Psychometric properties of the brief Questionnaire on Smoking Urges (QSU-Brief) in a Dutch smoker population

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Abstract

We investigated the reliability, validity, and factor structure of the 10-item Questionnaire on Smoking Urges (QSU-Brief) in a Dutch smokers sample (N = 208). The questionnaire displayed good internal consistency (Cronbach's alphas > 0.83), and scores were strongly correlated with three other rating scales for measuring craving, urge, and desire for cigarettes, and moderately linked to questionnaires that tap related constructs, such as cigarette dependence. As in previous research, a two factor structure was revealed. The first factor was best described by 'the relief from nicotine withdrawal or negative affect with an urgent and overwhelming desire to smoke', and appeared to be associated with negative affect, but not with positive affect. The second factor reflected 'the desire and intention to smoke', and was neither associated with positive nor negative affect. The factor structure, however, slightly deviates from the original, English version of the QSU-Brief, which might be explained by language differences. Overall, the Dutch translation of the QSU-Brief offers a reliable, valid, and multidimensional assessment of cigarette craving and appears suitable for use in a general population of young, Dutch adults.

Keywords: Craving; Smoking; Factor analysis; Validity; Reliability; Dutch

1. Introduction

Craving, which can be defined as "the desire to experience the effect(s) of a previously experienced psychoactive substance" (UNDCP & WHO, 1992), is considered an important concept in smoking addiction. Craving is often viewed as the most difficult and aggravating withdrawal symptom during abstinence and quitting (Orleans, Rimer, Cristinzio, Keintz, & Fleisher, 1991; Shiffman & Jarvik, 1976; West, Hajek, & Belcher, 1989). Moreover, several studies have shown that craving hampers successful smoking cessation and that it correlates with relapse after periods of abstinence (Allen, Bade, Hatsukami, & Center, 2008; Doherty, Kinnunen, Militello, & Garvey, 1995; Ferguson, Shiffman, & Gwaltney, 2006; Killen & Fortmann, 1997; Killen, Fortmann, Newman, & Varady, 1991; Niaura et al., 1988; Orleans et al., 1991; Shiffman et al., 1997; Shiffman & Jarvik, 1976; Swan, Ward, & Jack, 1996). Furthermore, the effects of positive outcome expectations of smoking on relapse appear to be completely mediated by craving (Dijkstra & Borland, 2003). Consequently, reliable assessment of craving is necessary in order to predict relapse, improve cessation treatment, and understand the nature of craving in general.

In the past decades, the majority of studies used single- or two-item questionnaires to measure craving (see for an overview Cox, Tiffany, & Christen, 2001). With such a restricted number of questions, the assessment of craving is rather one-sided and the psychometric properties cannot be determined. In order to reliably measure the multi-dimensional aspects of craving, Tiffany and Drobes (1991) designed the 32-item Questionnaire on Smoking Urges (QSU). This self-report instrument intends to capture

several different aspects of craving, ranging from positive expectations about the effects of smoking to more general, overwhelming urges to smoke. Factor analysis indicated that the QSU consists of two clearly distinguishable underlying factors, which can be described as 'the desire and intention to smoke with an anticipation of pleasure from smoking' and 'the relief from nicotine withdrawal or negative affect with an urgent and overwhelming desire to smoke' (Tiffany & Drobes, 1991).

Nonetheless, because of its length, the QSU turned out to be less suitable in clinical and laboratory settings where a fast assessment of the concept of craving is important. With this in mind, Cox et al. (2001) developed the QSU-Brief, which is an abbreviated version of the QSU consisting of only ten items that can be completed in about two minutes. The shortened scale has good reliability ($\alpha = 0.78 - 0.97$) and a two-factor structure that is generally well in keeping with that obtained for the original QSU. However, two items (items 2 and 5) appeared to be ambivalent by loading on both factors and consequently were, in spite of their inclusion in factor 2 of the original QSU, not assigned to any subscale of the QSU-Brief. In the QSU-Brief, factor 1 includes the items 1, 3, 6, 7, and 10, while factor 2 includes the items 4, 8, and 9 (Cox et al., 2001). These favorable psychometric properties have been confirmed in further research (Cappelleri et al., 2007; Cepeda-Benito & Reig-Ferrer, 2004) and since then the 10-item QSU-Brief has been used in a wide variety of studies (e.g., Attwood, O'Sullivan, Leonards, Mackintosh, & Munafò, 2008; Bradley, Field, Healy, & Mogg, 2008; LaRowe, Saladin, Carpenter, & Upadhyaya, 2007).

