Normal Performance on a Simulated Gambling Task in Treatment-Naïve Alcohol-Dependent Individuals

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Background: Research suggests that substance abusers make more disadvantageous decisions on

Intelligence Scale„Revised, memory and attention/concentration as measured by the Wechsler Memory Scale, visual retention measured by the Benton Visual Retention Test, and verbal ability from the COWAT. Additional tests conducted were the Wisconsin Card Sorting Task, the Facial Recognition Task, and the Judgment of Line Orientation Task.

Ventromedial prefrontal dysfunction may predispose an individual to make disadvantageous personal choices possibly leading to socially inappropriate or socially deviant behavior (Bechara et al., 1994, 1997) or to drink excessively even when it leads to significant problems. As noted above, the SGT was initially developed to study patients with acquired sociopathy due to damage to the ventromedial prefrontal cortex. Since that time, Bechara and colleagues have extended their work to show that patients with amygdala damage also show SGT impairments (Bar-On et al., 2003; Bechara et al., 1999).

A number of factors may contribute to the poor decisions that alcoholic individuals make in regard to their drinking, such as global problems in decision making associated with neuropsychological deficits that predate, or are a consequence of, their alcoholism, specific contextual factors (alcohol cues), and past learning specifically associated with drinking environments (such as conditioned responses), or peer pressure (Fein et al., 2004; Finn and Hall, 2004; Finn et al., 2002). Bechara et al.•s (1994) SGT has been administered to substance abusers by a number of researchers to investigate evidence of global problems in decision making. Studies show that on the SGT, alcoholic individuals (Bechara and Damasio, 2002; Bechara et al., 2001; Mazas et al., 2000), and drug abusers (Graopasal.,8-438.9(2;4(t)-37(Petr(may8-429.1(pas))-7.3(al.,8-333((8997h)-3-269(hav38-257.av38-342.5(niste-438n(o)-6.7

MATERIALS AND METHODS

Participants

The TxN alcohol-dependent group and the control group were age- and gender-matched, each consisting of 24 women and 34 men. All participants were recruited from the community by café postings, newspaper advertisements, and a local Internet site. The inclusion criterion for the control group was a lifetime drinking average of less than 30 drinks per month, with no periods of more than 60 drinks per month. Treatment-naïve participants needed to meet DSM-IV (American Psychiatric Association, 2000) criteria for current alcohol dependence. Exclusion criteria for both groups were as follows: (1) lifetime or current diagnosis of schizophrenia or schizophreniform disorder; (2) history of drug (other than nicotine or caffeine) dependence or abuse; (3) significant history of head trauma or cranial surgery; (4) history of diabetes, stroke, or hypertension that required medical intervention or of other significant neurological disease; or (5) clinical evidence of the Wernicke…Korsakoff syndrome. All participants were informed of the study's procedures and aims and signed a consent form before their participation. Subjects participated in four sessions that lasted from 1.5 to 3 hours, which included clinical, neuropsychological, electrophysiological, and neuroimaging assessments. All participants were asked to abstain from using alcohol for at least 24 hours before any lab visits, and a Breathalyzer test was administered to all subjects before each

Alcohol Use, Family Drinking Density Measures, and SGT Performance

Table 1. Characteristics of Participant Groups

Variable	Tx N study				Abstinent alcoholic study				Effect size (%)		
	Tx N (N 5 58)		Controls (N 5 58)		Abs. Alc. (N 5 43)		Controls (N 5 58)		TxN versus controls	Abs. Alc. versus TxN	Controls versus controls
Age (y)	31.1	7.8	31.3	7.9	46.5	6.6	44.6	6.6	0.0	53.9[a]	46.0[a]
Years education	16.2	1.5	16.5	1.8	15.7	2.1	16.2	1.8	0.7	2.0	0.7
Alcohol use variables											
Duration of active drinking (mo)	181.2	95.2	132.8	98.3	260.6	93.7	251.2	130.3	5.9[b]	15.7[a]	19.6[a]
Average lifetime drinking dose (std. drinks/mo)	84.9	43.3	6.6	6.3	157.8	131.8	6.8	7.1	64.3[b]	14.2	0.2
Duration of peak drinking (mo)	55.6	55.1	59.3	90.9	74.4	73.4	121.2	136.8	0.0[b]	2.6	7.3[a]
Peak drinking dose (std. drinks/mo)	150.9	113.1	14.9	13.6	317.4	250.9	15.9	18.0	41.9[b]	17.5	0.1
Age rst met criteria for heavy use	21.2	4.9	NA		23.5	6.4	NA		NA	6.3	NA
Level at rst heavy use	135.9	42.4	NA		187.1	117.5	NA		NA	9.1	NA
Family drinking density											
FamDD_1[c]	0.18		0.12		0.41		0.15		2.6	14.5	0.7
FamDD_2[d]	0.20		0.11		0.25		0.14		6.6	2.0	0.7
Deviance proneness & externalizing symptoms											
CPI Socialization Scale	31.6	5.4	37.2	4.5	27.7	5.9	37.1	3.7	25.4	10.4	0.2
MMPI_Pd Scale	18.7	4.5	16.1	3.2	22.0	4.2	16.0	3.6	10.8	11.7	0.0
Externalizing Symptoms (#)[e]	9.8	7.7	5.6	5.1	14.2	7.4	4.7	4.3	9.6	9.1	0.0
Gambling game	33.2	31.7	38.2	29.2	23.1	30.3	38.2	28.2	0.9	2.0	0.1

Measures are reported as mean standard deviation. Effect is significance:
p 0.05; p 0.01; p 0.001.

