Addiction (1998) 93(7), 1091–1102

RESEARCH REPORT

A comparison of two alcohol craving questionnaires

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Abstract

Aim. *To compare two multi-dimensional questionnaires to measure cravings and urges for alcohol: the Alcohol Craving Questionnaire (ACQ: Singleton, Henningfield & Tiffany, 1994a) and the Desires for Alcohol Questionnaire (DAQ: Clark et al.*, 1996). **Design, setting and participants**. *Both questionnaires were administered, in a counterbalanced order, to a total of 380 recreational drinkers. In a further study, a shortened version of the DAQ was administered to a sample of 131 drinkers attending AA or a treatment centre. Exploratory factor analyses were carried out on the data and relationships between questionnaire score and other variables were assessed.* **Findings**. *In recreational drinkers both instruments appeared to have a three-factor structure. The DAQ appeared superior to the ACQ in a number of respects: it produced more reliable factors; its structure accounted for a higher proportion of the variance; the factor inter-correlations were somewhat lower; in a combined analysis of both instruments most of the factors retained came from the DAQ; and the DAQ discriminated better between binge and non-binge drinkers and excessive and moderate drinkers. A similar factor structure was found for the DAQ in the alcoholic subjects with addition of a factor of "controllability".* **Conclusions**. *The results support a multifactorial account of alcohol craving, and indicate that the DAQ has some advantages over the ACQ as a research tool.*

Introduction

Despite the popularity and widespread use of the term "alcohol craving" in both the research and the treatment field, the concept of craving has attracted little conceptual or empirical analysis (Tiffany, 1990). Drug cravings are subjective states in which an individual experiences the desire to engage in drug-taking (Kozlowski & Wilkinson, 1987; Baker, Morse & Sherman, 1987; UNDCP and WHO Expert Committee, 1992). Cravings are usually thought to arise either from the positive-reinforcing (incentive) properties of the craved drug (Marlatt, 1985; Niaura *et al.*, 1988; Wise, 1988), or from negative-reinforcing properties related to withdrawal effects (Ludwig & Wikler, 1974; Poulos, Hinson & Siegel, 1981; West & Schneider, 1987), or in some models, from both positive and negative reinforcement processes (Baker *et al.*, 1987). However, some authors have argued that craving is independent of reinforcement mechanisms (Kozlowski & Wilkinson, 1987; Robinson &

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Submitted; 8th November 1996; initial review completed 14th February 1997; final version accepted 7th November 1997.

0965–2140/98/071091–12 $9.50

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Berridge, 1993), and there is some evidence that a cognitive account may be more appropriate (Tiffany, 1990, 1992).

Investigation of these more complex hypotheses is hindered by a lack of sophisticated instruments to measure craving, which is usually evaluated using one or two questionnaire items, which elicit ratings of craving on (typically) a 7-point scale (Ludwig & Wikler, 1974; Cooney *et al.*, 1984; Glassman *et al.*, 1984; Childress, McLennan & O'Brien, 1986). This approach assumes a unidimensional view of craving, and in effect, precludes the possibility that cravings could be either multidimensional entities, for example, related to both positive and negative reinforcement (Baker *et al.*, 1987), or more complex cognitive structures (Tiffany, 1990, 1992). Clearly, such concepts cannot be effectively evaluated using an instrument that includes one or a very few items.

An alternative approach, proposed by Tiffany & Drobes (1991), is to examine the factor structure of a multi-item craving questionnaire. Tiffany & Drobes' (1991) Questionnaire on Smoking Urges (QSU) is a 32-item instrument containing questions directed at four different areas relevant to cigarette craving: desire to smoke, anticipation of positive outcomes, relief of withdrawal or negative affect, and intention to smoke. The best fit to their data was a two-factor solution, in which the two factor scales were quite highly correlated ($r = 0.71$). Items contributing to factor 1 were related primarily to intention and desire to smoke and anticipation of pleasure from smoking, suggesting that factor I reflects the operation of positive reinforcement. Items contributing to factor II were related primarily to an overwhelming desire to smoke and anticipation of relief from negative affect and withdrawal, suggesting that factor II reflects the operation of negative reinforcement.

Subsequently, several groups have applied this approach to develop psychometric instruments to measure alcohol cravings (Clark, 1994; Singleton, Henningfield & Tiffany, 1994a; Bohn, Krahn & Staehler, 1995). As all these projects took the QSU as their starting point, the resulting instruments are similar in many respects. However, there are also differences, and the object of the present study was to compare directly two of these instruments, the Alcohol Craving Questionnaire (ACQ: Singleton *et al.*, 1994a) and the Desires for Alcohol Questionnaire (DAQ: Clark, 1994).

