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The Behavioral Economics of Young Adult Substance Abuse

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Abstract

Alcohol and drug use peaks during young adulthood and can interfere with critical developmental tasks and set the stage for chronic substance misuse and associated social, educational, and health-related outcomes. There is a need for novel, theory-based approaches to guide substance abuse prevention efforts during this critical developmental period. This paper discusses the particular relevance of behavioral economic theory to young adult alcohol and drug misuse, and reviews available literature on prevention and intervention strategies that are consistent with behavioral economic theory. Behavioral economic theory predicts that decisions to use drugs and alcohol are related to the relative availability and price of both alcohol and substance-free alternative activities, and the extent to which reinforcement from delayed substance-free outcomes is devalued relative to the immediate reinforcement associated with drugs. Behavioral economic measures of motivation for substance use are based on relative levels of behavioral and economic resource allocation towards drug versus alternatives, and have been shown to predict change in substance use over time. Policy and individual level prevention approaches that are consistent with behavioral economic theory are discussed, including brief interventions that increase future orientation and engagement in rewarding alternatives to substance use. Prevention approaches that increase engagement in constructive future-oriented activities among young adults (e.g., educational/vocational success) have the potential to reduce future health disparities associated with both substance abuse and poor educational/vocational outcomes.

Keywords

Young Adults; Substance Abuse; Alcohol use; Drug Use; Behavioral Economics

Young Adult Substance Use

Young adults between the ages of 18–25 have higher rates of past-month heavy episodic drinking (32% consume 4/5 drinks in a sitting for women/men) and illicit drug use (22%) than any other age group (Center for Behavioral Health Statistics and Quality, 2015). Approximately half of all young adults attend college, and although completing college is

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protective against *lifetime* substance abuse (Gilman et al., 2008), young adults who attend college report slightly higher rates of current heavy episodic drinking and drug use than young adults who do not attend college (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2015). Heavy drinking and drug use increase risk for substance-related consequences such as risky sexual activity, blackouts, sexual/physical assaults, arrests, injuries, and fatal accidents (Johnston et al., 2015). Marijuana is the most frequently used illicit drug among young adults, with 19.6% reporting past month use (Center for Behavioral Health Statistics and Quality, 2015). In addition to proximal risk behaviors associated with marijuana use (e.g., driving while impaired), frequent marijuana use among young adults can lead to cognitive impairments (Grant, Chamberlain, Schreiber, & Odlaug, 2012), and lower levels of academic engagement, achievement, and post-graduation employment (Arria et al., 2013; Mustane & Tewksbury, 2005; Roebuck et al., 2004). Thus, young adults are a critical population for prevention efforts, because substance misuse during this period can impede learning and brain development, as well as critical developmental tasks such as educational attainment and career development (Boden & Fergusson, 2011; Gotham et al., 2003), which may in turn increase risk for lifelong substance abuse and other health and social problems (Bennett, McCrady, Johnson, & Pandina, 1999; Zeigler et al., 2005).

A number of unique social and bio-developmental factors promote young adult substance use and increase risk for significant health and social consequences. For example, young adulthood is characterized by a cross-species, neuro-developmentally mediated tendency towards excessive reward seeking/appetitive behavior, impulsivity, present (vs. future) time orientation, dysphoria and mood instability, and risk taking (Bechara, 2005; Casey & Jones, 2010; Shannon, Jones, & Barnett, 2015; Spear, 2013). Additionally, drinking and drug use typically occur in a social context among young adults and can effectively facilitate social and sexual relationships during a period when establishing these relationships is developmentally critical (Kirchner et al., 2006; Meisel, Clifton, Mackillop & Goodies, 2015). Indeed, most young adults report that the positive (largely social) effects of heavy drinking outweigh the negative effects (Park, 2004), perhaps in part because heavy substance use is generally not stigmatized within this population (Tucker et al., 2015), and because young adults typically have less structured time and fewer responsibilities (e.g., children, demanding career), allowing them to use alcohol and drugs with lower opportunity cost (Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 2013; Wechsler & Nelson, 2008). Thus, although many young adults are at risk for immediate and delayed consequences related to substance use, they tend to devalue these risks (Field et al., 2007), relative to the highly salient rewards associated with drug use, and consequently express little motivation to participate in treatment or to change their substance use (Buscemi et al., 2010). The purpose of this paper is to summarize behavioral economic research in this area in order to encourage further research, inform clinical practice, and highlight policy-level implications. Papers for inclusion were identified by using the search terms "young adults," "college students," and pairing each of these with each of the following: "reinforcement pathology", "behavioral economics", and "behavioral theories of choice". We also searched the reference lists of the papers identified through this search. In some cases papers were not included if newer papers and/or papers with larger sample sizes were available.

