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AUTHOR Rather, Bruce C.; Goldman, Mark S.
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ABSTRACT

Alcohol expectancies have been theorized to be related to bits of information stored in memory about the subjective effects of alcohol use. Techniques for investigating memory processes are therefore helpful to identify these informational bits and their relation to each other in ways that correlation-based techniques may obscure. In this study five groups of drinkers were defined by dividing the drinking quantity/frequency distribution into equal segments. Data were analyzed from 150 and 130 undergraduate college students subjects in the "alcohol" and "feelings" conditions respectively. The organization and structure of 16 stimulus words (chosen to be representative of a larger set) were examined using Multidimensional Scaling (INDSCAL) and the Pathfinder network scaling algorithm under two instructional conditions defining the words as "effects of alcohol" or "human feelings." Points, indicating the most frequently expected effects of alcohol, for each of five drinking groups were mapped into the stimulus configuration. The results revealed systematic differences between network structures as a function of drinking status in the alcohol, but not in the feelings, context. Results suggest the organization of alcohol expectancies in memory may be important in influencing decisions about drinking. (Author/ABL)

Differences in the Memory Organization and Structure of Alcohol Expectancies

Bruce C. Rather and Mark S. Goldman

Department of Psychology, BEH 339

University of South Florida

Tampa, Florida 33620

Abstract

The organization and structure of sixteen stimulus words (chosen to be representative of a larger set) were examined using Multidimensional Scaling (INDSCAL) and the Pathfinder network scaling algorithm under two instructional conditions defining the words as "effects of alcohol" or "human feelings". INDSCAL dimensions were empirically labeled with adjective ratings. Points, indicating the most frequently expected effects of alcohol, for each of five drinking groups were mapped into the stimulus configuration. The results revealed systematic differences between network structures as a function of drinking status in the alcohol, but not in the feelings, context. Results suggest the organization of alcohol expectancies in memory may be important in influencing decisions about drinking.

Introduction

Alcohol expectancies have been theorized to bits of information stored in memory about the subjective effects of alcohol use (Goldman, Brown, Christansen, & Smith, 1991). Techniques for investigating memory processes are therefore helpful to identify these informational bits and their relation to each other in ways that correlation-based (e.g. factor analysis) techniques may obscure. Unlike traditional psychometric approaches, the techniques used here reveal mechanisms by which risk-related antecedent psychosocial or biological/genetic variables could influence later drinking patterns. In previous work, we identified these informational bits (corresponding to memory nodes in a network model) and mapped their relation to each other based on proximity (distance) measures calculated from likert-type rating scales on an expectancy instrument (Rather, Goldman, Roehrich, & Brannick, in press; Rather, Levine, & Goldman, 1990). An alternative and somewhat more direct method is based upon the subject's direct comparisons of the psychological distance between these memory nodes. Hence in the present study we replicated and extended our previous work by asking subject's to make direct comparisons of 16 expectancy nodes with each other and these were mapped using multidimensional scaling (MDS) techniques (Kruskal & Wish, 1978), specifically Individual Differences Scaling (INDSCAL). Additional techniques, based on multiple regression procedures, were used to empirically label the MDS stimulus dimensions (i.e. PROFIT; property fitting) and map different groups of drinkers into the stimulus space (i.e. PREFMAP; preference mapping) to clarify the most frequently effects of alcohol for the different drinking groups. Finally, a new program

used to generate network structures (Pathfinder; Cooke, Durso, & Schvaneveldt, 1986) was applied to the same data set to compare the expectancy networks of light versus heavy drinkers.

In the present study, 5 groups of drinkers were used defined by dividing the drinking quantity/frequency distribution into equal segments. These subjects rated the likelihood that all possible pairs of 16 stimulus words (chosen to be representative of a larger set of words), called either "effects of alcohol" or "human feelings and personality characteristics" (a control condition) could be experienced together. The resultant matrices were then analyzed using the techniques described above to model spatial and network representations of the stimuli.

It was hypothesized that activation of the concept "effects of alcohol" would result in systematic differences in the structures as a function of drinking status. In contrast, few systematic differences were expected to be observable in the structures between drinkers in the "feelings and personality characteristics" control condition.

Method

Subjects

Undergraduate college students were used to avoid bias of extreme groups because: (a) they represented a wide range of drinkers including frank alcoholics; (b) they permit study of semantic structures related to general drinking behavior, not simply drinking behavior labeled "alcohol dependence;" (c) they represent a population of drinkers who have not been identified through health or legal systems.

Data was analyzed from 150 and 130 subjects in the "alcohol" and

"feelings" conditions respectively. Subjects were randomly assigned to conditions and balanced for the number of males and females. Descriptive statistics of the subjects are shown in Table 1. Chi-square analyses on the categorical variables and a MANOVA on the continuous variables revealed no significant differences between the experimental groups, thus differences in semantic structures could not be due to these potentially confounding variables.

