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ORIGINAL INVESTIGATION

Is the ten-item Questionnaire of Smoking Urges (QSU-brief) more sensitive to abstinence than shorter craving measures?

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Abstract
Objective The Questionnaire on Smoking Urges is now very widely used as a measure of craving but is considerably longer than alternatives in current use. Longer scales carry a significant cost in studies and clinical practice. This study compared the ten-item Questionnaire on Smoking Urges (QSU-brief) with six shorter measures of craving in terms of sensitivity to abstinence and reliability.
Methods Sixty smokers were randomly assigned to continue smoking (N=30) or abstain completely for 24 h (n=30), by which time the craving would be expected to have increased. Craving was measured at baseline and after 24 h. The craving measures tested were the QSU-brief, the Minnesota Nicotine Withdrawal Scale (MNWS), the Mood and Physical Symptoms Scale (MPSS), the Shiffman Scale (SS), the Wisconsin Smoking Withdrawal Scale and the Cigarette Withdrawal Scale and a simple rating of 'craving' (CR).
Results All measures showed significant increases in scores following smoking abstinence. The two-item MPSS measure was similar to the QSU-brief (eta-squared 0.41 versus 0.45, respectively), and the CR was only slightly lower (eta-squared 0.37). The MNWS showed the least sensitivity (eta-squared 0.22). Stability while still smoking was good with the exception of the SS which showed a significant reduction on retest.
Conclusions The ten-item QSU-brief is not more sensitive to abstinence or reliable than the two-item MPSS or a single rating of craving.

Keywords Smoking · Craving · Measurement · Withdrawal · Addiction

Measurement of 'craving' for cigarettes is important for a number of reasons. One is that such measures can be used as a proxy for abstinence in preliminary testing of interventions to aid smoking cessation. Another is to support claims that particular smoking cessation medications or interventions reduce urge or desire to smoke. A third is for clinical monitoring to guide ongoing treatment. A fourth reason is to help understand why some interventions may be more effective in aiding abstinence than others. These are all based on the premise that craving is important in the relapse process (West and Schneider 1987). The 32-item Questionnaire on Smoking Urges and its ten-item form the QSU-brief (QSU) have become widely used in the measurement of craving (Cox et al. 2001; Tiffany and Drobes 1991), but to our knowledge, no study has compared the QSU with simpler measures involving fewer items in terms of validity and reliability. This paper reports the first such comparison, using sensitivity to abstinence as an index of validity and change in mean scores and correlation between scores on separate occasions as indices of reliability.

Brevity of an assessment tool, particularly one that may be used repeatedly or in large numbers of smokers or when

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translation into different languages is required, is important for economy and efficiency. The QSU was developed on theoretical grounds based on a particular view of craving, but the value of using these scales relative to other shorter measures has not been adequately tested. Prior to the QSU, there were a number of craving measures involving as few as one or two ratings (Hughes and Hatsukami 1986; West and Russell 1985). Since then, other relatively brief measures have been proposed (Etter 2005; Shiffman et al. 2000; Welsch et al. 1999).

There is a presumption in psychometrics that multiple-item measures are likely to be more reliable and valid than ones based on single items because of the opportunity they give to balance out noise from interpretation of specific items (Oppenheim 2001). However, this assumption is rarely tested, and one study of anxiety resulting from smoking cessation found that a single rating gave the same results as the 20-item State Trait Anxiety Inventory (West and Hajek 1997). In fact, studies using measures based on one or a few craving items have shown sensitivity to abstinence (Taylor et al. 2007; West et al. 1999) and to interventions such as nicotine replacement therapy that would be expected to reduce craving (Hughes et al. 1984; West et al. 1984). In some cases, they have also been shown to predict relapse (Killen and Fortmann 1997; Swan et al. 1996; West et al. 1989). Moreover, it has been shown that measures of cigarette withdrawal symptoms, such as restlessness or depression, based on a single rating are as valid as measures requiring multiple items (West et al. 2006).

We are aware of only one other comparison of craving measures (Etter and Hughes 2006). That study included only three measures (the Cigarette Withdrawal Scale (CWS), The Wisconsin Withdrawal Scale, the Minnesota Nicotine Withdrawal Scale (MNWS)) and concluded that there was little to choose between the scales in terms of predictive or construct validity. However, the methodology was limited in that the abstinence period varied, abstinence was not validated and cravings were reported retrospectively. Moreover, that study did not include the QSU. The present study compared the QSU with several widely used brief measures of craving in terms of sensitivity to abstinence, re-test reliability and stability of scores while continuing to smoke.