Overview of Behavioral Economic Models of Substance Misuse

Behavioral economic theory assumes that decisions to use alcohol and other drugs are a function of the benefit/cost ratio of substance use in relation to the benefit/cost ratios of other available activities (Rachlin, 2000; Vuchinich & Tucker, 1988). Addiction is understood as a continuous phenomenon that is defined as a pattern of fairly consistent preference for drug rewards relative to other activities. *Reinforcement pathologies* such as alcohol or drug addiction are presumed to result from ongoing interactions between endogenous (e.g., physiologically mediated subjective response to drugs, elevated stress or arousal) and contextual factors such as low availability of alternatives and low price of the drug, social contexts that reinforce alcohol/drug use, as well as life events that cause stress or dysphoria (Bickel et al., 2014; Vuchinich & Heather, 2003). As noted above, developmentally mediated endogenous and exogenous factors may increase the likelihood that drug-reinforcement will have an unusually high value relative to alternatives among young adults. The reinforcement pathology process is self-perpetuating because repeated use of many addictive commodities will have direct negative effects on the availability of alternatives, in part because frequent drug use can result in diminished sensitivity to the rewarding effects of an intrinsically reinforcing stimulus such as sex, food, or exercise (Koob, 2006; Volkow et al. 2003), which will in turn increase the relative degree of preference for the drug. In the context of young adulthood, this process may be especially pernicious given the importance of education attainment and vocational training to lifelong occupational, financial, and health outcomes.

Substance-related and Substance-Free reinforcement

Laboratory alcohol administration studies have demonstrated that young adults consume less as the amount of an alternative monetary reinforcer increases (Little & Correia, 2006; Vuchinich & Tucker, 1988). Similarly, survey studies suggest that higher levels of engagement in activities such as (excluding fraternity/sorority activities) predict less substance use (Correia et al., 1998, 2003; Buckner et al., 2010; Fenzel, 2005; Meshesha et al. 2015; Vaughan, Corbin, & Fromme, 2009). One longitudinal study found that the presence of alternative reinforcers reduced smoking onset during young adulthood (age 18–22) (Audrain-McGovern et al. 2011). Another study found that young adult heavy drinkers who reported a smaller proportion of their total activity participation and enjoyment (reinforcement) from substance use at baseline reported lower levels of drinking following a brief intervention, even after controlling for their baseline drinking level. Those who reduced their drinking showed increased proportional reinforcement from substance-free activities (Murphy, Correia, Colby, & Vuchinich, 2005). Interestingly, heavy drinking young adults actually report *greater* social satisfaction and rewards (Skidmore & Murphy, 2010), and reductions in drinking may predict *reductions* in social reward (Murphy et al., 2005). Conversely, reductions in drinking predict *increases* in academic activity (Murphy et al., 2005) and experimentally manipulated increases in some substance-free activities can lead to decreases in alcohol use (Correia, Benson, & Carey (2005). The latter study, assessed students' levels of substance use and substance-free behaviors and randomly assigned them to one of three conditions: 1) students were asked to increase their engagement in substance-free activities (in particular exercise and creative activities), 2) students were asked to

decrease their substance use, and 3) students were not asked to change any behaviors. Students who were asked to increase their substance-free activities decreased their drinking without explicit instruction to do so, to a degree similar to group that was asked to reduce drinking, and more than the control group.