Procedures

Subjects completed the following: (a) A questionnaire (alcohol condition only) designed to prime the subjects' concept of the "effects of alcohol" and elicit context-dependent meanings (Barsalou, 1982) of the words; (b) Proximity rating scales on all possible combinations (16 x 15/2 = 120) of the 16 stimulus words. The instructions for the alcohol condition were: "Think of the effects of alcohol on you. Rate each pair of alcohol effects on how likely or unlikely it is that you could feel them at the same time." Subjects made comparisons based on "how they would feel to you if you were a little high or under the influence of alcohol." Ratings were on a scale from 0 to 8, with 0 being "Extremely likely" and 8 being "Extremely unlikely." The instructions in the feelings condition were: "Think of feelings and personality characteristics. Rate each pair of words on how likely or unlikely it is that people could feel them at the same time;" (c) Ratings of expected effects of alcohol. Subjects rated each of the 16 alcohol effects "according to the frequency with which that effect of alcohol happens to you" on a scale ranging from 1 to 7 with 1 being "Never" and 7 being "Always;" (d) the Demographic Data/Drinking History Questionnaire provided

demographic information and indices of the quantity/frequency of alcohol consumption and problems due to drinking; (e) Ratings of the stimulus items on 5 bipolar adjective pairs (positive-negative, desirable-undesirable, social-antisocial, enhancing-impairing, real-imagined) were obtained from all subjects and ratings on 5 more adjective pairs (active-passive, weak-strong, inhibited-uninhibited, aroused-sedated, physiological-psychological) were obtained from an independent subject sample (N = 65). Adjective ratings were completed on a 9 point scale; (f) The family history of substance abuse form; and, (g) the Alcohol Expectancy Questionnaire-Adolescent Form Scale 2.

Results

In general subjects were asked to make comparisons between all pairs of stimulus words and make other ratings of these words to aid in labeling the MDS dimensions and map the point representing the most frequently expected effects of alcohol for each drinking group.

A manipulation check revealed that of the 120 proximity ratings, 81 mean ratings were found to be significantly different between the "alcohol" and "feelings" conditions after application of the Bonferroni t statistic ($p \leq .05$). Inspection of the means showed that subjects in the feelings condition uniformly rated the pairs of stimulus items as more likely to occur together than the alcohol condition subjects.

INDSCAL analyses were performed on the 5 alcohol and 5 feelings conditions proximity data matrices separately. A 2-dimensional solution was retained with the alcohol and feelings condition solutions explaining 79% and 75% of the variance respectively. INDSCAL weights presented in Table 2 reveal that when the stimulus items are

called "effects of alcohol" the weights differ as a function of drinking status but not when they are called "feelings."

PROFIT analyses (Chang & Carroll, 1968) were performed to empirically label the stimulus dimensions. Eight of 10 bipolar adjective pairs, in both conditions, had multiple correlations with the stimulus coordinates in the high .80's or low .90's indicating a good fit. Dimension 1 was Positive/social vs. Negative/antisocial effects and Dimension 2 was Arousing vs. Sedating effects of alcohol.

The PREFMAP analysis (Chang & Carroll, 1972) located an ideal point in the stimulus configuration by a regression procedure. The average correlation of the ideal points to the stimulus coordinates was .85 indicating a good fit. An ideal point indicates a hypothetical expected effect of alcohol that the subject expects the most. The ideal point is the center of a series of concentric circles ("iso-preference contours"). Effects that are near the ideal point are expected the most while effects that are far away are expected least.

Figure 1 presents the MDS solution, PROFIT vectors, and the PREFMAP ideal points of the alcohol condition data. Distance between points represents the likelihood of co-occurrence of that pair of effects. The PREFMAP ideal points clearly discriminate between the groups of drinkers with heavy drinkers expecting more arousing and positive/social effects than light drinkers who expect sedation.

Figure 2 presents the INDSCAL solution of the feelings condition. The feelings condition replicated the overall meaning of the alcohol stimulus dimensions but differences were revealed in the distances between the points (recall the manipulation check).

The proximity matrices of light and heavy drinkers in both conditions were analyzed by the Pathfinder algorithm for generating network structures. Links (associations) between nodes (stimuli) in a network represent the shortest distance between those nodes and the shortest path between a series of links between non-adjacent nodes (Schvaneveldt, Durso, & Dearholt, 1989). Figure 3 and Figure 4 present the networks of the heavy and light drinkers in the alcohol condition. Figure 5 and Figure 6 present the networks of the heavy and light drinkers in the feelings condition. Notice that for heavy drinkers in the alcohol condition, the concept node "intoxication" is directly linked to several positive effects and within 2 links of all others. Negative effects, even when directly linked, are rated as less likely to co-occur together. Light drinkers have closer links to negative effects of alcohol. Systematic differences between drinkers are not evident when the words are called "feelings."