Materials and methods

Sample

Smokers were recruited through posters in stores and workplaces. Volunteers were screened via telephone. Those eligible were aged 18–65 years, not receiving psychiatric treatment or pregnant and smoking at least ten cigarettes a day for three or more years. Participants were not required to be motivated to stop smoking. Those completing the study were paid £25 for their time and travel. Participants provided written consent and the local ethics committee gave its approval.

Design and procedure

A between-groups design was used with the outcome variables being different measures of craving and the independent variable being whether or not the smokers abstained. At the first visit, each of the 60 participants attended the laboratory individually, completed baseline assessments (including craving) and were individually randomly assigned to one of two conditions, either (a) complete abstinence from smoking for 24 h from the visit (n=30) or (b) to continue smoking as usual (n=30). Randomisation was by computer random number generation. The second visit took place 24 h after the first visit, and previous work has shown that this period of smoking abstinence is sufficient to induce significant craving for cigarettes (Taylor et al. 2007) while maximising the chances of participants remaining abstinent. At this time, abstinence was confirmed using expired carbon monoxide (CO) by means of a Bedfont's Smokerlyzer (<8 ppm), and the measures of craving were repeated as at the baseline visit. At both visits, the order of presentation of the craving measures was counterbalanced.

Measures

Demographics and smoking characteristics, including Fagerstrom Test for Nicotine Dependence (FTND; Heatherton et al. 1991), were recorded at the baseline assessment (see Table 1). At this time, participants also completed the QSU (Tiffany and Drobes 1991), plus six brief measures of cravings taken from the Mood and Physical Symptoms Scale (MPSS; West and Hajek 2004), MNWS (Hughes and Hatsukami 1986), Shiffman Scale (SS; Shiffman et al. 2000), Wisconsin Smoking Withdrawal Scale (WSWS; Welsch et al. 1999), CWS (Etter 2005) and a simple rating of craving. All the measures used are given in the "Appendix". Other multi-item craving measures were not included (Heishman et al. 2003) to avoid overloading the participants with questionnaires.

The brief QSU uses ten 'agree–disagree' Likert items, five covering need to smoke for relief and five covering positive desire to smoke for reward. The total QSU score and the scores of its two subscales were examined separately. The MPSS averages two six-point ratings: 'time spent with urges to smoke' and 'strength of urges to smoke'. The MNWS uses a single five-point rating of

Table 1 Characteristics of the sample

Variable	Abstinent group (*N*=30)		Continuing smoking group (*N*=30)	
	Mean (SD)	Percent (*N*)	Mean (SD)	Percent (*N*)
Age (years)	29.5 (11.2)		29.0 (9.2)	
Cigarettes per day	15.6 (5.2)		15.0 (5.1)	
FTND score (0–10)	3.8 (2.6)		3.2 (2.4)	
Baseline expired air CO (ppm)	14.5 (7.9)		11.8 (5.3)	
Females		36.8 (14)		63.4 (22)
Tried to quit in last 5 years		73.3 (22)		63.3 (19)
Non-manual occupation		43.3 (13)		50.0 (15)
University degree		26.7 (8)		33.3 (10)

CO carbon monoxide

'Desire or craving to smoke'. The SS uses four ten-point ratings of 'Urge to smoke', 'Need to smoke', 'Crave a cigarette' and 'Need a cigarette', which are averaged. The WSWS involves averaging ratings of extent of agreement with the following statements: 'I have frequent urges to smoke', 'I have been bothered by the desire to smoke a cigarette', 'I have thought about smoking a lot' and 'I have trouble getting cigarettes off my mind'. The CWS involves averaging ratings of the extent of agreement with the following statements: 'The only thing I can think about is smoking a cigarette', 'I miss cigarettes terribly' and 'I feel an irresistible need to smoke'. The simple rating of craving assessed 'How much have you craved cigarettes today?' on a six-point scale. For all measures, participants rated how they felt 'today'.