Delayed Reward Discounting

Delayed reward discounting (DRD) is a behavioral economic measure of impulsivity that refers to the level of decrease in subjective value associated with reward delay. Although the value of all rewards decreases with delayed receipt, there are individual differences in the degree that delayed rewards are discounted, and this systematic decision making bias may be a key risk factor for substance abuse (Madden & Bickel, 2010). Young adults who sharply discount the value of delayed health and career outcomes may be less likely to engage in the behaviors consistent with success in these areas (e.g., exercising, studying, attending class or internships), and may instead allocate their behavior towards immediately reinforcing activities such as using drugs or sleeping late and missing work/class following an evening of substance use (Gentile, Librizzi, & Martinetti, 2012). Indeed, numerous studies have demonstrated that the capacity to value delayed outcomes increases throughout the lifespan (Eppinger, Nystrom, & Cohen, 2012; Green et al., 1994; Whelan & McHugh, 2009) and that young adult substance abusers discount the value of delayed rewards more steeply than control participants (Acheson et al., 2011; Field, Christianson, Cole and Goudie, 2007; Kollins et al., 2003; Vuchinich & Simpson, 1998).

Young adults experience elevated impulsivity and mood instability, as well as social/environmental risk factors that lead to increased risk for substance-related health and social consequences. Behavioral economic theory provides a novel framework for understanding the factors that contribute to excessive substance use, for quantifying the increased valuation of substances and devaluation of alternatives and devaluing of delayed rewards can help describe, explain and assist in severity of substance use, and for guiding prevention and intervention approaches.

Implications for Prevention

Three primary implications of behavioral economic models for the prevention of young adult substance misuse are: 1) the assessment of substance abuse, including response to treatment, should include measurement of the relative valuation of drug-related and drug-free rewards, as well as the degree to which delayed rewards are discounted, and 2) that treatment should attempt to reduce the overvaluation of current relative to future rewards and increase engagement in regular patterns of behavior that lead to delayed reinforcement, and 3) public and university policies should aim to increase the financial and effort price of drugs while also reducing the effort/cost for engaging in drug-free alternatives.

Assessment

According to behavioral economic theory, *reinforcing efficacy* (RE) is the relative level of preference for a reinforcer such as alcohol (Bickel et al., 2014; Heinz, Lilje, Kassel, and de Witt, 2012; Hursh and Silberberg, 2008; Tucker, Roth, Vignolo, & Westfall, 2009; Tucker,

Roth, Huang, Crawford, & Simpson, 2012). In laboratory settings, RE is quantified by the amount of effort/behavior expressed to access the reinforcer. The reinforcing efficacy (RE) (also referred to as *reward value* or *relative reinforcing efficacy*) of a given drug is theorized to both be a product of the direct reinforcing effects of the drug and individual differences in decision making (e.g., delay discounting). Young adults with elevated RE allocate considerable resources to substance use (e.g., time, money) and are relatively insensitive to the increasing costs of substance use (i.e., inelastic demand). For example, reinforcement survey instruments (i.e. the Adolescent Reinforcement Survey Schedule (ARSS); Murphy et al., 2005) operationalize reinforcement as the product of activity frequency and enjoyment ratings, and addiction researchers have modified these measures to differentiate and quantify substance-related and substance-free reinforcement (Correia et al., 1998, 2003). High proportionate substance-related reinforcement is theorized to be an early indicator of disproportionate reliance on substance-related reinforcement compared to alternative (non-drug) reinforcers (see Figure 1; Murphy et al., 2007; Murphy et al., 2012). As such, it may predict the likelihood of subsequent escalation of substance misuse and a lower probability of maintaining healthy drinking patterns (Murphy et al., 2005).