Discussion

The findings of this study demonstrate that the organization and structure of alcohol expectancies in memory differ as a function of the subjects' level of alcohol consumption. Further, these structures can be profitably represented in a multidimensional space or a Pathfinder network, the results of which are both overlapping and complementary. The MDS results here replicates previous work using different subjects, data collection procedures, and number of stimuli. The subjectively defined MDS dimensions of previous work were supported and empirically labeled in this study. As previously, PREFMAP results showed that drinkers differ in the effects they typically expect from alcohol. Thus, the entry point into the

expectancy network is determined by the particular drinking history of the individual. This study extends previous work by examining Pathfinder network structures that reveal striking differences in how alcohol concept nodes are organized. The addition of the "feelings" control condition revealed that the differences are only apparent when the stimuli are called "effects of alcohol."

It is hypothesized an alcohol expectancy network influences decision-making about drinking as a function of the strength of association between network elements. How can the organization of network structures actually translate into different behavioral responses in various alcohol contexts? In the realm of affect, Lang (1985) has proposed an information processing view where the informational structure of emotion is semantically represented and associatively related to stimulus representation, physiological/emotional activation, and skeletal muscle patterns. When applied to drinking behavior, it is hypothesized that expectancies of sociability and arousal in heavy drinkers are connected to affective and action patterns which produce these behaviors (i.e. give a "go" signal). In contrast, expectations of sedation in light drinkers lead to diminished activity (i.e. a "no go" signal). Conceptualized as a spreading-activation network, expectancy operation is mostly automatic, but this does not rule out top-down (effortful) control of drinking decisions. Future work needs to extend the validation of the MDS findings by studies of retrieval latency and pattern of the kind already used in memory research (e.g. Roediger, 1990).

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Table 1

Relevant Subject Variables by Instructional Condition

Variable	Condition	
	Alcohol	Feelings
Gender (n)	(N = 150)	(N = 130)
Males	75.0	65.0
Females	75.0	65.0
Race (%)		
Caucasian	88.6	87.6
Other	11.4	12.4
Marital Status (%)		
Single	86.6	79.2
Married	4.0	8.5
Other	9.4	12.3
Age (M in years)		
(Range = 18 to 40)	21.7	22.2
Drinking Quantity/ Frequency (M)		
(Range = 5 to 33)	18.2	17.5
Problems Due to Drinking (M)		
(Range = .0 to 6)	1.1	0.9
AEQ-A Scale 2 (M)		
(Range = 2 to 15)	9.6	9.8

Note. The experimental groups were equivalent on all variables. AEQ-A Scale 2 measures expectations of social facilitation.

Table 2

INDSCAL "Subject" Weights for the Drinking Groups in the Alcohol and Feelings Conditions

Drinking Group	Dimension	
	1	2
Alcohol Condition		
1 (Light)	.75	.40
2 (Light-Moderate)	.74	.51
3 (Moderate)	.67	.60
4 (Moderate-Heavy)	.70	.59
5 (Heavy)	.65	.62
Variance Explained:	.49	.30
Feelings Condition		
1 (Light)	.65	.61
2 (Light-Moderate)	.62	.61
3 (Moderate)	.57	.61
4 (Moderate-Heavy)	.61	.62
5 (Heavy)	.56	.65
Variance Explained:	.36	.38

Note. Dimension 1 = Positive/social vs. Negative/antisocial effects. Dimension 2 = Arousing vs. Sedating effects. Larger weights indicate greater emphasis on that dimension.