Like the QSU, the ACQ includes items directed at four different areas relevant to alcohol craving: urges and desires to drink alcohol, intent to use alcohol, anticipation of positive outcome and anticipation of relief from withdrawal; in addition, a number of items are directed at the area of (lack of) control over the use of alcohol (Singleton *et al.*, 1994a). It has been reported that the ACQ reveals alcohol craving to be a multi-dimensional, rather than a uni-dimensional, construct (Singleton, Tiffany & Henningfield, 1994b, 1995) The factor structure of the ACQ has not yet been published but the questionnaire is available from the authors (Singleton *et al.*, 1994a).

The DAQ was also derived from the QSU, and therefore many of the items in the DAQ are very similar to items in the ACQ. However, the DAQ differs from the QSU (and ACQ) in two important respects. First, while the four categories of item included in the QSU were retained, items were selected to provide a range of intensities (e.g. mild to very strong desires) within each category, and to match the intensity of items across categories. Secondly, in contrast to the QSU (and the ACQ), "reverse keyed" items (e.g. "I have no desire to drink right now") were rephrased using a positive wording. A factor analysis of the DAQ revealed a stable four-factor structure, which accounted for 65% of the overall variance. The factors were characterized as "negative reinforcement", "strong desires and intentions", "mild intentions and positive reinforcement" and "controllability of alcohol consumption". Like the ACQ, the DAQ has been reported in abstract form and the full data have been submitted for publication (Clark, *et al.*, 1996).

In addition to its theoretical significance (see above), the development of adequate methods to measure alcohol craving is also an important practical issue, given the importance of craving as a therapeutic target (e.g. Spanagel & Zieglgansberger, 1997), and the putative role of craving in theories of relapse (e.g. Tiffany & Carter, 1998). To this end both instruments were compared by administering them to a large sample of recreational drinkers. In addition a shortened version of the DAQ was administered to a sample of alcoholics and these results were also subjected to factor analyses.

Methods

Subjects

For the main study, questionnaires were administered to a total of 380 recreational drinkers from the Swansea and Swansea Valley areas of South Wales. The questionnaires were completed at various times of the day and in a range of locations, over a 3-week period; 214 respondents were female and 165 were male. The respondents ranged in age from 15 to 68 (mean 29). On average, respondents began drinking regularly at 16.1 years, drank on nine occasions per month and drank an average of 10.9 units of alcohol per occasion. Subjects for the second study were a total of 131 alcoholics, of whom 79 were clients at a Minnesota Method-based treatment centre and 52 were contacted through Alcoholics Anonymous groups.

Procedure

In the main study all subjects were asked to complete two questionnaires. The Alcohol Craving Questionnaire contains 47 items, each scored on a 7-point Likert-type scale labelled strongly disagree–strongly agree. Nine items represent each of five areas relevant to alcohol craving: urges and desires to use alcohol, intent to drink alcohol, anticipation of positive outcome, anticipation of relief from withdrawal or negative outcome, and lack of control over the use; the two additional items are included as part of a consistency check subscale. Thirteen items, distributed unevenly over the five categories, are "reverse keyed"; that is, they are phrased negatively and the scores are subtracted from 7 for scoring purposes (Singleton *et al.*, 1994a). The DAQ contains 36 items, also scored on 7-point Likert-type scales, in four categories, intentions to drink alcohol (10 items), desires to consume alcohol (10 items), anticipation of positive outcomes from drinking (eight items), and anticipation of relief of negative affect or alcohol withdrawal (eight items). The DAQ contains no "reverse-keyed" items. In order to avoid biases attributable to questionnaire position, 190 of the questionnaires were randomly allocated to be administered with the DAQ first and ACQ second; for the remaining questionnaires the order was reversed. Subjects also completed a short drinking history questionnaire and provided demographic data. The second study used a shortened 14-item version of the DAQ made up of items with high loadings on one factor for each of the four factors identified in the initial analyses of the DAQ (four items for each of factors 1–3 and two items for factor 4) (Clark *et al.*, 1996).

Statistical analysis

The data collected were subjected to exploratory factor analyses (Floyd & Widaman 1995). Only those cases with no missing data for any of the items were included in the analyses, resulting, in the main study, in 221 cases being retained in the DAQ analysis and 251 cases in the ACQ analysis. Principal components analysis was used as the original extraction method for both questionnaires. The number of factors retained was determined using a Scree Plot (Cattell, 1978). The initial principal components obtained were rotated using both orthogonal (varimax) and oblique (oblimin) rotations (Kaiser, 1958; Hendrickson & White, 1964). Both forms of rotation identified similar factors for each type of questionnaire. However, as might be expected, the oblique rotation provided 'cleaner' factors with fewer cross loadings, and the results of these analyses are reported. Those items loading at higher than 0.4 on one factor were retained. The resulting factor scales were checked for reliability using Cronbach's Alpha. Similar procedures were applied to the data from the second study, which led to the retention of 126 cases. The data were checked for sampling adequacy and sphericity using the Kaiser–Meyer–Olkin and Bartlett tests.

