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RESEARCH REPORT

Development of the Leeds Dependence Questionnaire (LDQ): a questionnaire to measure alcohol and opiate dependence in the context of a treatment evaluation package

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Abstract

The Leeds Dependence Questionnaire (LDQ) has been developed as part of a treatment evaluation package. The LDQ is a 10-item, self completion questionnaire designed to measure dependence upon a variety of substances; it has been shown to be understood by users of alcohol and opiates. The questionnaire was designed to be sensitive to change over time and to be sensitive through the range from mild to severe dependence; the follow-up data are insufficient to demonstrate change over time, but are encouraging. It is expected that both clinicians and researchers will find it useful to have a single measure relating to substance use, but not limited by specific substances. All items are scored 0–1–2–3; there are no normative data. The procedure for establishing content validity is described and estimates of concurrent, discriminant and convergent validities are reported; these validities are thought to be satisfactory. A principal components analysis produced a single factor accounting for 64% of the variance. Cronbach's alpha was 0.94. Test–retest reliability was found to be 0.95.

Introduction

The original description of alcohol dependence (Edwards *et al.*, 1977) and then drug dependence (Edwards, Arif & Hodgson, 1982) seemed to mark an important new contribution to the understanding of addictive behaviour. However, the field is still divided between those who believe dependence to be of little or no importance even if it exists, those who believe in a psychobiological dependence syndrome, and those who have adopted a purely psychological formulation of dependence.

Heather & Robertson (1989) have consistently argued against taking the dependence *syndrome*, as opposed to the *concept* of dependence, into the prevailing orthodoxy; however, notwithstanding unanswered critique, the dependence syndrome, the psychobiological concept, in more or less its original form, appears in ICD-10. A key element of the argument against this syndrome is that tolerance and withdrawal phenomena, though not essential to the 'diagnosis', in practice dominate the syndrome; the consequence is that the syndrome is tantamount to a disease model and fails to take forward a theoretical basis or liberate thinking on treatment approaches. Tabakoff (1990) has alluded to the preoccupation of researchers with withdrawal symptoms, perhaps because they are measurable and observable, to the detriment of appreciating the continued importance of the drug effect through all degrees of dependence and neuroadaptive change. It seems

likely that withdrawal problems will be more prevalent among clinic attenders than others and this may also distort clinicians' perceptions of the importance of withdrawal. The criticism of including tolerance and withdrawal as a component of dependence itself is that these pathophysiological events constitute a separate phenomenon. Tolerance and withdrawal will occur with repeated administration of particular drugs; these are capable of conditioning drug seeking behaviour but they do not necessarily do so. Equally they are not essential to the conditioning of drug-seeking behaviour. It is the authors' view that a more adequate explanation of dependence, the psychological concept, rests with the subjects' cognitive and behavioural responses to a whole variety of conditioned cues, be these physiological, pharmacological, social or psychological.

In this paper dependence is viewed as a purely psychological phenomenon, explained by learning theory and departing from the psychobiological view in that tolerance and the resulting withdrawal symptoms are relegated to the realm of *consequences* of regular, excessive use, albeit that they have powerful reinforcement characteristics and themselves cue the dependent behaviour (Tober, 1992).

The LDQ measures the same phenomena as defined in ICD-10, which is itself very similar to DSM-III-R. Rather than taking substance specific withdrawal symptoms and tolerance *per se* as markers of dependence, the items *maximizing effect, primacy of effect* and *constant state* are used to tap these phenomena. Importantly, these items also tap the related loss of psychoactive drug effect, which is not well covered in the other formulations. By choosing items that are responses to tolerance and withdrawal the LDQ becomes more generally applicable and automatically excludes subjects, such as surgical patients given opiates for pain relief, who are neuroadapted, but showing no desire to continue opiate use. ICD-10 specifically requires exclusion of such subjects from the dependence coding.

The broad view of dependence, embracing such objects of dependence as activities and people favoured by Marks (1990), is essentially a restatement of learning theory and has little utility (Bradley, 1990). The authors have taken *substance dependence* as a clinically useful concept. Dependence upon alcohol, heroin, cocaine or any other psychoactive substance is seen to be the same phenomenon (Kosten *et al.*, 1987) where dependence may transfer from one substance to another. What then distinguishes these from non-substance dependencies, such as gambling, exercise or even treatment (Bell, 1992) dependence?