So far, no cigarette craving questionnaire has been validated for the Dutch population, and consequently studies have primarily relied on a non-validated translation

of the QSU-Brief (Littel & Franken, 2007; Littel, Franken, & Van Strien, in press). Although this research has shown that the Dutch QSU-Brief appears to be sensitive to tasks that are believed to enhance cigarette craving, such as viewing smoking-related pictures, it is still unknown whether the Dutch translation of the QSU-Brief has acceptable psychometric properties similar to its original English version. Therefore, the main goal of the present study was to examine the factor structure, internal consistency, and validity of a translated version of the QSU-Brief in a Dutch smokers population utilizing a cross-sectional design with random subject selection.

Since the two original QSU-Brief factors make reference to positive and negative affect, an additional goal of the current study was to examine the correlations between the QSU-Brief, and especially its subscales, and constructs reflecting positive and negative mood. Research has shown that lower levels of positive affect and higher levels of negative affect predict nicotine dependence (McChargue, Cohen, & Cook, 2004b), that college smokers with elevated symptoms of depression are more dependent on cigarettes than non-depressed peers (McChargue, Cohen, & Cook, 2004a), and that relapse is preceded by increasing or intense negative affect (Shiffman, 2005). In line with these results, negative mood appears to be positively associated with craving (Cox et al., 2001). Positive mood, however, is negatively related to craving in abstinent smokers who are enrolled in a cessation program, but positively linked to craving in active smokers in a laboratory setting (Cox et al., 2001). In the present study, it is predicted that QSU-Brief factor 1 ‘the desire and intention to smoke with an anticipation of pleasure from smoking’ is especially related to positive affect, whereas factor 2 ‘the relief from nicotine withdrawal or negative affect with an urgent and overwhelming desire to smoke’ is

mainly associated with high negative affect and anhedonia. Obviously, such findings would provide further support for the validity of the subscales of the QSU-Brief.

2. Method

2.1 Participants

The sample consisted of 208 smokers (58.7% female) with a mean age of 24.4 years (*SD* = 7.9). Smokers' mean score on the Fagerström Test for Nicotine Dependence (FTND; Vink, Willemsen, Beem, & Boomsma, 2005) was 3.7 (*SD* = 2.3). 32.2 % of the participants smoked on average between one and ten cigarettes per day, 51.4 % smoked between 11 and 20 cigarettes per day, 13.9 % smoked between 21 and 30 cigarettes per day, and 2.4% smoked more than 31 cigarettes per day. A subset (*N* = 184)[1] of the participants was asked about smoking duration and quit attempts. On average, this group had smoked for 8.0 years (*SD* = 7.9). 63.9% of them made one or more quit attempts, with a mean total duration of 11.6 months (*SD* = 16.1). Participants were recruited by advertisements on internet forums and -communities and flyers distributed at the Erasmus University Rotterdam (the Netherlands). They were not allowed to smoke during the completion of the questionnaire.

2.2 Measures

Participants filled out an online questionnaire containing several questionnaires and some additional demographics and rating scales. First of all, participants filled out the Dutch

[1] Since we combined data from several datasets that slightly differed in content, the number of participants is different for some of the variables

translation of the QSU-Brief (Cox et al., 2001), which is a self-report questionnaire measuring urges and cravings to smoke. As mentioned in the introduction, the QSU-Brief consists of 10 items. Five items (items 1, 3, 6, 7, and 10) represent 'the desire and intention to smoke with an anticipation of pleasure from smoking' and three (items 4, 8, and 9) reflect 'the relief from nicotine withdrawal or negative affect with an urgent and overwhelming desire to smoke'. All items, including items 2 and 5, contribute to the total craving score. As in the original version of the QSU (Tiffany & Drobes, 1991), a Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used for the responses to each question. The Dutch translation of the QSU-brief is based upon translations by several persons, including native English speakers, that were discussed until eventually consensus was reached.