Results

Alcohol craving questionnaire

Three factors with eigenvalues of 13.87, 1.77 and 1.52 were identified from the ACQ analysis. Thirteen items loaded on the first factor. Six of these items reflected strong desires to drink (I want a drink so bad I can almost taste it); six items reflected strong intentions to use alcohol (All I want to do right now is drink), and the remaining item indicated positive anticipation of alcohol consumption ('Drinking would be wonderful'). The first factor was therefore labelled "Strong desires and intentions to use alcohol". The second factor contained four negatively phrased items, all reflecting no desire to drink (I have no desire to drink right now). This factor

Table 1. *Factor analysis of alcohol craving questionnaire*

Variable		Factor 1	Factor 2	Factor 3
aq19	'I would do almost anything for a drink'	**0.95**	0.06	0.01
aq24	'All I want to do right now is drink'	**0.94**	0.01	−0.04
aq17	'I want a drink so bad I can almost taste it'	**0.94**	0.10	0.01
aq16	'If I drank a little alcohol right now I would not be able to stop using it'	**0.87**	0.01	−0.08
aq18	'Nothing would be better than drinking right now'	**0.87**	−0.01	0.07
aq47	'My desire to drink seems overpowering'	**0.84**	0.11	0.10
aq21	'I want to use alcohol right now'	**0.84**	−0.16	−0.02
aq31	'I would not be able to control how much alcohol I drank if I had some here now'	**0.78**	−0.01	0.05
aq44	'I crave alcohol right now'	**0.74**	−0.05	−0.03
aq23	'I am thinking of ways to get alcohol'	**0.69**	0.05	0.15
aq7	'Right now I miss drinking'	**0.65**	−0.17	0.01
aq15	'I could not stop myself from drinking if I had some alcohol here'	**0.64**	−0.12	0.13
aq5	'Drinking would be wonderful'	**0.57**	−0.25	0.16
aq27	'Drinking would not be very satisfying right now'	0.09	**0.83**	0.05
aq29	'I would not enjoy drinking right now'	0.02	**0.71**	−0.16
aq40	'I have no urge to drink now'	−0.15	**0.70**	−0.01
aq38	'I have no desire to drink right now'	−0.28	**0.66**	−0.05
aq39	'If I were using alcohol now I would feel less nervous'	−0.09	0.04	**0.95**
aq28	'If I used alcohol now I would feel less tense'	−0.05	−0.04	**0.95**
aq9	'I would feel less jittery if I used alcohol right now'	0.02	0.04	**0.82**
aq46	'Drinking would put me in a better mood'	−0.02	−0.17	**0.76**
aq14	'Drinking would make me feel less jittery'	0.20	0.06	**0.76**
aq34	'I would feel less restless if I drank alcohol now'	0.10	−0.05	**0.74**
aq22	'I would feel less irritable if I used alcohol now'	0.23	0.00	**0.72**
% of Variance explained		57.8	7.4	6.3
Eigenvalues		13.87	1.78	1.51

Statistics: Kaiser–Meyer–Olkin = 0.96110, Bartlett = 5849.3403, Sig. < 0.001, $n = 251$.

was labelled "No desire to drink". Seven items indicating both relief from negative states through drinking and anticipation of positive outcome through drinking loaded on the third factor. Six items were concerned with relief from negative states (I would feel less jittery if I used alcohol right now), while the remaining item indicated anticipation of a positive outcome (Drinking would put me in a better mood). This factor was labelled "Negative and positive reinforcement". Overall these factors accounted for 71.5% of the total variance (see Table 1). Cronbach's alphas of 0.97, 0.75 and 0.95 were found for the scales of factors 1, 2 and 3, respectively.

Factor 2 (No desire to drink) was weakly negatively correlated with both factor 1 (Strong desires and intentions) and factor 3 (Positive and negative reinforcement). However, factor 1 and factor 3 were quite highly correlated (see Table 3). This indicates that those who scored highly on factor 1 (Strong desires and intentions) were also likely to score highly on factor 3 (Negative and positive reinforcement).

Desires for alcohol questionnaire

Three factors with eigenvalues of 17.9, 2.51 and 1.75 were similarly identified from the DAQ. Factor 1, in this case, contained 12 items, eight reflecting relief from negative states through drinking (Drinking now would make me feel less tense), and four reflecting anticipation of positive effects from drinking (Drinking now would make