The pharmacological properties of psychoactive substances produce sources of reinforcement which may be positive, such as 'topping up' the loss of drug effect, or negative such as an anxiolytic effect or the relief or avoidance of withdrawal symptoms. Substance dependence predicts that a psychoactive substance profiled as having a high potency, rapid CNS availability, short half-life and a withdrawal syndrome will have a high dependence-forming potential. The word 'potential' is used here because dependence is not simply the product of pharmacological reinforcement, but rather the individual cognitive and behavioural responses to pharmacological events in terms of behaviours and cognitions which are conditioned by them. Eiser (1989) has described this with reference to relapse.

So, substance dependence acknowledges the central role of pharmacology, and in particular the capacity of drugs to modify the physiological substrate upon which they act, thereby separating it from an all-embracing concept of dependence, but placing the understanding within a purely psychological framework, thereby separating it from the psychobiological concept, the dependence syndrome.

Without dependence the use of alcohol or other drugs is determined largely by cultural factors. The progression, or not, of dependence on a substance will involve a complex interaction of individual, environmental and pharmacological variables: where there is social or psychological morbidity then an individual is more vulnerable to the reinforcement of the substance effect. Increasing levels of dependence reflect substance use which is increasingly driven by the pharmacological state and a loosening of control by cultural or internal factors. Raistrick (1988) has suggested that the specific task of specialist services is the treatment of dependence and from this premise the Leeds Dependence Questionnaire (LDQ) has been developed to make up one element of a treatment evaluation package. This paper describes the procedure used for determining the content validity of the questionnaire and

some estimates of concurrent discriminant and convergent validation as defined by Davidson (1989). Not all design features can be demonstrated as successful at this time, and further evaluation work will be required to test its applicability to drugs other than alcohol or opiates and its use in different cultural settings.

Method

The authors prepared an initial bank of questions based upon the psychological formulation of dependence but modified and added to by in-depth, tape-recorded interviews with patients who were asked for their descriptions of dependence phenomena prompted by the interviewer. The questions were then refined through a series of 8 pilot stages involving between 5 and 50 subjects each. A 10-item questionnaire now called LDQ emerged; this instrument included one item for each of 10 markers of dependence (see Appendix I). Each item is scored 0–1–2–3 giving a maximum score of 30. The LDQ was then subjected to some tests of validity. Briefly, the operational definitions given to the 10 markers of substance dependence are as follows.

Pre-occupation. The primacy of thoughts about the substance: how, where, when to procure and use it. There is a sense of the thoughts being intrusive and sometimes resisted.

Salience. The primacy of activities involved in the procurement and use of the substance over other routine and/or once important activities. Substance use continues despite recurrent, related psychological, social and physical problems.

Compulsion to start. The perceived inability to refrain from use of a substance in the face of conditioned cues. A persistent desire or failure to cut down on substance use.

Planning. The way in which the user's day is organized around procurement and use of the substance. This is often in anticipation of a need to 'top up' at particular times of the day.

Maximise effect. The use of a substance in a particular way which maximizes the desired effect. This may be in response to tolerance of the drug effect or the desire for a rapid onset of effect.

Narrowing of repertoire. Taking the same substance at the same intervals, and in the same way. This happens irrespective of the social constraints on substance use.

Compulsion to continue. The perceived need to continue using the substance in order to enhance or prolong the state achieved by the initial use. There is a sense of being unable to stop.

Primacy of effect. Achieving any pharmacological effect takes precedence over the use of the preferred substance or circumstance of use. This is an extreme version of the desire for a psychoactive effect irrespective of what the effect might be. This may be a consequence of falling blood levels of the substance or assoicated withdrawal symptoms.

Constancy of state. The maintenance of a drug-induced state, which may be intended to maintain a state of intoxication, or the avoidance of withdrawal or the avoidance of a drug-free state. Tolerant users have more difficulty maintaining a constant state because blood levels fall most rapidly from initial high levels.

Cognitive set. The belief in the need to use the drug in order to cope with everyday life. Use of a substance or loss of substances has become central to a person's existence.

Alcohol users were recruited from three sources to tap different patterns of use and assumed dependence:

(i) consecutive referrals to the Leeds Addiction Unit, $n = 47$;
(ii) college students who had taken a drink in the previous week recruited by a 'snowballing' technique, $n = 64$;
(iii) random selection of attenders at a GP practice who had taken a drink in the previous week, $n = 14$.