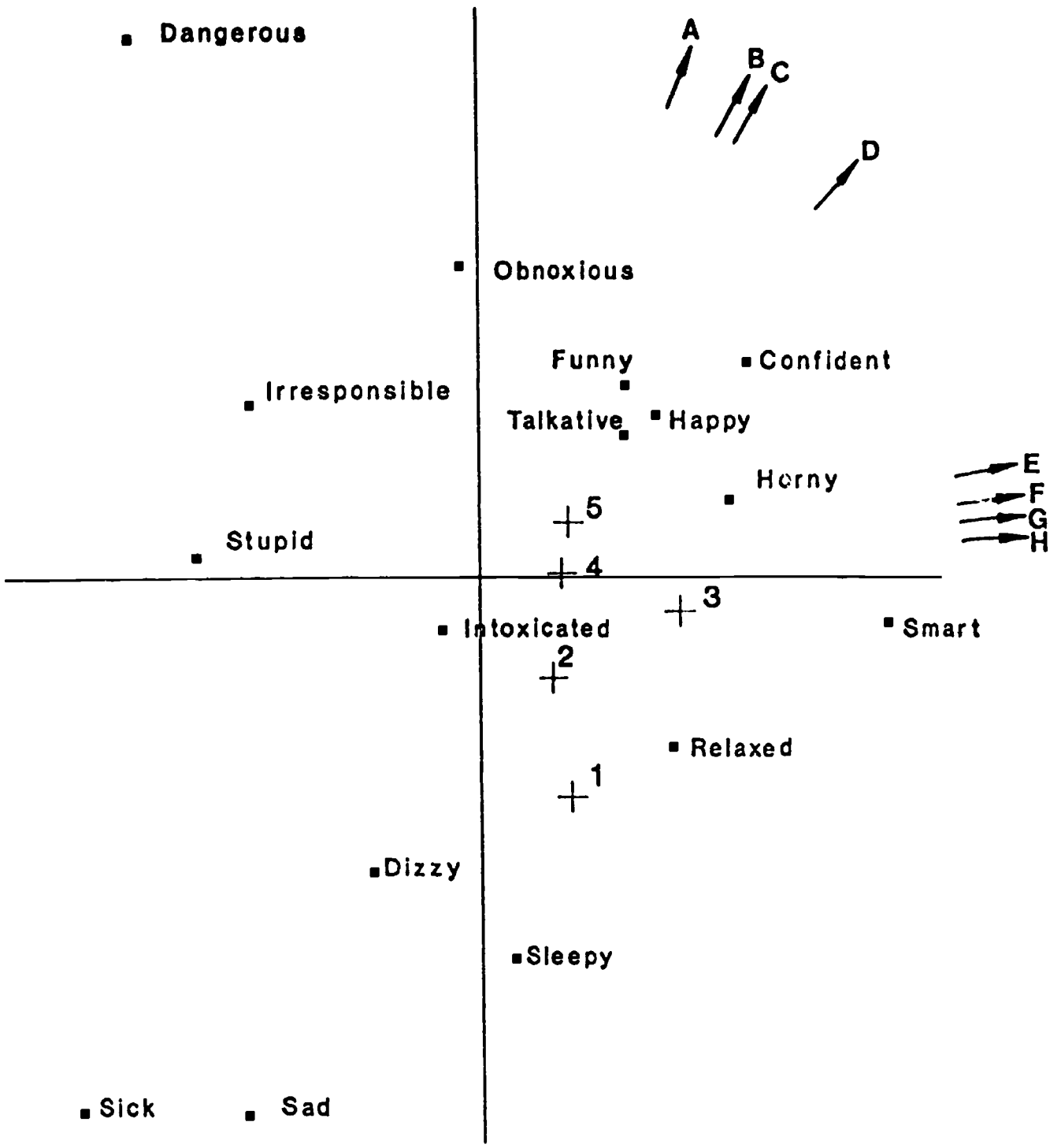

Figure 1

INDSCAL Group Stimulus Space for the Alcohol Condition with PROFIT Vectors and PREFMAP Ideal Points. The PREFMAP ideal points are labeled from light (1 = Light) to heavy drinkers (5 = Heavy). The arrows represent the positive poles of the PROFIT vectors. A = Aroused, B = Active, C = Strong, D = Uninhibited, E = Social, F = Enhancing, G = Desirable, H = Positive.