Table 2. *Factor analysis of the DAQ (oblimin rotation)*

Variable		Factor 1	Factor 2	Factor 3
sq14	'Drinking now would make the bad things in my life seem less bad'	**0.92**	− 0.08	− 0.06
sq11	'Drinking now would make me feel less tense'	**0.91**	0.13	0.06
sq27	'I would probably feel less worried about my daily problems if I drank now'	**0.90**	− 0.03	0.02
sq22	'If I drank now the small daily hassles would feel less important'	**0.88**	0.18	0.21
sq36	'All my tension would completely disappear if I drank now'	**0.80**	− 0.20	− 0.12
sq31	'Drinking now would make me feel less stressed'	**0.79**	0.03	0.13
sq8	'Even major problems in my life would not bother me now if I drank'	**0.78**	− 0.24	− 0.25
sq2	'Drinking now would make the good things in my life appear even better'	**0.78**	0.06	0.15
sq4	'It would feel as if the bad things in my life had completely disappeared if I drank now'	**0.76**	− 0.19	− 0.02
sq21	'Drinking would make me feel good'	**0.76**	0.06	0.30
sq10	'Drinking now would make me feel on top of the world'	**0.75**	− 0.19	0.02
sq33	'Drinking now would make things seem just perfect'	**0.65**	− 0.39	− 0.07
sq25	'I want a drink so much I can almost taste it'	0.01	**− 0.92**	− 0.03
sq13	'I would do almost anything to have a drink now'	− 0.00	**− 0.92**	0.02
sq32	'I will have a drink now whatever gets in the way'	0.09	**− 0.90**	− 0.16
sq7	'My desire to drink now seems overwhelming'	0.04	**− 0.88**	0.01
sq15	'I crave a drink now'	0.02	**− 0.88**	0.04
sq6	'I need a drink now'	− 0.05	**− 0.82**	0.20
sq24	'I have an urge to drink now'	− 0.01	**− 0.75**	0.28
sq29	'I am thinking of ways to get alcohol'	0.12	**− 0.75**	− 0.05
sq34	'I am going to drink as soon as I possibly can'	0.09	**− 0.72**	0.09
sq20	'Nothing would be better than drinking now'	0.12	**− 0.71**	0.20
sq3	'I am missing having a drink now'	− 0.06	**− 0.63**	0.33
sq19	'I might like a drink now'	0.10	− 0.18	**0.76**
sq17	'I would consider having a drink now'	0.11	− 0.19	**0.71**
sq23	'If I had the chance to use alcohol now I think I would drink'	0.11	− 0.20	**0.71**
sq26	'Drinking would be pleasant now'	0.20	− 0.17	**0.70**
sq12	'Drinking would be satisfying now'	0.29	− 0.11	**0.65**
% of variance explained		64.0	9.0	6.3
Eigenvalues		17.91	2.51	1.75

Statistics: Kaiser–Meyer–Olkin = 0.96186, Bartlett = 7932.2913, Sig. < 0.001, $n = 221$.

me feel good). This factor, labelled "Negative and positive and reinforcement" was similar to factor 3 of the ACQ. Factor 2 on the DAQ included 11 items, seven reflecting strong desires for alcohol (My desire to drink seems overwhelming), and four reflecting strong intentions to drink alcohol (I will have a drink now whatever gets in my way). This factor, labelled "Strong desires and intentions to use alcohol", was very similar to factor 1 of the ACQ. The third factor of the DAQ contained five items, three indicating mild desires for alcohol ("Drinking would be pleasant now", and two reflecting mild intentions to use alcohol ("I would consider having a drink now"). This factor was labelled "Mild desires and intentions to use alcohol". These three factors explained 79.3% of the overall variance (see Table 2). Cronbach's alpha of 0.97, 0.97 and 0.95 were found for the scales of factors 1, 2 and 3, respectively. Factor 1 (Positive and negative reinforcement) and factor 2 (strong desires and intentions) were highly correlated. Factor 3 (Mild desires and intentions) had a small positive correlation with factor 1 and a small negative correlation with factor 2 (see Table 3).

Table 3. *Factor correlation matrices*

	Factor 1	Factor 2	Factor 3
ACQ			
Factor 1	—		
Factor 2	−0.41	—	
Factor 3	0.71	−0.41	—
DAQ			
Factor 1	—		
Factor 2	0.64	—	
Factor 3	0.48	−0.45	—
Combined ACQ and DAQ			
Factor 1	—		
Factor 2	0.66	—	
Factor 3	−0.39	−0.38	—

Further analyses

Three further analyses were run in order to provide further comparisons between the two questionnaires.

(1) Reliability analysis. In order to check the reliability of the analyses and to ascertain the effect of questionnaire order, the subjects were grouped according to questionnaire position (DAQ first, ACQ second, ACQ first, DAQ second) and the analyses re-run. The two subsamples were compared and did not differ significantly on sex distribution, age, age of first drink or binge status (see below).