Opiate users were consecutive attenders in two periods at the Leeds Addiction Unit, $n = 49$.

All subjects completed the LDQ and were interviewed with the purpose of eliciting a detailed substance use history using a time-line technique (Sobell *et al.*, 1988). The procedure took between 30 and 90 minutes. Alcohol intake

was measured in grams, calculated for the previous using week. Opiate intake was measured in milligrams of methadone equivalents (Department of Health, 1991); 1 g of street heroin was taken as equivalent to 80 mg of methadone and reduced by one-third if smoked, calculated for the previous using week. The relationship between dependence and intake is of particular interest in considering the use of dependence alone as an outcome measure. Alcohol users completed the SADQ (Stockwell *et al.*, 1979) which is a validated measure of dependence based upon the original description of the Alcohol Dependence Syndrome, and similarly opiate users completed the SODQ (Sutherland *et al.*, 1986) which has a more diverse set of questions, validated as measuring the Opiate Dependence Syndrome. The SADQ and SODQ were, therefore, chosen as measures of concurrent validity.

The association between dependence on a substance and harmful consequences is recognized (e.g. Caetano, 1993), and equally the association between 'neurosis' and substance use is established (e.g. Darke *et al.*, 1992). The relationship of social problems and psychopathology to dependence can, therefore, be used as a measure of convergent validity. All subjects completed a Social Functioning Questionnaire (SFQ) (Corney & Clare, 1985). a 33-item instrument tapping satisfaction with housing, work, finances, relationships, domestic situations and legal matters, and the General Health Questionnaire (GHQ) (Goldberg, 1972) using the 28-item version to assess psychological morbidity. Both instruments are applicable across a wide range of socio-economic groups.

Experienced clinicians (DR, GT and JW) made clinical assessments using the Drug Taking Evaluation Scale (DTES) (Holsten, 1980) on a sub-group of Addiction Unit attenders; this instrument has four sub-scales assessing substance misuse/dependence, social functioning, interpersonal functioning and psychological functioning. An attempt was made to follow up all Addiction Unit attenders at 3 months in order to test the sensitivity of the LDQ to change over time; the intake interview and questionnaires were repeated. A principal component analysis was carried out on the 10 items making up the LDQ in order to assess internal consistency. Test and retest reliability was assessed on a separate sample of subjects.

Results

Sample characteristics

The characteristics of the four samples are presented in Table 1, making a total sample $n = 174$. The age and sex distribution are as might be expected for the samples chosen; however, the LAU alcohol group is younger than in some studies of clinic attenders with 66% under 30 years, matching the 66% of opiate users under 30 years. The clinic attenders have similar high scores on psychological morbidity (GHQ) and social problems (SFQ) compared to the two non-clinic groups. For the purposes of validation it was not thought necessary to characterize the groups further, for example in terms of polysubstance use or duration of use. The distribution of LDQ scores for opiate and alcohol users are presented in Fig. 1.

Content validity

Particular care was taken to build up the content validity through the eight pilot versions; visual inspection of the instrument can further confirm this (see Appendix I). Subjects reported finding the items emotionally neutral; this was checked in the early pilot work by the interviewer who had the task of asking about both the understanding of words and phrases and also picking up any emotional response. In spite of the rigorous pilot work three alcohol subjects from the Addiction Unit sample had difficulty in understanding questions 5 and 8; re-wording is not considered necessary at this stage, but it may be prudent to monitor the performance of these items.

Concurrent validity

Concurrent validity was assessed by comparing LDQ scores with other instruments, the SODQ and SADQ, purporting to measure the same construct. This procedure is useful only in so far as the criterion variables are considered meaningful: both SODQ and SADQ measure a psychobiological variant of dependence and are not, therefore, strictly measuring the same construct as the LDQ, but are considered sufficiently close to be useful. Spearman correlation coefficients are presented in Table 2; as might be expected, correlations are higher at follow-up than initial contact.