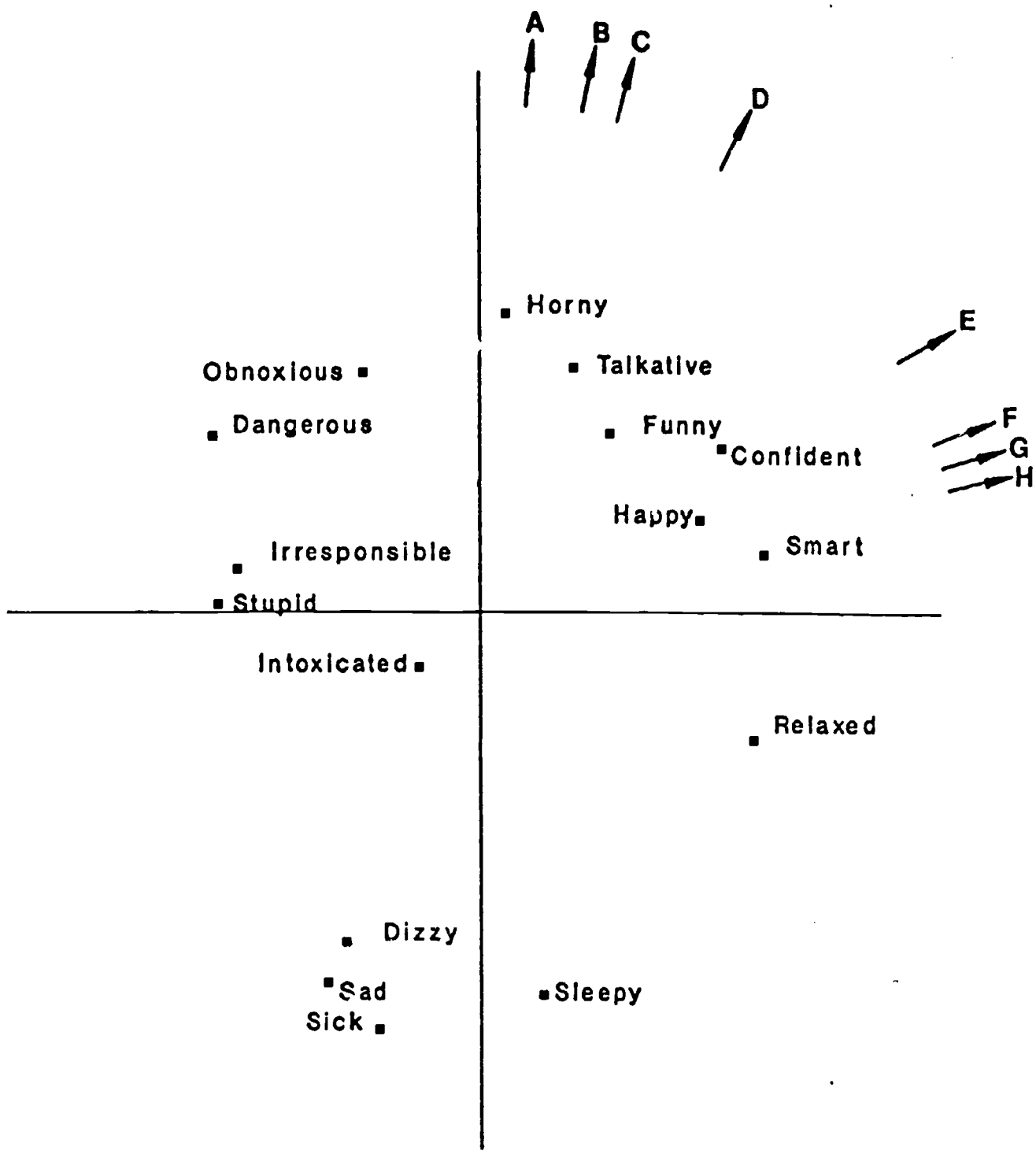

Figure 2

INDSCAL Group Stimulus Space for the Feelings Condition with PROFIT Vectors. Arrows represent the positive poles of the PROFIT vectors. A = Aroused, B = Active, C = Strong, D = Uninhibited, E = Social, F = Enhancing, G = Desirable, H = Positive.