Drug and alcohol demand

Alcohol (Murphy & MacKillop, 2006) and drug (Collins et al., 2014; Bruner & Johnson, 2014; Mackillop et al., 2008; Pickover et al., 2015) purchase tasks (APTs) estimate reward value by generating demand curves that plot consumption as a function of price and identify how much someone would consume given unrestricted (free) access to alcohol/drugs (demand intensity), how much money they would spend on alcohol/drugs (O_{max}), and the extent to which their consumption level is price sensitive (elasticity) (see Figure 2). Hypothetical purchase tasks yield reliable and valid individual difference measures of reinforcing efficacy that are correlated with lab-based consumption and a variety of collateral indices of problem severity among young adults, including substance use disorder symptoms, and specific risk behavior such as drinking and driving (Bertholet et al., 2015; Skidmore et al., 2014; Mackillop et al., 2010) even in models that control for recent alcohol consumption level and other established risk factors such as sensation seeking (Teeters & Murphy, 2015). Studies also suggest that increased alcohol demand may be linked to negative affective/mood and partially explain the relationship between mood symptoms and alcohol-related consequences (Tripp et al., 2015; Murphy et al., 2015). Alcohol demand has also been shown to vary with craving in response to alcohol consumption (Amlung et al., 2015), to increase acutely in response to experimentally induced elevations in craving (MacKillop et al., 2010) and stress (Amlung & MacKillop, 2014; Rousseau et al., 2011) among young adults; and to decrease acutely following administration of the anti-craving medication, naltrexone (Bujarski et al., 2012). Alcohol demand also functions as a dynamic (proximal) index of response to intervention that predicts subsequent change in drinking (Dennhardt, Yurasek, & Murphy, 2015; Murphy et al., 2015).

Alcohol and drug purchase tasks may be especially useful indices of strength of motivation for alcohol among young adults given that they control for contextual variables that might create disparities between *actual recent* and *desired* consumption levels. For example, constraints on availability due to age/legal restrictions and limited income or opportunities to

use with peers, might make recent consumption an underestimate of desired future levels of consumption. The intensity variable also models an important element of risk for young adult drinkers—the ability to modulate use when in situations where alcohol or other drugs are available with minimal or no constraints (i.e., many young adult parties, bars with drink specials). Additionally, the purchase task indices that assess price sensitivity may model a young adult’s ability to regulate drinking in response to contingencies that may be ultimately protective against developmentally persistent substance misuse. Likewise, purchase tasks can be modified to provide information on other contextual influences on demand (beyond price), such as the presence of employment, college classes, or volunteer activities the *morning after* a drinking event (e.g., *how many drinks would you purchase if you had to work the next day?*; Skidmore & Murphy, 2011), or drinking decisions in specific high-risk situations (e.g., *how many drinks would you purchase if you had to drive a vehicle following the drinking situation?*; Teeters & Murphy, 2015). A variety of next-morning alternatives have been shown to suppress demand (Gilbert, Murphy, & Dennhardt, 2014), but individuals with established individual difference risk factors such as elevated sensation seeking or a positive family history of alcohol problems show less of a reduction in demand in response to a next-day responsibility (Murphy et al., 2014; Skidmore & Murphy, 2011). Similarly, individuals who report recent drinking and driving episodes show less of a reduction in demand in the face of a hypothetical driving scenario (Teeters & Murphy, 2015). Thus, simulated alcohol purchases appear to show meaningful relations to real world patterns of substance use and problems, can effectively model the impact of potential prevention efforts, and can also identify individuals who may be at greater risk due to an inability to modulate drinking in response to important contingencies.

Reinforcing efficacy, when used in conjunction with other risk factors such as elevated consumption and dependence symptoms, may contribute to comprehensive models of young adult substance use severity that may prove useful in understanding the nature of young adult substance misuse, and in identifying young adults who are most at risk for escalating substance abuse severity and in need of intervention services. Skidmore et al. (2014) suggested potentially unique applications of the various RE indices as screening and outcome measures in clinical contexts. For example, Intensity and O_{\max} could be especially useful clinical screening measures for risky drug use as they can be measured with the very brief Alcohol or Drug Purchase Task (intensity with a single item asking about maximum consumption at price = 0). The proportion of actual recent expenditures allocated towards alcohol and drugs also provides information on relative valuation of drug reward and shows significant associations with alcohol use severity among young adults (Skidmore et al., 2014) and drinking/recovery trajectories among adult problem drinkers (Tucker et al., 2009, 2012). Actual recent proportionate substance-related reinforcement could provide useful information on the specific need for a treatment that increases substance-free activities (Murphy et al. 2012), and changes in the reinforcing efficacy indices over time could be monitored as a secondary outcome measure or indicator of a need for additional treatment. It is of note that the majority of the studies of demand in young adults have been in reference to alcohol and although it would be expected that the same patterns would emerge with a range of drugs, more research in this area would be of use.