A second estimate of concurrent validity for

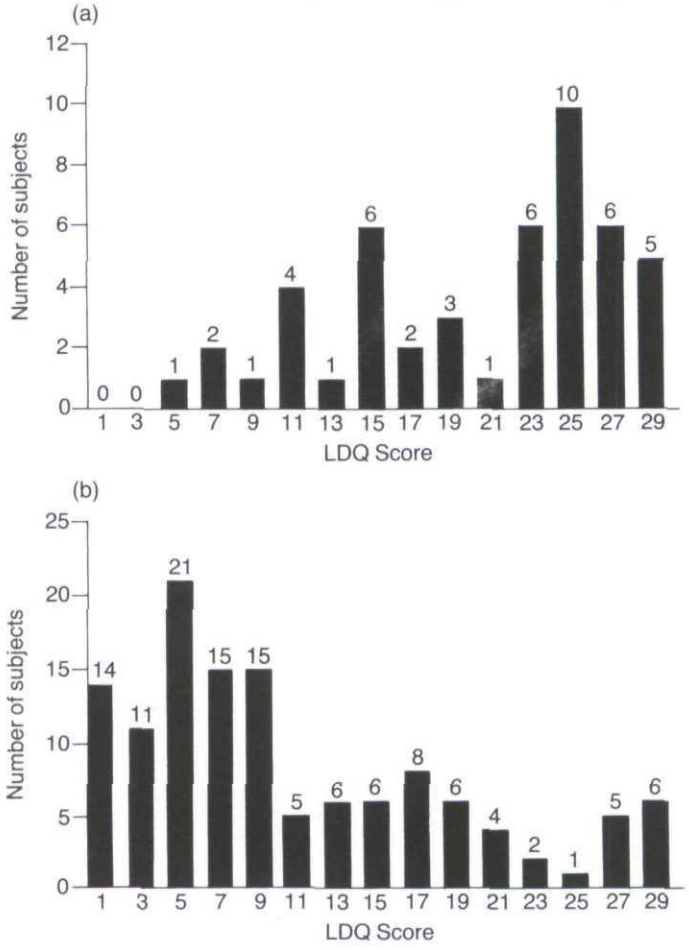

Figure 1. *(a) LDQ Score total for opiates. (b) LDQ score total for alcohol*

the alcohol users was the comparison of three sub-groups (LAU attenders, students, GP attenders) whose characteristics are defined in Table 1. The mean dependence scores are all significantly different reducing from LAU attenders (LDQ mean = 16.3) to students (LDQ mean = 7.0) and GP attenders (LDQ mean = 3.1); there are corresponding falls in the scores of other criterion measures, notably intake.

Discriminant validity

Gender, age and for opiates, method of use (IV, smoked or oral) were used to assess discriminant validity using a chi square test. For opiates: gender chi-square = 2.0, df 2, NS; age chi-square = 14.6, df 12, NS; method of use chi-square = 5.9, df 4, NS. For alcohol: gender chi-square = 2.2, df 2, NS; age chi-square = 18.0, df 18, NS. These results support the independence of the LDQ scores from these criterion variables.

Convergent validity

Significant, but low to middle order, correlations were expected for the LDQ against criterion variables GHQ and SFQ, with higher order correlations for intake. The results are presented in Table 2. Generally higher order correlations than expected were found for the GHQ, the SFQ

Table 1. *Characteristics of the sample by means for age and criterion measures and gender frequency*

	Opiates LAU sample $n = 49$	Alcohol LAU sample $n = 47$	Alcohol Student sample $n = 64$	Alcohol GP sample $n = 14$
Age ± SD	28.3 ± 7.07	38.6 ± 12.7	22.8 ± 3.4	26.9 ± 8.1
Gender—% male	77%	61%	56%	43%
LDQ ± SD	20.1 ± 6.8	16.3 ± 8.9	7.0 ± 4.4***	3.1 ± 3.2***
SODQ ± SD	59 ± 14	N/A	N/A	N/A
SADQ ± SD	N/A	29 ± 16.7	5.9 ± 6.1***	2.6 ± 4.5***
GHQ ± SD	43 ± 19	40 ± 18	27 ± 11**	20 ± 10*
SFQ ± SD	7.0 ± 5.3	7.1 ± 4.9	3.5 ± 3.6*	1.4 ± 1.9***
Intake (mg methadone)	435 ± 349	N/A	N/A	N/A
Intake (g alcohol)	N/A	983 ± 1007	251 ± 189***	111 ± 90***

t-test = *** $p < 0.001$, ** $p < 0.01$ * $p < 0.05$, paired against mean in column to left for alcohol samples only.

performed in a rather unpredictable manner, and intake correlations were as expected for alcohol but failed to reach significance for opiates, except at follow-up.