For each craving measure, using analysis of covariance, the score after 24 h was compared between the two groups using the baseline score as a covariate. This has the advantage, over comparison of change scores, of maximising the utility of the pretest score in explaining the post-test score variance and therefore the ability of the score to discriminate abstinence from smoking. The effect size for this comparison is provided as partial eta-squared. This represents the variance accounted for by the comparison of interest. As a measure of 'retest reliability', the craving scores in the group which continued to smoke were correlated between baseline and 24 h later. To assess stability of the measures, we examined the change in mean score over 24 h in the group that continued to smoke by *t* test. We also assessed associations between scale scores using Pearson correlation coefficients between all pairs of scales and data from visit 2.

Results

The cigarette consumption and FTND scores of the two groups were similar to each other and slightly higher than the average for the English smoking population (Fagerstrom and Furberg 2008). All of those in the abstinent group had CO readings <8 ppm following 24 h of abstinence. Those in the continued smoking group showed no decline in number of cigarettes smoked or expired air CO concentration. Table 2 shows that all of the craving measures were sensitive to abstinence, with partial eta-squared values ranging from 0.22 to 0.45 ($p<0.001$ in all cases). Table 3 shows moderate to high retest reliability of the different measures. The single rating of craving was at least as reliable as the ten-item QSU. All the measures showed a high degree of stability in the continue smoking group except for the Shiffman Scale which showed a significant reduction between pre-test and post-test. The measures all correlated with each other with a Pearson *R* of 0.6–0.8 ($p<0.001$) in all cases. No one measure showed a consistent pattern of higher or lower correlations.

Discussion

The findings show that simple measures with even just one rating are both sensitive to abstinence and reliable. The MPSS and a single rating of craving performed similarly to the QSU. Two of the measures, the MNWS and the SS, showed somewhat lower sensitivity to abstinence compared with the QSU. All the scales except the SS were stable over time in continuing smokers.

There was no evidence that measures that used more than one item were more sensitive to abstinence than those that used just one item. Although the single-item rating of craving in the MNWS showed lower sensitivity, the other single-item, stand-alone craving rating showed similar sensitivity to the QSU. The MNWS has been found in another study to be at least as sensitive to the effects of medications on craving as the QSU (West et al. 2008) so its

Table 2 Mean (SD) craving scores at baseline and after 24 h

	Abstinent		Smoking		Partial eta-squared for differences between abstinent and smoking groups at 24 h adjusting for baseline***
	Baseline	24 h	Baseline	24 h	
QSU Tot	31.9 (13.6)	49.2 (11.1)*	34.0 (14.4)	32.3 (13.3)	0.45
QSU F1	18.5 (8.0)	28.4 (6.2)*	19.9 (8.0)	18.5 (7.6)	0.44
QSU F2	16.1 (5.6)	21.8 (5.8)*	14.8 (6.5)	14.5 (6.3)	0.37
MPSS	1.9 (0.8)	3.1 (0.9)*	1.8 (0.8)	1.9 (0.7)	0.41
MNWS	2.0 (1.1)	2.9 (0.9)*	1.8 (1.0)	2.0 (0.8)	0.22
SS	20.0 (7.3)	26.1 (8.2)*	22.4 (8.2)	19.5 (6.9)**	0.26
WSWS	1.7 (0.9)	2.7 (0.7)*	1.8 (0.8)	1.9 (0.7)	0.32
CWS	2.1 (0.8)	3.2 (1.0)*	2.1 (0.8)	2.1 (0.7)	0.33
CR	2.2 (1.0)	3.8 (1.1)*	2.2 (1.0)	2.4 (1.0)	0.37

QSU Tot Questionnaire of Smoking Urges Total, *QSU F1* QSU Factor 1, *QSU F2* QSU Factor 2, *MPSS* Mood and Physical Symptoms Scale, *CR* Single item craving rating, *MNWS* Minnesota Nicotine Withdrawal Scale, *SS* Shiffman Scale, *WSWS* Wisconsin Smoking Withdrawal Scale, *CWS* Cigarette Withdrawal Scale

*$p<0.001$ (a significant change from baseline in this group); **$p<0.05$ (a significant change from baseline in this group); ***$p<0.001$ (all eta-squared are significant)

reduced sensitivity in this study may represent chance variation.