The two analyses of the ACQ both provided three factors; the first two in both cases were very similar to those indicated by the analysis of the complete dataset (strong desires and intentions to use alcohol; positive and negative reinforcement). The third factor, however, differed. If the ACQ was administered first, the third factor contained four items reflecting a mild intention to drink (If I had the chance to use alcohol now I think I would drink). This factor was similar to factor 3 of the DAQ, but differed totally from factor 3 of the original ACQ analysis. If the ACQ was administered second, the third factor contained three items, two indicated no intentions to drink (Right now I am not making any plans to drink) and one indicating no desire to drink (Drinking would not make me content). This factor resemble the original factor 3, but contains different items. These factor structures explained 77.3% of the total variance when the ACQ was administered first, and 73.6% of the total variance when then ACQ was administered second. Thus the factors identified by the analysis of the ACQ were not very stable.

The factors produced by the two DAQ analyses proved to be almost identical to those from the initial run irrespective of questionnaire position, indicating that the factors identified by the DAQ analysis were stable. The factors identified in the reliability analyses were: strong desires and intentions to use alcohol, positive and negative reinforcement, and mild desires and intentions to use alcohol. These structures explained 79.1% (DAQ first) and 77.6% (DAQ second) of the total variance.

(2) Combined analysis. As a further check a factor analysis was run on all the items from both questionnaires. From an initial pool of 83 items, 23 were retained, 19 from the DAQ and four from the ACQ. Three factors were again retained with eigenvalues of 13.98, 2.28 and 1.16 (see Table 4).

The first factor contained 12 items indicating strong desires and intentions to use alcohol. The second reflected anticipation of relief from negative states (seven items) and anticipation of positive outcomes from using alcohol (two items). Thus, these two items were equivalent to factors 1 and 2 identified from the analyses of the DAQ and the ACQ separately. The final factor, however, was new, and contained two items reflecting control of alcohol consumption ("I could easily limit how much I would drink if I had a drink now"). These factors explained 73.4% of the overall variance. Factor 1 (Strong desires and intentions to use alcohol) and factor 2 (Positive and negative reinforcement) were again quite highly correlated. Factor 3 (Control-

Table 4. *Factor analysis of combined DAQ and ACQ*

Statement	Factor 1	Factor 2	Factor 3
I need a drink now (d)	**0.99**	−0.05	0.07
I crave a drink now (d)	**0.95**	−0.04	0.09
I want a drink so much I can almost taste it (d)	**0.94**	−0.09	−0.03
My desire to drink now seems overwhelming (d)	**0.94**	0.00	0.09
I would do almost anything to have a drink now (d)	**0.92**	−0.04	−0.04
Nothing would be better than drinking now (a)	**0.86**	0.04	−0.07
I have an urge to drink now (d)	**0.82**	0.09	−0.01
I want to use alcohol right now (a)	**0.77**	0.07	−0.08
I am missing having a drink now (d)	**0.77**	0.10	0.02
I will have a drink now whatever gets in the way (d)	**0.69**	0.05	−0.15
Nothing would be better than drinking now (d)	**0.65**	0.29	−0.00
I will drink as soon as I get the chance (a)	**0.63**	0.04	−0.16
If I drank now the small daily hassles would feel less important (d)	−0.08	**0.93**	−0.02
Drinking now would make me feel less tense (d)	−0.07	**0.93**	0.06
I would feel less worried about my daily problems if I drank now (d)	0.04	**0.89**	−0.01
Drinking now would make the bad things in my life seem less bad (d)	0.06	**0.88**	0.02
Drinking now would make me feel less stressed (d)	0.02	**0.84**	0.03
Drinking now would make the good things in my life even better (d)	−0.02	**0.82**	−0.04
All my tension would completely disappear if I drank now (d)	0.01	**0.80**	−0.12
It would feel as if the bad things in my life had completely disappeared if I drank now (d)	0.16	**0.73**	−0.01
Drinking now would make me feel on top of the world (d)	0.33	**0.65**	0.02
I could easily limit how much alcohol I would drink if I had a drink now (d)	0.06	−0.05	**0.87**
I could easily limit how much alcohol I drank right now (a)	−0.12	0.02	**0.79**
Eigenvalues	13.98	2.28	1.16
% of variance explained	60.8	9.9	5.0

Total % of variance explained 75.8%, Kaiser–Meyer–Olkin = 0.94532, Bartlett = 4597.7887. Sig. < 0.001 $n = 179$.
(d) DAQ item; (a) ACQ item.

lability) had a weak negative correlation with both factors 1 and 2 (see Table 3).

(3) Higher order factor analysis. In order to ascertain whether the factors extracted from the analyses of the two questionnaires were representative of a higher order construct of craving, the factors scores were themselves factored. In both cases, all three factors loaded on a single factor. In the analysis of the ACQ, factor 1 (Strong desires and intentions to use alcohol) and factor 3 (No desire to drink) had high positive loadings (0.90 and 0.91, respectively) and factor 2 (Negative and positive reinforcement) a lower, negative loading (−0.58). This factor had an eigenvalue of 1.99 and explained 66.6% of the variance. The three DAQ factors all had high positive loadings on the single factor (factor 1 = 0.91, factor 2 = 0.92 and factor 3 = 0.90). This factor had an eigenvalue of 2.50 and explained 83.5% of the variance.