The clinical ratings of the DTES were expected to give high order correlations against the substance use sub-scale and total score and achieved this for a sub-group of alcohol users ($n = 20$), correlation coefficients $r = 0.61$ and 0.60, respectively, both $p < 0.01$, but failed to reach significance for opiates.

Internal consistency and retest reliability

A principle components analysis produced a single factor solution account for 64.2% of the variance ($n = 207$: main sample $n = 174$ and retest sample $n = 33$). The loadings for each item on factor 1 are presented in Table 3; questions 5 and 8, possible problem items identified in content validity, had the lowest loadings at 0.72 and 0.74, respectively.

Cronbach's alpha coefficient of reliability was computed at 0.94. Corrected item total correlations, a measure of the correlation between each question score and the sum of the remaining scores was lowest for questions 5 and 8, but still reaching 0.66 and 0.69, respectively.

Test-retest reliability was estimated on a sample of subjects ($n = 33$) with a mixed range of dependence levels, mean 17.9 SD ± 9.4; 26 were male, seven female and 13 were opiate users, 20 were alcohol users. Retesting was carried out over an interval of 2–5 days. Total score retest reliability was 0.95 and individual question retest reliability was Q1, 0.82; Q2, 0.88; Q3, 0.76; Q4, 0.75; Q5, 0.82, Q6, 0.90; Q7, 0.71; Q8, 0.82; Q9, 0.74 and Q10, 0.80.

Discussion

This paper has presented evidence for the validity and reliability of the LDQ as a measure of substance dependence for opiate and alcohol users. The evidence is particularly strong for alcohol users where all measures of validity, with the possible exception of the SFQ, are favourable. This may in part be a function of having, as measures of concurrent validity, three subgroups within the alcohol user sample, and the SADQ being a close relative of the LDQ. The construct measured by the SODQ is much less clear and this may account for weaker associations. Equally the DTES, which was chosen as a clinical rating scale for practical reasons, was not in retrospect an ideal instrument for the task in hand, and it seems likely that there were inter-rater reliability problems with this scale. Although all the discriminant validity measures are favourable for both opiate and alcohol users, the authors believe there is an argument for dependence and age covarying, particularly for less addictive drugs such as alcohol. The use of problem scores as a measure of outcome has difficulties; Farid, Sherbini & Raistrick (1986) have noted that perceptions of problems change as treatment progresses, in that a reduction in consumption and dependence scores may be accompanied by an increase in the recognition of problems in other life areas.

Part of the rationale for designing the LDQ was to circumvent the need to estimate intake for

Table 2. *Spearman correlation coefficients for LDQ and criterion variables in total samples at first contact (T1) and follow-up samples at first contact (T1) and 3-month follow-up (T2)*

	Opiates			Alcohol		
	Total sample $n = 48$	Follow-up sample $n = 20$		Total sample $n = 125$	Follow-up sample $n = 25$	
	T1	T1	T2	T1	T1	T2
SODQ	0.30*	0.11	0.73***	—	—	—
SADQ	—	—	—	0.69***	0.73***	0.80***
GHQ	0.33*	0.44*	0.56**	0.51***	0.38	0.70***
SFQ	0.27*	0.55**	0.77***	0.42***	0.12	0.24
Intake	0.12	0.00	0.47*	0.68***	0.54**	0.72***

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

Table 3. *Principal components analysis*

Factor	Eigenvalue	% of variance	Item	Factor 1
			Question 1	0.78
1	5.83	58.3	Question 2	0.82
2	0.82	8.2	Question 3	0.76
3	0.63	6.3	Question 4	0.84
4	0.57	5.7	Question 5	0.67
5	0.49	4.9	Question 6	0.77
6	0.41	4.1	Question 7	0.75
7	0.38	3.8	Question 8	0.68
8	0.34	3.4	Question 9	0.78
9	0.31	3.1	Question 10	0.77
10	0.23	2.3		
Total		100%		

Factor 1 accounts for 58.3% of the variance.