The findings of this study are consistent with those of previous research showing that there was no clear benefit to multi-item scales over very brief scales and individual ratings when measuring withdrawal symptoms (Etter and Hughes 2006; West et al. 2006). The findings that scores on the SS reduced over time in continuing smokers was also consistent with previous research on use of that scale to measure other withdrawal symptoms. Given that in many studies of craving there is no control group that continues smoking, a tendency for scores to reduce over time in continuing smokers may limit the value of the measure. It is not clear why the SS should show a tendency to yield lower scores with repeated measurement, but the fact that it uses ten-point ratings only anchored at each extreme may be a factor. This should be investigated further.

Another area for future research is a comparison of the different craving measures in predicting abstinence. While there is good evidence that several of the measures of craving examined in the present study predict relapse, no direct comparisons have been published (Allen et al. 2008; Bagot et al. 2007; West et al. 1989).

The study had several limitations. One limitation of the study is that the sample consisted of relatively light smokers compared with those seen in smoking cessation programmes, though it was similar in terms of cigarette consumption and dependence to the general population of smokers in the UK (Goddard 2007). Another limitation is that the smokers were not intending to quit for good and one might get different results in those who are. Thirdly, the period of abstinence was brief and it could be that different results might have been obtained after a longer period. Finally, it may be that multi-item measures and single-item measure perform differently in different subgroups, which we did not have the power to analyses.

The main practical implication of the present findings is that there is no reason to prefer the QSU over briefer measures when it comes to assessing craving in clinical studies or clinical practice. This could represent a significant saving in time and resources.

Table 3 Re-test reliability for those in the group continuing to smoke, for scores at baseline and 24 h later

	Pearson correlation
QSU Tot	0.54*
QSU F1	0.56*
QSU F2	0.65**
MPSS	0.73**
MNWS	0.61**
SS	0.54*
WSWS	0.69**
CWS	0.74**
Craving	0.55*

*$p<.01$; **$p<.001$

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Appendix: Craving measures and their rating scales

Questionnaire on smoking urges (QSU) (1=strongly disagree to 7=strongly agree)
1. I have a desire for a cigarette right now
2. Nothing would be better than smoking a cigarette right now
3. If it were possible I would probably smoke now
4. I could control things better right now if I could smoke
5. All I want right now is a cigarette
6. I have an urge for a cigarette
7. A cigarette would taste good now
8. I would do almost anything for a cigarette now
9. Smoking would make me less depressed
10. I am going to smoke as soon as possible

Mood and physical Symptoms Scale	
1. How much of the time have you felt the urge to smoke today?	0=not at all, 1=a little of the time, 2=some of the time, 3=a lot of the time, 4=almost all the time, 5=all the time
2. How strong have the urges been today?	0=no urges, 1=slight, 2=moderate, 3=strong, 4=very strong, 5=extremely strong
Wisconsin Smoking Withdrawal Scale	
1. I have frequent urges to smoke	0=strongly disagree, 1=disagree, 2=feel neutral, 3=agree, 4=strongly agree
2. I have been bothered by the desire to smoke a cigarette	
3. I have thought about smoking a lot	
4. I have trouble getting cigarettes off my mind	
Cigarette Withdrawal Scale	
1. The only thing I can think about is smoking a cigarette	0=totally disagree, 1=mostly disagree, 2=more or less agree, 3=mostly agree, 4=totally agree
2. I miss cigarettes terribly	
3. I feel an irresistible need to smoke	
Minnesota Nicotine Withdrawal Scale	
Desire or craving to smoke	0=none, 1=slight, 2=mild, 3=moderate, 4=severe
Shiffman Scale	
1. Urge to smoke	1=low to 10=high
2. Need to smoke	
3. Crave a cigarette	
4. Need a cigarette	
Craving rating	
How much have you craved cigarettes today?	0=not at all, 1= hardly at all, 2=a little, 3=somewhat, 4=quite a bit, 5=a great deal

References

Allen SS, Bade T, Hatsukami D, Center B (2008) Craving, withdrawal, and smoking urges on days immediately prior to smoking relapse. Nicotine Tob Res 10(1):35–45

Bagot KS, Heishman SJ, Moolchan ET (2007) Tobacco craving predicts lapse to smoking among adolescent smokers in cessation treatment. Nicotine Tob Res 9(6):647–652

