higher risk for drug abuse, it seems reasonable to develop and test the effectiveness of interventions that target children growing up in particularly hazardous environments. This would include children in drug-using environments, children in families with parents or siblings who are drug abusers, families identified for child abuse and neglect, children in homeless situations, and so forth. Given the importance of family influences and good parenting, children in foster homes may also be at greater risk for developing drug abuse (General Accounting Office, 1994). At this time there are few preventive interventions designed specifically for this group of children.

The third targeted prevention possibility might focus on children demonstrating the types of predisposing antecedent psychopathologies and intermediaries discussed above. These potential antecedent, co-occurring, and intermediary behaviors are often identifiable in childhood, raising the possibility of early intervention that might mitigate vulnerability to drug abuse as well as other behavior problems. Families often observe these behaviors or are alerted to them by schools, alternate care providers, supervisors of child oriented activities, etc. For the most part, drug abuse prevention programs have not been developed to help families understand and provide an ameliorative or compensating influence on these psychiatric characteristics. A number of family programs targeting other conduct problems and disorders are being developed, and it may be possible to develop comparable interventions to reduce drug abuse vulnerability. Some programs currently being developed are taking a step in this direction (e.g., Dishion & Andrews, 1995). One complicating issue is that children demonstrating these types of problems and disorders may have parents who also have dysfunctions, may not be readily capable of providing good parenting, and may even be substance abusers themselves (e.g., Merikangas, Dierker, & Szatmari, 1998). Considering the familial aggregation of behavior problems and psychopathologies, this is a significant concern. In these cases, the families may be more of an exacerbating influence rather than a helpful one; this is even more of a concern, as there is evidence that parent and child psychopathology may occur in a mutually interactive manner (e.g., Blanz, Schmidt, & Esser, 1991).

Other Social Institutions

School-based prevention programs play a critical role in anti-drug-abuse efforts (Tobler & Stratton, 1997). For some preteens and teenagers, possibly those already at higher risk for drug abuse, these programs may not be sufficient. Families also play a major prevention role, and family-based prevention programs, including targeted programs, seem to offer in-

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creased promise for many children. However, it is likely that expanding prevention efforts to include family programs will still not be adequate in many instances. The issue then becomes, is there an additional possibility?

There are three major societally administered institutions which attempt to influence the behavior and well-being of individuals, including the identification, correction, and control of problems and individual function. These are the educational system, the health care system, and the criminal justice system. Schools are already heavily involved in prevention efforts, but it is clear that additional help is needed.

At this time, the health care system does not play a major role in drug abuse early identification or prevention (e.g., National Center on Addiction and Substance Abuse at Columbia University, 2000). There are probably a number of reasons for this, and part of the problem may be that few programs to facilitate identification and prevention have been developed and shown to be practical and effective in current health care settings. Developing such programs with demonstrated effectiveness would create an additional prevention possibility. In the mean time, given the currently limited role that the health care system plays, the criminal justice system has had much of the responsibility of being society's second line of defense for drug abuse prevention and early intervention. This means that the criminal justice system becomes responsible for many early stage abusers, and their drug problem is then viewed in the context of criminal behavior. An alternative may be to have the health care system take on more responsibility, which would mean that these early stage abusers would be treated in the context of people with a health disorder. In addition, it is more likely that their drug problem would be identified and hopefully treated at an earlier and less destructive point.

Developmentally Appropriate Methods

Another tenet of developmental psychopathology is that it is always important to consider the developmental stage and functional characteristics of children and adolescents when attempting to understand, identify, or intervene with potential problems. It is important to consider that preteen and adolescent drug abuse are pediatric disorders, differing from the adult form of the disorder in significant ways. Unfortunately, many diagnostic systems and treatment programs are geared to adults and are not as appropriate for teens and children.