the purpose of evaluating outcome; the difficulties of measuring alcohol intake have been commented on by Room (1990). In spite of these difficulties alcohol intake covaries closely with LDQ scores in this study, and it is thought that this reflects the possibility of eliciting reasonably accurate information on alcohol intake when sufficient time and good technique are applied to the history taking. It is not too surprising that opiate intake estimates did not covary with dependence. Even in a research setting it is almost impossible to obtain an accurate measure of opiate intake; there are problems of purity and nature of 'street' drugs, problems accounting for multiple and varied methods of use and problems finding equivalents between opiates with different potencies and pharmacokinetics. Darke *et al.* (1991) have commented on the difficulties of measuring opiate intake with reference to heroin users and suggested frequency of use as a useful indicator of change; it would have been interesting to develop the idea of frequency of use for inclusion in this study. Most opiate users smoked or injected 'street' heroin at the time of contact but were taking prescribed methadone at follow-up; setting intake equivalents between these two circumstances is problematic. Equally, at contact most opiate and some alcohol users were taking a variety of other drugs and, in some cases, shifted to different supplementary drugs at follow-up; the authors are not aware of any accepted method to take account of this. In summary, the LDQ may be taken to correlate well with alcohol intake, and therefore be useful for outcome evaluation, but such an association has yet to be proved for opiates.

It is hoped that other researchers will build up the validity of the LDQ as a measure of substance dependence and also its use as a surrogate estimate of intake. Further work also needs to be done on establishing the validity of the LDQ in different cultures and with different substances. The authors intend to include the LDQ in a treatment outcome package having the advantage that the single variable dependence can measure change across use of a range of substances. The follow-up measures (T2 scores) presented in Table 2 are encouraging in that the correlations are a high order even though intake measures moved in both upward and downward directions; the numbers are small, however, and these data are included as much as a stimulus to investigate this further as any claim to sensitivity to change of the LDQ. The generally higher correlations at follow-up may be accounted for by greater stability within individuals and less 'noise' in their responses to all of the questionnaires used. We are not aware of any of the validation instruments being themselves validated at a follow-up period and further work in this area is necessary. Opiate intake is an example of the problems of collecting good quality first contact data; in this study there was essentially no correlation between LDQ and intake at T1 when 'street' heroin was the opiate used, but a significant correlation at T2 when methadone was usually prescribed and therefore intake known accurately.

At this stage it would be premature to attach meaning to particular scores; indeed, users of the scale are encouraged to see dependence as a continuum rather than attempting to define cut-

off points for low, moderate and severe dependence. In outcome evaluation it will be change in dependence score as well as score at assessment that will be important. A crude comparison with the SADQ suggests that an LDQ score of 20 or more would approximate to SADQ 'severe dependence': there is no equivalent meaning available for SODQ scores. The predictive value of dependence ratings continues to be investigated within the field.

As indicated in the Method section, considerable resource was given over a period of 1 year to establishing content validity. This effort seems to be vindicated by the factor analysis which suggests that the LDQ has a strong internal consistency with a single factor, which in turn supports the homogeneity of substance dependence. These data are an improvement on the findings of Davidson *et al.* (1989) for an alcohol dependence scale (SADD).

In conclusion, the LDQ is presented as a brief, user-acceptable, self-completion instrument for use in clinical and research settings. Evidence has been presented in this paper of its validity in measuring alcohol and opiate dependence. There needs to be further validity testing particularly with other drug groups and the relationship to intake and in other cultures. The authors believe that sufficient evidence has been presented to offer the LDQ as an alternative to the SADQ or SADD; the relationship to the SODQ is less strong, but equally the SODQ is a weaker measure of dependence. The potential use of the LDQ in evaluating treatment outcome is seen as particularly important.

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APPENDIX I

Leeds Dependence Questionnaire—LDQ

In answering this questionnaire:

☐ think about the last week
☐ think about your main substance or substance groups, please specify.....
☐ tick the answer that's most appropriate to you

	Never	Sometimes	Often	Nearly always
Pre-occupation				
1. Do you find yourself thinking about when you will next be able to have another drink or take drugs?				
Salience of substance use				
2. Is drinking or taking drugs more important than anything else you might do during the day?				
Compulsion to start				
3. Do you feel your need for drink or drugs is too strong to control?				
Planning around substance use				
4. Do you plan your days around getting and taking drink or drugs?				
Maximize effect				
5. Do you drink or take drugs in a particular way in order to increase the effect it gives you?				
Narrowing of using repertoire				
6. Do you take drink or drugs morning, afternoon and evening?				
Compulsion to continue				
7. Do you feel you have to carry on drinking or taking drugs once you have started?				
Primacy of effect				
8. Is it getting the effect you want more important than the particular drink or drug you use?				
Constant state				
9. Do you want to take more drink or drugs when the effect starts to wear off?				
Cognitive set				
10. Do you find it difficult to cope with life without drink or drugs?				