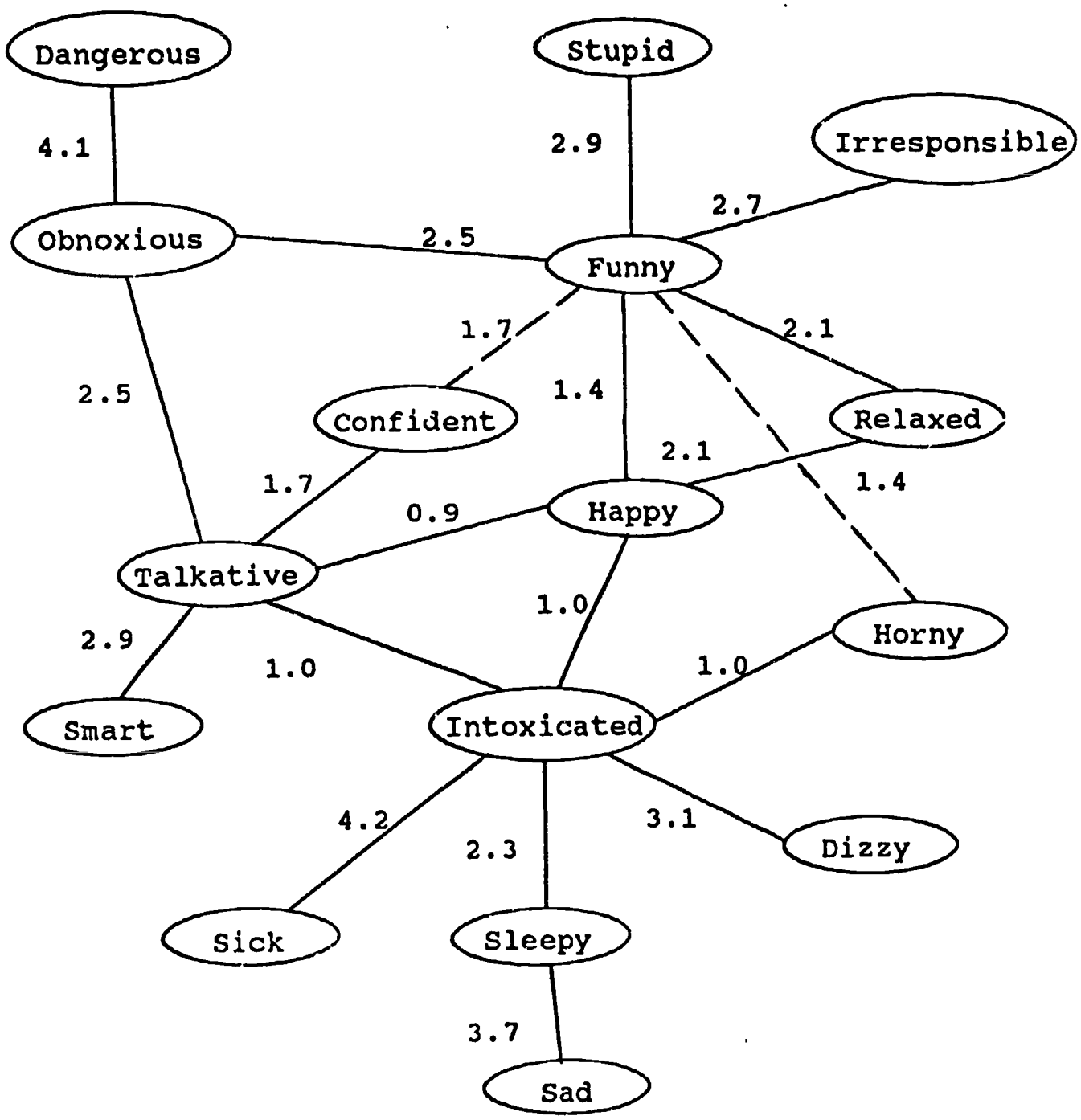

Figure 3

Pathfinder Network for Heavy Drinkers in the Alcohol Condition. Link weights are the mean proximity values indicating the likelihood of co-occurrence of that pair of alcohol effects. Lower values indicate higher likelihood of co-occurrence. Solid lines indicate PFNET (r = infinity, q = 2), solid plus broken lines indicates the PFNET (r = 7, q = 2).