Young Adult Treatment and Brief Intervention

Contingency management, community reinforcement therapy, and coping skills training attempt to help individuals increase substance-free sources of reinforcement (Petry et al., 2000) and may be especially helpful with treatment seeking young adults. However, these treatments require substantial resources on the part of the treatment provider (counselors, money for vouchers) and the participant (attending frequent counseling sessions and drug tests) and would be difficult to implement with the majority of young adult alcohol and drug users, who despite elevated risk, generally have little motivation to change or participate in treatment (Buscemi et al., 2010; Dennhardt & Murphy, 2013).

Delay discounting may be a particularly relevant treatment target for young adults given the developmental risk factors identified above. Behavioral economic research suggests that impulsive choices can be reduced by increasing the salience of delayed outcomes and the extent to which the behavior leading to those rewards or punishers is viewed as part of a coherent pattern (Hofmeyr et al., 2011; Monterosso & Ainslie, 1999). For example, focused thinking/writing about potential positive future events (episodic future thinking) can reduce delay discounting and may promote positive health behavior change (Bickel, Quisenberry, Moody, & Wilson, 2015; Kaplan, Reed, & Jarmolowicz, 2015; Stein, Daniel, Epstein, & Bickel, 2015). Additionally, Loewenstein and Prelec (1992) showed that if future events were framed as part of a temporally extended sequence or pattern, then their value was discounted less steeply than if they were viewed as independent events in separate, discrete choices. Clinically, this suggests that interventions should encourage those who abuse substances to think about desired future outcomes and view their daily behaviors as part of a larger pattern of behavior necessary to achieve those outcomes (Cheong et al., 2014). Personalized substance use feedback may help to accomplish this perspective shift; alcohol/drug use decisions are aggregated to form meaningful tallies, like instances of drug use per week, money spent on drug use during a month/year, and rates of drug use relative to peers. However, a key and unique implication of behavioral economic theory is that interventions should encourage individuals to view their day-to-day decisions and activities (both substance-related and substance-free) as cohesive patterns that have implications for long-term substance-free rewards (Schroeder, Tucker, & Simpson, 2013).

Murphy and colleagues developed the Substance-free Activity Session (SFAS) session as a brief approach to enhance engagement in future-oriented substance-free activities that might “compete” with drinking. The SFAS is a single session intervention that supplements a standard alcohol or drug-focused motivational interview. It uses principles of motivational interviewing (MI) (Miller & Rollnick, 2012) to target the behavioral economic mechanisms of substance-free reinforcement and delayed reward discounting. The SFAS can be best understood as a direct application of MI to target increased engagement in substance-free activities, but it also integrates elements from cognitive behavioral therapy/community reinforcement for addiction (Carroll et al. 2012) and behavioral activation (Lejuez et al., 2011). The SFAS is distinguished from the latter approaches by its brevity and appropriateness for non-treatment seeking populations, inclusion of personalized feedback, and explicit emphasis on enhancing molar patterns of future-oriented and goal-directed behavior.