For example, the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV; American Psychiatric Association, 1994), and the International Classification of Mental and Behavioral Disorders (ICD-10; World Health Organization, 1992) systems for classifying substance use disorders were developed for and tested with adult populations. They are symptom-based diagnostic categorizations based on later stages of drug abuse and its consequences and on manifest drug use disorders. Although some drug-using adolescents and even preteens have sufficiently severe abuse patterns to satisfy the diagnostic criteria of these systems, many drug-abusing preteens and adolescents are not identified diagnostically by them. Drug abuse screening assessments for use with adolescents have been developed—for example, the POSIT (Rahdert, 1991) and the DUSI-R (Kirisci, Mezzich, & Tarter, 1995; Tarter, 1990)—but these do not yield standard accepted diagnoses. How this problem should be resolved is not clear. For example, is it possible to extend the DSM-IV and ICD-10 systems to include adolescent drug abuse patterns and disorders? And, if so, what would be the implications of doing this? Research will need to address these adolescent diagnostic issues. In the mean time, both researchers and clinicians need to be aware that if adolescents and preteens do not satisfy the DSM-IV–ICD-10 criteria for a drug abuse disorder, it does not necessarily mean that they do not have a drug abuse problem.

If the diagnostic identifications of adolescent drug abuse may require modifications of adult criteria in order to be comprehensive and most useful, then treatment for adolescent drug abuse is likely to benefit from being modified also. Individuals are particularly vulnerable to problems and problem behaviors during transitions that are one of the constants of childhood and adolescence. Adapting treatment approaches to be responsive both to the particular patterns of preteen and teenage drug abuse and to the specific characteristics and challenges of these ages and

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stages is likely to increase the effectiveness of treatment. Although tested models for treating the drug abuse problems of teenagers exist, further improvement is possible.

The majority of prevention programs focus on the prevention of initiation. The majority of treatment programs for adolescents and young adults are designed for individuals who are already at an escalated level of drug abuse or have a demonstrated drug abuse disorder. Few programs are designed for those who have initiated drug use but are still at a lower level of drug abuse. Prevention programs and early treatment programs targeting escalation or progression might prevent these early abusers from developing a drug abuse disorder or addiction. This could meet a largely unmet need for a very vulnerable and underserved population.

Relatedly, the availability of specialized adolescent treatment is limited (Center for Substance Use Treatment, 1999; Dembo, 1995; Greenbaum, 2000; Greenbaum, Foster–Johnson, & Petrila, 1996; Harrison & Fulkerson, 1996; Latimer, Winters, & Stinchfield, 1997). The impact of the limited availability of adolescent-appropriate treatment is unknown. The effectiveness of adolescent treatment also needs to be improved, particularly with the trend in younger drug use. Finally, while new pharmacological treatments for drug abuse continue to be developed, little is known about the effectiveness and consequences of using these treatments with adolescents.

Science and Policy

As science provides more information about drug abuse and methods for effective intervention, public policy decisions will increasingly have to go beyond the question of "what can be done?" to include questions of "what should be done?" For example, research is now in progress to identify genetic markers and contributors to increased risk for drug abuse vulnerability. It is possible that some day a genetic profile associated with greater predisposition to drug abuse, for at least some individuals, will be identified. If a readily assessable profile is identified, then there will be a question of what should be done with this technology and who should make the decision.

Taking another example, there is research showing that testing for drug use can have a powerful deterrent effect on drug use (e.g., Bachman, Freedman–Doan, O'Malley, Johnston, & Segal, 1999; Goldberg, Elliot, Moe, Kuehl, & Clarke, 1999). Although currently in use as a prevention program in the military and in some sports and employment settings, the effectiveness of drug testing as a prevention program for use with adolescents in general school populations or for adults in employment or other circumstances is not known. Determining whether this type of program can be effective is a currently unanswered scientific question. If it is determined that drug testing can be used for effective prevention, the question of whether to implement such a program and under what circumstances will have to be dealt with. Research is currently overcoming the enormous challenge of understanding the nature of drug abuse and the means to most effectively prevent and treat it. In the near future, the questions of what to do with this information may also be a great challenge.

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