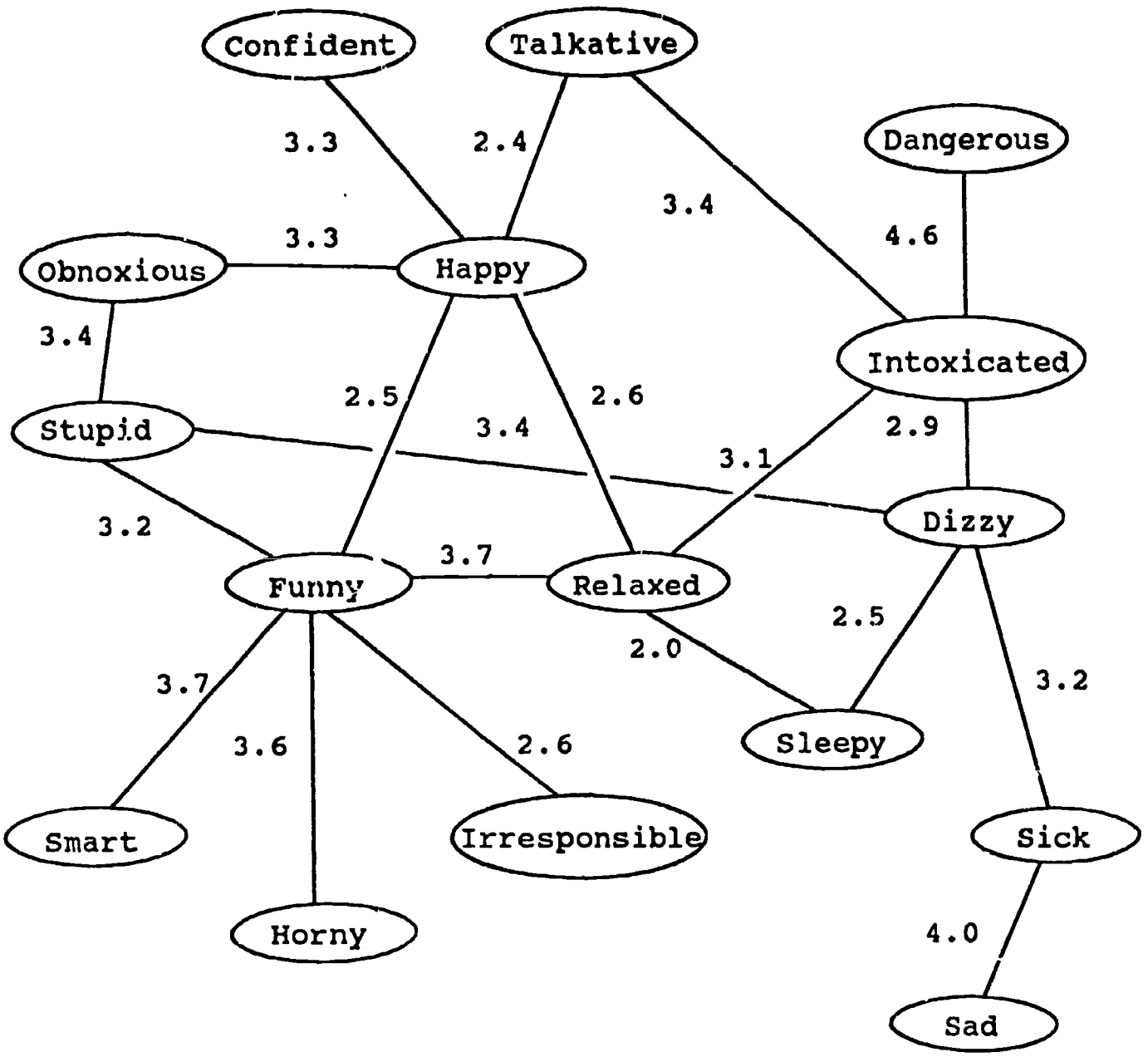

Figure 4

Pathfinder Network for Light Drinkers in the Alcohol Condition. Link weights are the mean proximity values indicating the likelihood of co-occurrence of that pair of alcohol effects. Lower values indicate higher likelihood of co-occurrence. Solid lines indicate PFNET (r = infinity, q = 2).

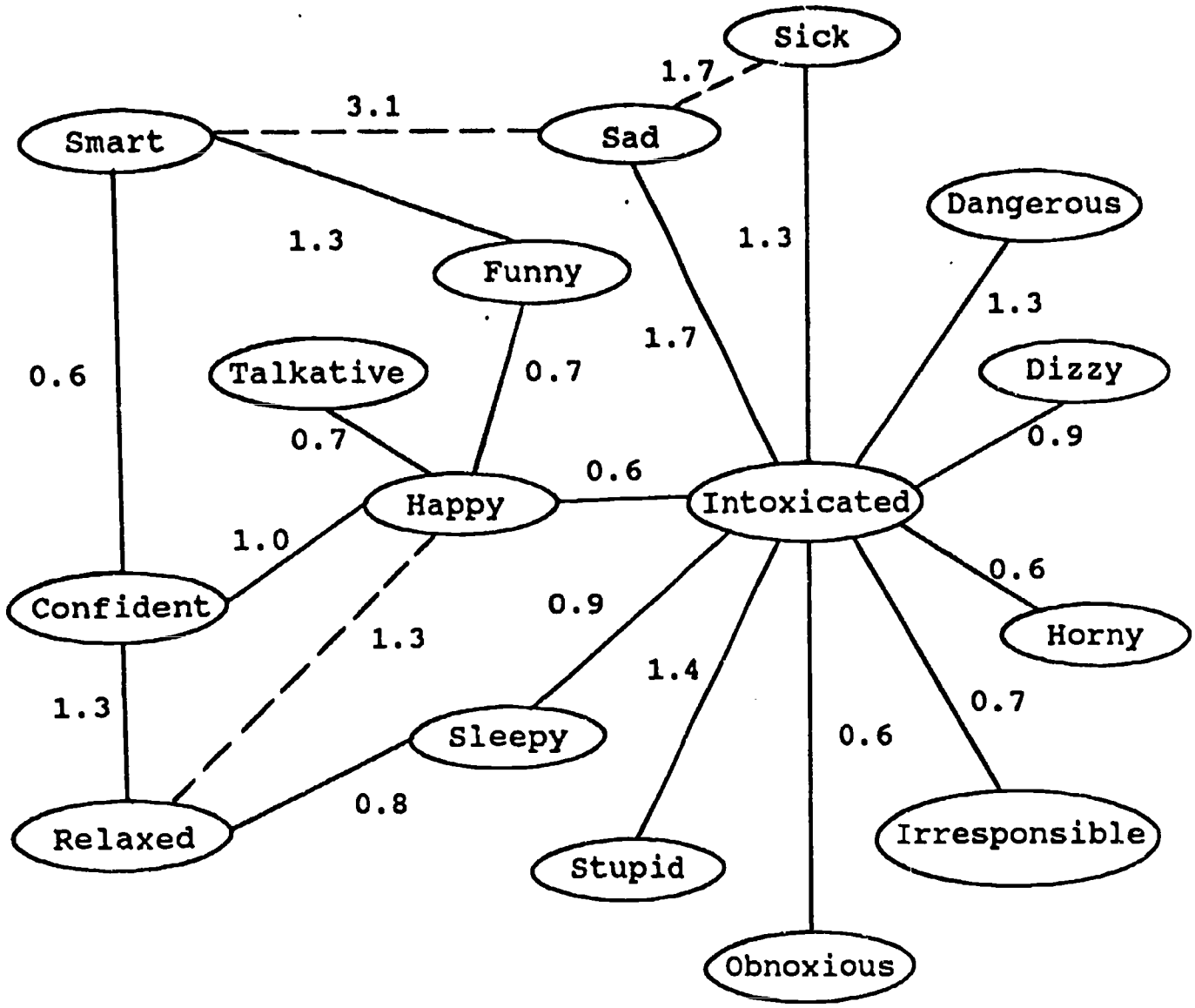

Figure 5

Pathfinder Network for Heavy Drinkers in the Feelings Condition. Link weights are the mean proximity values indicating the likelihood of co-occurrence of that pair of feelings and personality characteristics. Lower values indicate higher likelihood of co-occurrence. Solid lines indicate PFNET (r = infinity, q = 2), solid plus broken lines indicates the PFNET (r = 5, q =2).