Bingers and non-bingers

As "binge" drinking may be related to the development of problem drinking, we also asked which questionnaire distinguished better between binge- and non-binge drinkers, using an index of binge drinking. The binge index was derived by multiplying the variables "largest number of drinks per occasion in the last year" and "frequency with which this or a similar amount has been consumed during the last year". In order to compare "bingers" with "non-bingers" a median split was performed on the data: subjects falling above the split were labelled bingers and those below, non-bingers. The median split was performed for men and women

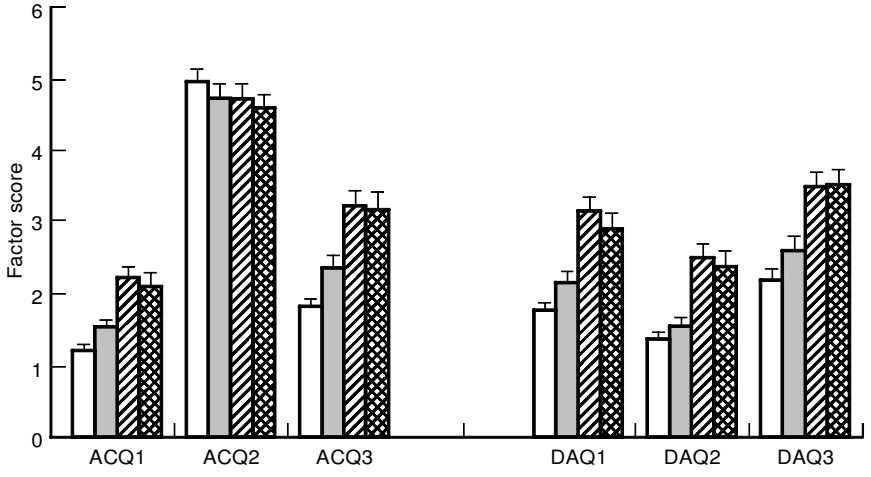

Figure 1. *Values are the mean factor scores for the three factors of the Alcohol Craving Questionnaire (ACQ 1, ACQ2, ACQ3) and the three factors of the Desires for Alcohol Questionnaire (DAQ1, DAQ2, DAQ3) in male and female bingers and non-bingers. Note that there is no effect of binge status on ACQ2 in either sex. For further details, see text.* □, *Female non-bingers;* ▦, *male non-bingers;* ▨, *female bingers;* ▩, *male bingers.*

separately, as men, on average, binged more than women. Median scores were: men, 31; women, 24.5. A two-way analysis of variance (bingers/non-bingers, male/female) was carried out on each factor of each questionnaire (Fig. 1).

On the ACQ, bingers scored more highly than non-bingers on two of the three factors, factor 1 (Strong desires and intentions to drink), and factor 3 (Negative and positive reinforcement) (F (1, 344) = 31.87, $p < 0.001$; F (1, 342) = 38.75, $p < 0.001$, respectively). However, binge status was not significantly associated with factor 2 scores (No desire to drink) (F (1,345) = 0.96, $p < 0.327$). On the DAQ bingers scored more highly than non-bingers on all three factors (F (1,334) = 38.23, $p < 0.001$; F (1,340) = 40.09, $p < 0.001$; F (1,344) = 30.21, $p < 0.001$, for factors 1, 2 and 3, respectively). There were no significant sex differences or sex by binge interactions.

Excessive and moderate drinking levels

The sample was divided into two groups of excessive and moderate drinkers according to the Department of Health recommended sensible drinking levels for men and women. Prior to December 1995 these were set at 14 units per week for women and 21 units per week for men, these levels were increased slightly in December 1995. However, the increase has caused concern among some professionals and for the purpose of this analysis, the original levels were employed. The number of units drunk per week was calculated by multiplying the number of units usually drunk on any one occasion by the usual number of drinking sessions in any one week. The sample was divided into two groups excessive drinkers (women drinking 14 units and under and men drinking 21 units and under) and "moderate" drinkers (women drinking over 14 units and men drinking over 21 units). The results are shown in fig. 2.