In addition, all participants filled out the Dutch version of the Fagerström Test for Nicotine Dependence (FTND; Vink et al., 2005), which is a 6-item measure assessing smoking habit and dependence. This questionnaire has acceptable reliability (Cronbach's alpha's ranging from 0.66 - 0.71) and correlates significantly with number of cigarettes smoked per day (correlations ranging from 0.50 - 0.60, all p's > 0.05). The items of the FTND were scored according to the scoring system described in Heatherton et al. (1991).

Further, a subset of the participants (N = 84) completed two mood questionnaires, i.e., the Positive Affect Negative Affect Scales (PANAS; Watson, Clark, & Tellegen, 1988) and the Snaith-Hamilton Pleasure Scale (SHAPS; Snaith et al., 1995). The PANAS consists of 20 items that either measure positive affect (PA; 10 items) or negative affect (NA; 10 items). Each item refers to a mood state (e.g., proud, scared), and participants rate the extent to which each mood state describes how they feel at the moment of testing

on a scale ranging from 1 (not at all or very slightly) to 5 (extremely). High PA is thought to reflect high energy, concentration, and pleasurable mood states, whereas low PA is characterized by sadness and lethargy. Negative affect (NA), on the other hand, refers to distress and unpleasurable mood states, with low NA reflecting a state of calmness and serenity (Watson et al., 1988). The Dutch version of the PANAS, which was used in the present study, has comparable satisfactory psychometric properties as the original questionnaire. Cronbach's alpha's of the questionnaire ranges from 0.86 – 0.89, and moreover, the questionnaire reliably differentiates between depressed patients and patients with an anxiety disorder (Boon & Peeters, 1999).

The SHAPS is a 14-item self-report instrument measuring hedonic tone, i.e., the (in)ability to experience pleasure (Snaith et al., 1995). The Dutch version, employed in the current study, has excellent psychometric properties. The questionnaire discriminates between clinical patients and non-clinical individuals. Cronbach's alpha's are between 0.91 - 0.95 (Franken, Rassin, & Muris, 2007).

Finally, a subset of the participants reported smoking duration (i.e., for how many years they had been smoking; $N = 181$), the degree of cigarette craving on a scale ranging from 0 to 100 ($N = 84$), and urge and desire for a cigarette on a Visual Analogue Scale (urge-VAS and desire-VAS; $N = 84$). These scales appear to be reliable and responsive to cue exposure (e.g., Niaura et al., 1998; Sayette & Hufford, 1994), they can be administered quickly and repeatedly, and they are used regularly in smoking research (e.g., Mogg & Bradley, 2002; Shadel, Niaura, & Abrams, 2001; Thewissen, Snijders, Havermans, van den Hout, & Jansen, 2006; Thewissen, van den Hout, Havermans, & Jansen, 2005).

2.3 Procedure

To determine the factor structure of the Dutch translation of the QSU-Brief, an exploratory principal components analysis with Promax rotation was conducted on the 10 items. Reliability analysis was conducted to determine internal consistency of the QSU-Brief and its subscales. In order to assess the validity of the QSU-Brief, Spearman correlations were calculated between the QSU-Brief and other questionnaires/rating scales. We selected Spearman correlation because data of the QSU-Brief and the other craving rating scales displayed a non-normal distribution.

3. Results

3.1 Exploratory factor analysis

A principal components analysis was conducted on the 10-item QSU-Brief. A Promax rotation was employed as the two subscales 'desire and intention to smoke' and 'anticipation of relieve from negative affect with an urgent desire to smoke' are considered to be non-orthogonal factors (Cappelleri et al., 2007; Cox et al., 2001). Investigation of the scree plot pointed in the direction of a two-factor solution. These two factors had eigenvalues greater than one, i.e., 4.10 and 2.43, and respectively accounted for 41.02 % and 24.27 % of the variance. Eight of the items had a loading of > 0.40 on one of the two factors. The other two items (i.e., items 1 and 6) displayed substantial loadings (i.e., > 0.40) on both factors.

In general, the factor analysis revealed that most of the items loaded most substantially on their hypothesized factor (see Table 1), that is, factor 1 consisted of items

2, 4, 5, 8, and 9 and corresponds with factor 2 of the factor structure described by Cox et al. (2001), i.e., 'the relief from nicotine withdrawal or negative affect with an urgent and overwhelming desire to smoke'. Factor 2 contained the items 1, 3, 6, 7, and 10 and was entirely in accordance with factor 1 of the original QSU-Brief, i.e., 'the desire and intention to smoke with an anticipation of pleasure from smoking'. Items 2 and 5 were not included in their factor solution, but because of high factor loadings and face validity, these items were nevertheless assigned to factor 1 in the present study. Items 1 and 6 initially loaded on both factors, but were assigned to factor 2 in order to avoid too much deviation from the original factor structure.