Cox LS, Tiffany ST, Christen AG (2001) Evaluation of the brief questionnaire of smoking urges (QSU-brief) in laboratory and clinical settings. Nicotine Tob Res 3(1):7–16

Etter JF (2005) A self-administered questionnaire to measure cigarette withdrawal symptoms: the Cigarette Withdrawal Scale. Nicotine Tob Res 7(1):47–57

Etter JF, Hughes JR (2006) A comparison of the psychometric properties of three cigarette withdrawal scales. Addiction 101 (3):362–372

Fagerstrom K, Furberg H (2008) A comparison of the Fagerstrom Test for Nicotine Dependence and smoking prevalence across countries. Addiction 103(5):841–845

Goddard E (2007) Smoking and drinking among adults, 2006: general household survey. Office of National Statistics, London

Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO (1991) The Fagerstrom Test for Nicotine Dependence: a revision of the Fagerstrom Tolerance Questionnaire. Br J Addict 86(9):1119–1127

Heishman SJ, Singleton EG, Moolchan ET (2003) Tobacco Craving Questionnaire: reliability and validity of a new multifactorial instrument. Nicotine Tob Res 5(5):645–654

Hughes JR, Hatsukami D (1986) Signs and symptoms of tobacco withdrawal. Arch Gen Psychiatry 43(3):289–294

Hughes JR, Hatsukami DK, Pickens RW, Krahn D, Malin S, Luknic A (1984) Effect of nicotine on the tobacco withdrawal syndrome. Psychopharmacology (Berl) 83(1):82–87

Killen JD, Fortmann SP (1997) Craving is associated with smoking relapse: findings from three prospective studies. Exp Clin Psychopharmacol 5(2):137–142

Oppenheim AN (2001) Questionnaire design, interviewing and attitude measurement. Continuum, London

Shiffman S, Khayrallah M, Nowak R (2000) Efficacy of the nicotine patch for relief of craving and withdrawal 7–10 weeks after cessation. Nicotine Tob Res 2(4):371–378

Swan GE, Ward MM, Jack LM (1996) Abstinence effects as predictors of 28-day relapse in smokers. Addict Behav 21 (4):481–490

Taylor AH, Ussher MH, Faulkner G (2007) The acute effects of exercise on cigarette cravings, withdrawal symptoms, affect and smoking behaviour: a systematic review. Addiction 102 (4):534–543

Tiffany ST, Drobes DJ (1991) The development and initial validation of a questionnaire on smoking urges. Br J Addict 86(11):1467–1476

Welsch SK, Smith SS, Wetter DW, Jorenby DE, Fiore MC, Baker TB (1999) Development and validation of the Wisconsin Smoking Withdrawal Scale. Exp Clin Psychopharmacol 7(4):354–361

West R, Hajek P (1997) What happens to anxiety levels on giving up smoking? Am J Psychiatry 154(11):1589–1592

West R, Hajek P (2004) Evaluation of the mood and physical symptoms scale (MPSS) to assess cigarette withdrawal. Psychopharmacology (Berl) 177:195–199

West RJ, Russell MA (1985) Pre-abstinence smoke intake and smoking motivation as predictors of severity of cigarette withdrawal symptoms. Psychopharmacology (Berl) 87(3):334–336

West R, Schneider N (1987) Craving for cigarettes. Br J Addict 82 (4):407–415

West RJ, Jarvis MJ, Russell MA, Carruthers ME, Feyerabend C (1984) Effect of nicotine replacement on the cigarette withdrawal syndrome. Br J Addict 79(2):215–219

West RJ, Hajek P, Belcher M (1989) Severity of withdrawal symptoms as a predictor of outcome of an attempt to quit smoking. Psychol Med 19(4):981–985

West R, Courts S, Beharry S, May S, Hajek P (1999) Acute effect of glucose tablets on desire to smoke. Psychopharmacology (Berl) 147(3):319–321

West R, Ussher M, Evans M, Rashid M (2006) Assessing DSM-IV nicotine withdrawal symptoms: a comparison and evaluation of five different scales. Psychopharmacology (Berl) 184 (3–4):619–627

West R, Baker CL, Cappelleri JC, Bushmakin AG (2008) Effect of varenicline and bupropion SR on craving, nicotine withdrawal symptoms, and rewarding effects of smoking during a quit attempt. Psychopharmacology (Berl) 197(3):371–377