On the ACQ, extreme drinkers scored higher than safe drinkers on two of the factors factor 1 (Strong desires and intentions to drink) and factor 3 (Negative and positive reinforcement) (F (1, 344) = 41.10, $p < 0.001$; F (1,344) = 43.75, $p < 0.001$, respectively). However, unsafe drinkers scored lower than safe drinkers on factor 2 (No desire to drink) (F (1,337) = 5.62, $p < 0.05$). On the DAQ unsafe drinkers scored higher than safe drinkers on all three factors (F (1, 325) = 35.71, $p < 0.001$; F (1,330) = 31.09, $p < 0.001$; F (1,335) = 21.58, $p < 0.001$, for factors 1, 2 and 3, respectively). The were no

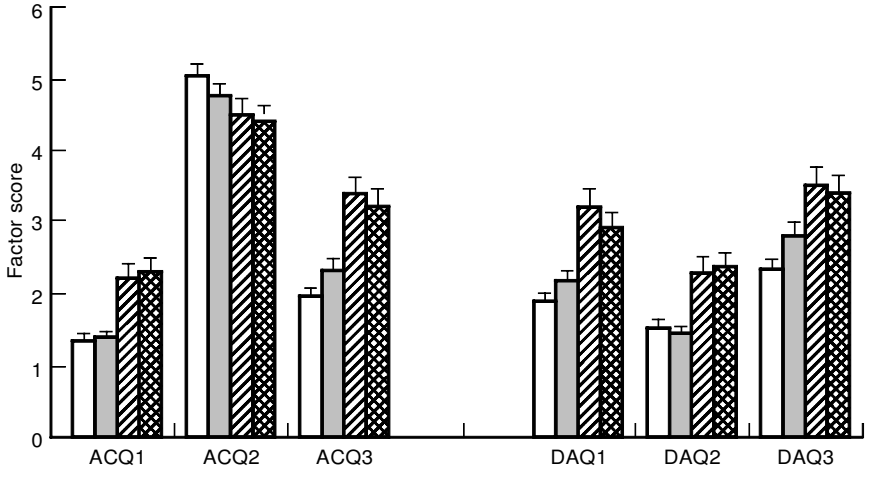

Figure 2. *Values are the mean factor scores for the three factors of the Alcohol Craving Questionnaire (ACQ1, ACQ2, ACQ3) and the three factors of the Desires for Alcohol Questionnaire (DAQ1, DAQ2, DAQ3) in male and female safe and unsafe drinkers. For further details, see text.* □, *Female safe drinkers;* ▦, *male safe drinkers;* ▨, *female unsafe drinkers;* ▩, *male unsafe drinkers.*

significant sex differences or sex by drinking level interactions.

Desires for alcohol questionnaire in alcoholics

The data from the alcoholics study are presented in full in Table 5 which shows factor loadings for all 14 items. Four factors with eigenvalues of 6.39, 2.47, 1.49 and 1.05 were found. Factor 2 (Negative reinforcement) and factor 3 (Control over drinking) were identical to those found in the original study (Clark *et at.*, 1996, see Introduction). Factor 1 (Strong desires and intentions to drink) and factor 4 (Mild desires to drink) were also very similar to the factors found in the original study (Clark *et al.*, 1996, see Introduction) and in experiment 1 of the present study (Strong desires and intentions to drink and Mild desires and intentions to drink). In the present study, however, items relating to mild intentions to drink items loaded alongside items relating to strong desires and intentions to drink items (although one item cross-loads with mild desires to drink at −0.644). This suggests that among alcoholic respondents there may be less of a distinction between intensity of intentions to drink than in recreational drinkers. The Mild desires to drink factor correlated negatively with all the other factors; other factor correlations were very low (see Table 6).

Discussion

Our analysis of the DAQ is broadly supportive of the earlier analysis of the original data (Clark *et al.*, 1996). The present analysis retained three factors: "Positive and negative reinforcement", "Strong desires and intentions" and "Mild desires and intentions". These factors were almost identical to those identified in recreational drinkers in the original study, and the DAQ factor structure was stable in a reliability analysis. The earlier study also indicated a fourth factor, Control over alcohol drinking (see Introduction). This factor did emerge in the combined analysis of all DAQ and ACQ items and was present in the alcoholics study, which used the short (14-item) version of the DAQ. The face validity of the "Control" factor in the context of problematic drinking behaviour supports the retention of the four-factor version of the DAQ for some research purposes.

The group who developed the ACQ (Singleton *et al.*, 1994a,b, 1995) have not yet published the results of their factor analyses. Our own analysis revealed a three-factor structure for the

Table 5. *Factor analysis of the DAQ (oblimin rotation) in alcoholics*

Variable	Factor 1	Factor 2	Factor 3	Factor 4
I want a drink so much I can almost taste it	**0.94**	0.24	0.03	−0.14
My desire to drink now seems overwhelming	**0.90**	0.19	0.03	−0.14
I would do almost anything to have a drink now	**0.90**	0.43	0.13	−0.51
I am going to drink as soon as I possibly can	**0.90**	0.32	0.19	−0.39
I would consider having a drink now	**0.83**	0.16	0.36	−0.32
I would accept a drink now if it was offered to me	**0.73**	0.40	0.34	−0.64
I would feel as if all the bad things in my life had disappeared if I drank now	0.28	**0.89**	0.23	−0.51
Even major problems in my life would not bother me if I drank now	0.24	**0.89**	0.02	−0.32
I would feel less worried about my daily problems if I drank now	0.26	**0.88**	0.05	−0.40
Drinking now would make me feel less tense	0.42	**0.64**	−0.27	−0.61
If I started drinking now I would be able to stop	0.16	0.03	**0.83**	−0.05
I could easily limit how much I would drink if I drank now	0.25	0.43	**0.77**	−0.54
Drinking would be satisfying now	0.33	0.33	0.22	**−0.93**
Drinking would be pleasant now	0.25	0.60	0.01	**−0.88**
% of variance explained	45.7	17.7	10.6	7.5
Eigenvalues	6.39	2.47	1.49	1.05