3.2 Reliability

Cronbach's alpha was 0.83 for the total score of the QSU-Brief, which indicates that the Dutch translation of this questionnaire has adequate internal consistency. The internal consistency of the separate factors was also good: factor 1 (items 2, 4, 5, 8, and 9: $\alpha = 0.84$) and factor 2 (items 1, 3, 6, 7, and 10: $\alpha = 0.84$).

3.3 Validity

Spearman's correlation coefficients between the QSU-Brief total score and other questionnaires/rating scales are reported in Table 2. As expected, scores on the QSU-Brief were highly correlated with scores on the craving rating scale, $\rho = 0.80$, $p < 0.01$, the desire-VAS, $\rho = 0.77$, $p < 0.01$, and the urge-VAS, $\rho = 0.76$, $p < 0.01$. In addition, moderate, positive correlations were found between the QSU-Brief and the FTND, $\rho = 0.14$, $p < 0.05$, and number of cigarettes smoked per day, $\rho = 0.25$, $p < 0.01$.

The subscale representing anticipation of relieve from negative affect with an urgent desire to smoke (factor 1) was significantly correlated with negative affect (PANAS-NA), $\rho = 0.25$, $p < 0.01$, whereas this appeared not true for the subscale representing a desire and intention to smoke (factor 2), $\rho = 0.16$, ns. Neither of the factors were significantly correlated with positive affect (PANAS-PA), $\rho = -0.02$, ns and $\rho = -0.01$, ns. However, both factors were significantly correlated with the SHAPS, $\rho = 0.23$, $p < 0.01$ (factor 1) and $\rho = 0.22$, $p < 0.01$ (factor 2). To recapitulate, craving, especially the subscale 'anticipation of relieve from negative affect with an urgent desire to smoke', is related to negative affect, but not necessarily to positive affect.

4. Discussion

The present study investigated the factor structure, reliability, and validity of the Dutch translation of the QSU-Brief. It can be concluded that the questionnaire seems to be a reliable and valid measure of cigarette craving. The Dutch QSU-Brief displayed good internal consistency, and scores on this scale were strongly correlated with three other rating scales for measuring craving, urge, and desire for cigarettes, and moderately linked to questionnaires that tap related constructs, i.e., cigarette dependence and number of cigarettes smoked per day.

An exploratory factor analysis revealed a two factor structure, which is largely in agreement with exploratory and confirmatory factor analyses of the English and Spanish versions of the original QSU (Cepeda-Benito, Henry, Gleaves, & Fernandez, 2004; Davies, Willner, & Morgan, 2000), and the English and Spanish versions of the 10-item

QSU-Brief (Cappelleri et al., 2007; Cepeda-Benito & Reig-Ferrer, 2004; Cox et al., 2001).

The first factor, which corresponds with the second factor of the English QSU-Brief, consisted of the items 2, 4, 5, 8, and 9, whilst items 1, 3, 6, 7, and 10 comprised factor 2. In the present study, items 2 and 5 loaded convincingly on factor 1, whereas they loaded ambivalently on two factors in previous studies. This discrepancy might be explained by language differences. Items 2 and 5, i.e., 'nothing would be better than smoking a cigarette right now' and 'all I want right now is a cigarette' convey quite extreme utterances, especially when they are literally translated into Dutch. Because items as 'smoking would make me less depressed' (9) and 'I could control things better right now if I could smoke' (4) are also quite extreme and rarely used in Dutch, it is not surprising that these items load on one and the same factor. The abovementioned items constitute the subscale 'the relief from nicotine withdrawal or negative affect with an urgent and overwhelming desire to smoke', and the inclusion of items 2 and 5 makes this designation even more valid. Furthermore, and in accordance with the findings by Cox et al. (2001), this subscale was significantly correlated with negative affect and anhedonia, thereby yielding further evidence for its relation to negative mood and withdrawal symptoms.