Participants in an initial randomized controlled trial (Murphy et al. 2012) were 82 college freshman (50% female) who reported two or more past-month heavy drinking episodes. In comparison to an alcohol brief motivational interview (BMI) plus a relaxation training active control session, the alcohol BMI + SFAS condition was associated with significantly greater reductions in alcohol related problems at both 1-month and 6-month follow-up assessments. Additionally, students in the BMI plus SFAS condition who reported lower levels of substance-free reinforcement or higher symptoms of depression at baseline reported greater reductions in heavy drinking compared to participants in the BMI + Relaxation control condition. Finally, participants reported increases in two of the intended mechanisms of change, namely consideration of future consequences (Strathman et al., 1994) and evening studying. These findings suggest that incorporating a single session focused on increasing engagement in alternative activities can enhance the effects of standard BMIs. A second randomized controlled trial evaluated an abbreviated version of the alcohol BMI + SFAS that were administered back-to-back in a single hour. This session was compared to a similarly timed alcohol BMI + Education session control (Yurasek, Dennhardt & Murphy, 2014). This study adapted the BMI and SFAS sessions to address both drug and alcohol use. Unlike the original Murphy et al., (2012) study, all participants reduced their alcohol consumption and problems at follow-up and there was no significant advantage for the BMI + SFAS. However, participants in the BMI+SFAS condition used marijuana on significantly fewer days at the 6-month follow-up compared to those in the BMI+ED. It is possible that compressing the administration of the BMI + SFAS sessions into a single hour reduced efficacy for alcohol outcomes relative to its original two hour (separated by a week) administration.

Research is needed to examine this approach with young adults who are not college students, who might also benefit from an approach that helps them to address drinking/drug use in the context of developing a greater consideration of the future and identifying patterns of goal-directed substance-free activities (e.g., exercise, satisfying employment, family activities, religious activities, hobbies). Similarly, young adult military veterans are a high-risk group that might also lack viable alternatives to drinking and require an approach that attempts to specifically address this issue (McDevitt-Murphy et al., 2014). The SFAS may be especially helpful for individuals with psychiatric comorbidity, which is often associated with elevated alcohol reward value (Murphy et al., 2013) and diminished engagement in rewarding alternatives to substance use (Lejuez et al., 2011). Finally, given the goal of developing long term and consistent patterns of substance-free activities, research is needed to develop technology-enhanced elements that can be delivered remotely over time (e.g., Schroder et al., 2013).

Environmental/Policy Level Risk Factors and Prevention Implications

There are a number of environmental factors specific to young adults that convey additional risk for problematic substance use patterns. As noted above, many young adults, particularly those enrolled in college, have ample free time and few responsibilities that prohibit them from spending excessive time drinking and using drugs such as a demanding work schedule or family responsibilities (Schulenberg & Maggs, 2002), and report that they would drink less when faced with a next-day responsibility (e.g. class, internship). Thus, to reduce

substance use, colleges and universities should consider increasing the cost of using these substances by scheduling more early morning and Friday classes. Similarly, worksites that employ large numbers of young adults might consider structuring schedules and responsibilities such that young adults are required to be activity working in the morning hours. Relatedly, universities and communities should strive to decrease the cost of substance-free activities (e.g. fitness classes, outdoor activities, art events, special interest clubs), by providing them free of charge and at convenient times/locations.

Another environmental prevention target is alcohol/drug use availability and acceptability. The most commonly used substances by this group are alcohol and marijuana, both of which are readily available particularly on college campuses and in young adults' social circles. Research has shown that alcohol outlet density and "wet" environments (alcohol drinking is prevalent, cheap and easily accessible) are associated with greater heavy drinking and alcohol-related problems (Weitzman, Folkman, Lemieux Folkman, & Wechsler, 2003; Weitzman, Nelson & Wechsler, 2003). Alcohol and marijuana use are also widely accepted and do not carry the stigma that other drugs such as heroin or cocaine. Both of these factors diminish the time-related and social costs of substance use and increase the likelihood of use. Although altering the acceptability of use through policy is difficult, this might be accomplished through advertising campaigns that highlight risks associated with heavy use, and policy can assist in reducing the availability or increasing the price of alcohol and other drugs (Fagan, Hawkins, & Catalano, 2011). Cities in which colleges and universities reside can assist in creating stricter licensing requirements for establishments located in areas where students are housed, require beer keg registration (Spath, Greenberg, & Turrisi, 2009), and limit the extreme drink specials often found close to college campuses (Kuo et al., 2003). As described above, young adults are vulnerable to substance use in part due to the devaluing of delayed rewards. They often choose the immediate reward of drinking or using drugs over working towards the larger, but delayed reward of academic/career success. This could be counteracted at an organizational level by providing more frequent feedback on progress as well as opportunities that might increase the salience of these rewards such as internship programs or service learning activities.