Statistics: Kaiser–Meyer–Olkin = 0.62056, Bartlett = 652.3749, Sig. < 0.001, $n = 126$.

Table 6. *Factor correlation matrix—alcoholics*

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	—			
Factor 2	0.28	—		
Factor 3	0.14	0.04	—	
Factor 4	−0.31	−0.46	−0.15	—

ACQ. Two of the factors, which we labelled "Strong desires and intentions" and "Negative and positive reinforcement", appear almost identical to the same-labelled factors in the DAQ. However, a different third factor was obtained, "No desire to drink". This factor appeared to be unstable. The fact that all of the items loading on this factor in the main analysis are "reverse-keyed", and so more difficult to answer, together with its instability, suggests that this factor may be a statistical artefact.

In addition to its greater stability, the factor structure indicated by the DAQ appears superior to that of the ACQ in a number of other respects: (1) it accounted for a slight higher proportion of the variance (79.2 vs. 71.5%); (2) the factor inter-correlations were somewhat lower; (3) in a combined analysis of all DAQ and ACQ items, most of the items retained (19/23) were from the DAQ; and (4) in a higher order factor analysis the higher order factor identified from the DAQ explained a higher proportion of the variance than the factor identified from the ACQ (83.5% vs. 66.6%). (5) The DAQ also discriminated better between excessive and moderate drinkers and binge- and non-binge drinkers.

The factor structure derived for the DAQ has three interesting implications. First, the analysis produces a single "reinforcement" factor, which includes items representing both positive and negative expectations. This tends to argue against accounts of alcohol craving expressed exclusively in terms of one or other of these processes, and to support the involvement of both (Baker *et al.*, 1987). Secondly, the "Strong desires and intentions" factor, which represents urges to drink rather than expected effects of drinking, includes no reinforcement items of any kind. This provides support for theoretical positions which argue that urges to engage in drug taking are distinct from reinforcement processes (Tiffany, 1990, 1992; Robinson & Berridge, 1993). Thirdly, the presence of a higher order factor suggests that these factors are a represen-

tation of a single higher order construct of "craving".

In alcoholics a clear four-factor structure was obtained for the short (14-item) version of the DAQ. However, one important difference between the alcoholics' data and data from recreational drinkers in both the present study and the earlier study (Clark *et al.*, 1996) was that in alcoholics, the factor "Mild desires and intentions" appears as "Mild desires" only, with mild intentions separating out from this factor and loading alongside strong desires and intentions. The "Mild Desires" factor correlated negatively with all other factors. This minor shift in the factor structure may reflect the treatment received by the alcoholics, who were recruited either from a Twelve-Step treatment programme or from Alcoholics Anonymous groups: in the alcoholics, mild desires appear to be well controlled and are not associated with intentions to drink.

A recent study found evidence for a single alcohol-craving factor in a sample of 350 alcoholics (Bohn *et al.*, 1995). In this study a questionnaire was developed along very similar lines to the ACQ and the DAQ, and containing very similar items. Principal components analysis revealed a single major factor, which appears almost identical to the "Strong desires and intentions" factor identified by the ACQ and the DAQ. However, the principal components analysis identified a number of further factors with eigenvalues greater than unity, some of which presumably correspond to some of the other factors identified in the present study but were not reported. Items loading on the major factor were used to construct an eight-item scale, the Alcohol Urges Questionnaire (AUQ), which represents a homogeneous, single-factor measure of strong urges to drink alcohol, and contains no items related to expected effects of drinking (Bohn *et al.*, 1995). The DAQ (and ACQ), in contrast, provide separate scales for urges to drink (Strong desires and intentions) and expected effects (Negative and positive reinforcement), as well as Control over drinking. In view of the importance of anticipated outcomes in almost all theoretical accounts of alcohol craving, it may be preferable for research purposes to use an instrument, such as the DAQ, which provides measures of anticipated outcomes from drinking, in addition to the pure measure of urges to drink provided by all three instruments.

Acknowledgements

This study was funded by the Welsh Office. The authors would also like to thank Drs Ed Singleton and David Clark for providing and allowing us to use the ACQ and DAQ, respectively.

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