[a]Statistical comparisons on age and variables associated with subject's age are not appropriate since age was associated with the study selection criteria.

[b]Statistical comparisons of the groups on alcohol use variables are not valid since alcohol use was part of the group selection criteria.

[c]Total number of problem drinking rst-degree relatives divided by the total number of rst-degree relatives.

[d]Total number of problem drinking second-degree relatives divided by the total number of second-degree relatives.

[e]Sum of antisocial personality disorder and conduct disorder symptoms from the Diagnostic Interview Schedule.

NA, not applicable; std. drinks/mo, number of standard drinks per month; TxN, treatment-naïves; MMPI_Pd, Psychopathic Deviance Scale of the MMPI-2; Abs. Alc., Abstinent alcoholics.

observed on the gambling task in other samples are a re"ection of the long-term consequence of chronic alcohol abuse and physiological dependence on alcohol. Our sample of young, TxN alcoholic individuals had less severe symptoms of alcohol abuse/dependence and did not drink as heavily nor as long as our sample of abstinent alcoholic individuals who showed evidence of decision-making deficits (Fein et al., 2004). It might be that physiological dependence on alcohol leads the individual to pay more attention in general to short-term outcomes, because the short-term outcome of significant withdrawal symptoms is so motivationally significant for severe alcoholic individuals. In other words, as an individual becomes more and more physiologically dependent on alcohol, the individual becomes more and more concerned about the short-term outcome of withdrawal. As alcohol-seeking and consumption behaviors begin to dominate their lives, they develop the habit of constantly making decisions that put far more weight on short-term outcomes. It is also possible that the impact of long-term exposure to alcohol and physiological dependence on brain structures, such as the ventromedial prefrontal cortex and the amygdala, results in a condition quite similar to that displayed by the patients with ventromedial prefrontal cortex lesions (Bechara et al., 1994) or amygdala lesions (Bar-On et al., 2003; Bechara et al., 2003).

Second, as suggested above, it may also be that our TxN sample comes from a different population of alcohol-dependent individuals, who do not have either a high level of genetic vulnerability to alcoholism or a global decision-making deficit that predates their alcoholism. The TxN group had significantly fewer problem drinker family members compared with our treated alcoholic individuals, which suggests that they have a lower genetic vulnerability to alcoholism. Our TxN subjects also did not show very high levels of deviance proneness or externalizing symptoms compared with other samples of alcoholic individuals who demonstrate decision-making deficits, such as our sample of abstinent alcoholic individuals (Fein et al., 2004) or the antisocial alcoholic individuals in Mazas et al. (2000) or in Finn et al. (2002). It may be that the term ••alcoholism•• as commonly understood in our society refers only to the more virulent form of alcohol dependence that involves higher genetic vulnerability, SGT impairments, and more severe early alcohol use trajectories. The population studied here may have alcohol dependence that can remit as suggested by the work of Schulenberg et al. (1996), Sher and Gotham (1999), or Dawson et al. (2005).

Deviance proneness and antisocial traits are typically associated with decision-making deficits in substance abusers (Fein et al., 2004; Finn et al., 2002; Mazas et al.,

2000; Stout et al., 2005). In contrast, our data suggest that the decision-making problems in our TxN subjects may be specific to their drinking and not evident in other domains of their life. However, we did not carefully assess the decision making of our TxN subjects in other contexts or with drinking itself. If we are to understand the nature of decision-making problems in the range of types, or degrees of severity, of alcoholism, then it is essential that researchers attempt to characterize the decision making of alcoholic individuals across different domains (i.e., behaviors) and contexts (e.g., drinking vs nondrinking contexts). Future research should attempt to examine how individual alcoholic persons, well characterized in terms of personality, family history, cognitive abilities, and psychopathology, make decisions in domains such as alcohol consumption, sexual behavior, money management (including purchasing behavior), work-related behaviors, eating behaviors, interpersonal con”ict, emotion-provoking situations, and other contexts that are motivationally relevant to the individual. Furthermore, it is also very important that researchers assess the in”uence of the typical context in which the individual makes these sorts of decisions. Animal research suggests that context is an important in”uence in determining drug administration behavior and response (Robinson and Berridge, 1993). For instance, our TxN subjects might make impulsive decisions when at a bar, or in a typical drinking context, but not in other situations, such as at home with family members or in arti“cial laboratory environments. Finally, it may be that the decision-making deficits in TxN subjects are subtler or somewhat different than those of our long-term abstinent alcoholic subjects or other samples of substance abusers that show deficits on the gambling task. Although the gambling task models real-life decisions that involve weighing short-term rewards and long-term consequences, it remains an arti“cial task and it may not be sensitive to more subtle deficits in decision making or39.9(on)](()-460.3(the)-449(gamb2J 0 9n5-3ns)-73s8437.1lev)-8i39.9(on6.9(3s.3((g)((3s.dng)-887.6(th8.1 -64593(drinb)-9.6ling

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