The second factor corresponds with the first factor of the original QSU-Brief, although, in the present study, items 1 and 6 loaded on two factors. Item 6, however, loaded considerably higher on factor 2 than on factor 1, and was thus assigned to factor 2. In order to avoid too much deviation from the original factor structure, item 1 was also assigned to this factor. An explanation for these items loading on both factors might be

again the Dutch language. Items 1 and 6 contain the terms ‘desire’ and ‘urge’. Although Dutch people may use phrases such as ‘I have a strong desire or urge for a cigarette, it is far more common to employ less strong expressions, e.g., ‘I would like/fancy a cigarette’. Nevertheless, items 1 and 6 are less extreme than the items assigned to factor one. This justifies the decision to assign them to factor 2, which can be described as ‘desire and intention to smoke’. We are careful with the addition of ‘anticipation of pleasure from smoking’ to the name of this factor, because the subscale is neither significantly correlated with positive nor negative affect and the individual items make no explicit reference to any pleasure or reward that one can get from smoking. In previous research (Cox et al., 2001), an ambiguous relation was found between positive affect and craving in that it was negatively related to craving in abstinent, treatment-seeking smokers, but positively related to craving in active smokers in a laboratory setting. If any relationship between ‘desire and intention to smoke’ and mood exists, we expect this to be the case with depressive symptoms, since this subscale correlated significantly with anhedonia.

In the present study only young adults with moderate to low smoking dependence were questioned. Although their FTND score does not seem to deviate from the average FTND score, which appears to be relatively low in the Netherlands (< 3; Fagerström & Furberg, 2008), future research needs to confirm the factor structure and psychometric properties in older and more dependent smokers in order to be able to generalize the results to the population.

Overall, the Dutch translation of the QSU-Brief offers a reliable, valid and multi-dimensional assessment of craving for cigarettes in a general population of young adults and is suitable for being used in laboratory settings. However, it would be useful if future

research confirms the present factor structure in a Dutch sample, since it slightly deviates from the original, English version.

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Table 1

Factor loadings for items of the Dutch QSU-Brief as obtained with a principal components analysis

Original item (item number) *Dutch translation*	Factor	
	1	2
All I want right now is a cigarette (5) *Het enige wat ik nu wil is een sigaret*	0.87	
Nothing would be better than smoking a cigarette right now (2) *Niets zou beter zijn dan nu een sigaret te roken*	0.85	
Smoking would make me less depressed (9) *Als ik nu mocht roken zou ik me minder depressief voelen*	0.81	
I would do almost anything for a cigarette now (8) *Ik zou er bijna alles voor over hebben om nu te mogen roken*	0.70	
I could control things better right now if I could smoke (4) *Ik zou alles beter onder controle hebben als ik nu mocht roken*	0.65	
I have an urge for a cigarette (6) *Ik ervaar een sterke drang om een sigaret te roken*	0.64	0.53
If it were possible, I probably would smoke now (3) *Als het mogelijk was, zou ik waarschijnlijk nu een sigaret opsteken*		0.87

A cigarette would taste good now (7) *Een sigaret zou me nu wel smaken*		0.82
I am going to smoke as soon as possible (10) *Zodra dit mogelijk is, ga ik roken*		0.80
I have a desire for a cigarette right now (1) *Ik verlang op dit moment naar een sigaret*	0.42	0.79

Note. QSU-Brief = Brief Questionnaire on Smoking Urges; factor 1 = 'the relief from nicotine withdrawal or negative affect with an urgent and overwhelming desire to smoke'; factor 2 = 'desire and intention to smoke'.

Only loadings > 0.40 are shown.

Table 2

Spearman's correlations between scores on the QSU-Brief and rating scales/questionnaires tapping similar and related constructs

	QSU-Brief	0-100 craving rating scale	Desire-VAS	Urge-VAS	FTND	Cigarettes/day
QSU-Brief		0.80**	0.76**	0.77**	0.14*	0.25**
0-100 Craving rating scale			0.86**	0.71**	0.33**	0.42**
Desire-VAS				0.73**	0.19	0.29**
Urge-VAS					0.26**	0.31**
FTND						0.75**
Cigarettes/day						

Note. QSU-Brief = Brief Questionnaire on Smoking Urges; VAS = Visual Analogue Scale; FTND = Fagerström Test of Nicotine Dependence.

* $p < 0.05$

** $p < 0.01$