Many of the same general principals apply to young adults who are not in college. For example, social capital can be thought of as patterns of engagement, trust and mutual obligation among people within social structures and individuals with increased social capital have reduced risk of binge drinking (Lindstrom, 2005, Weitzman & Chen, 2005; Weitzman & Kawachi, 2000,) and marijuana use (Lindstrom, 2004). Thus, steps should be taken to encourage young adults to become engaged in their community through attractive and accessible social and service activities (e.g., worksite, church, or community efforts to encourage mentoring or service). Finally, given that educational attainment is protective against future substance abuse and many other health and social problems (Bennett et al., 1999; Woolf & Braveman, 2011), community programs that promote access to higher education, awareness of the economic benefits associated with completing higher education (particularly 4-year college degrees; Pew Research Center, 2014), and retention in high school and junior colleges could contribute to reductions in long-term risk for substance misuse and reductions in health disparities

Substance use in young adulthood is a significant public health problem and behavioral economic principals such as alcohol and drug demand and delay discounting have been shown to be useful in understanding and predicting substance use in this population. Behavioral economic theory may also be useful in policy and individual level prevention approaches that attempt to increase engagement in constructive, future-oriented activities among young adults. At the university/community level it may be important to increase the costs and availability of substance use and to make viable alternatives more easily accessible.

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Highlights

A review of how behavioral economic models apply to young adult substance use.

Low substance-free rewards and future time orientation predict substance abuse.

Measures of substance reward value may identify the most at-risk young adults.

Interventions informed by behavioral economics are promising.

Environmental and policy-level changes are important for prevention.

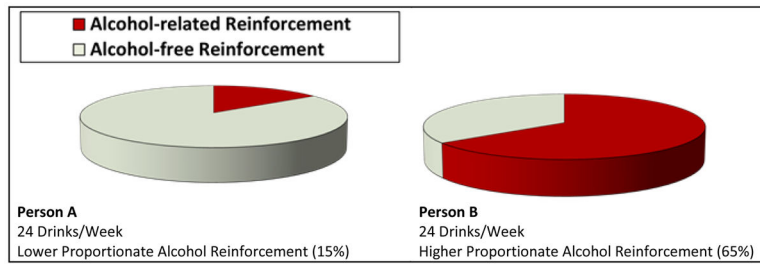


Figure 1. Proportionate alcohol-related reinforcement

This index provides a quantitative measure of the relative prominence of alcohol reinforcement within a person's behavioral repertoire. It is distinct from drinking itself, as shown below with hypothetical individuals with equal drinking and substantially different proportions of alcohol reinforcement.

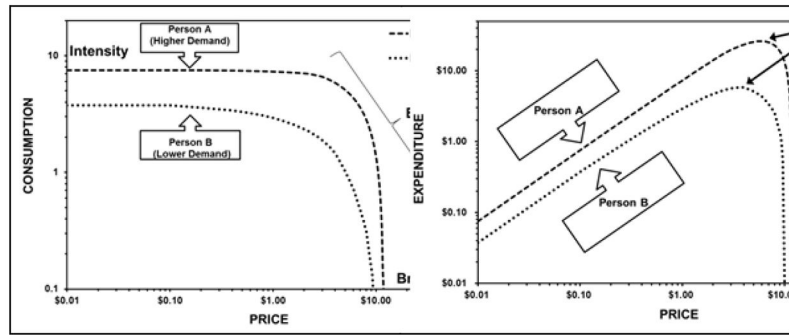


Figure 2. Prototypic demand and expenditure curves for individuals exhibiting higher and lower demand for alcohol

The demand curve uses an individual's alcohol cost-benefit preferences to quantify alcohol as a reinforcer.