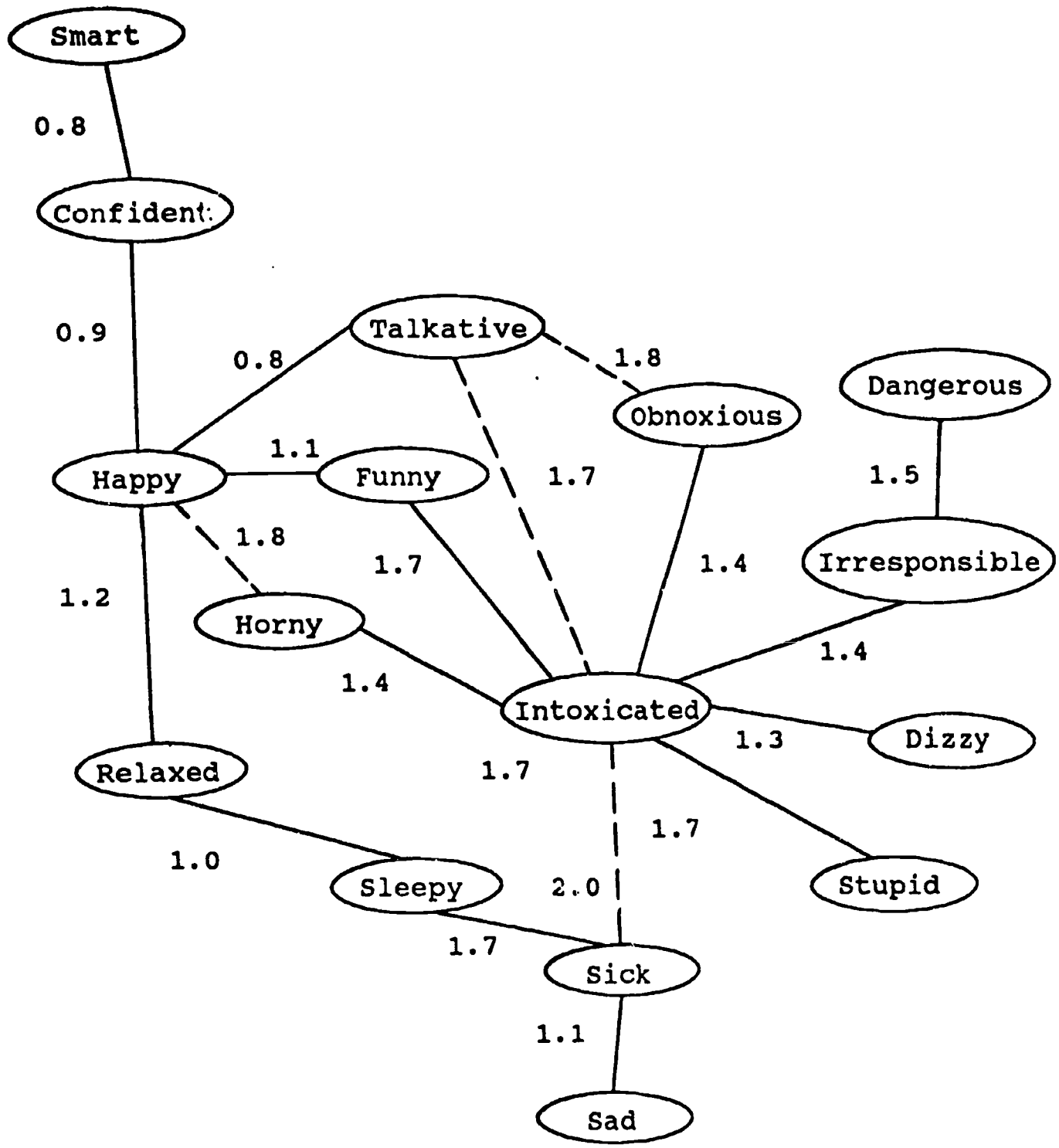

Figure 6

Pathfinder Network for Light Drinkers in the Feelings Condition. Link weights are the mean proximity values indicating the likelihood of co-occurrence of that pair of feelings and personality characteristics. Lower values indicate higher likelihood of co-occurrence. Solid lines indicate PFNET (r = infinity, q = 3), solid plus broken lines indicates the PFNET (r = 5, q =3).