The Craving Experience Questionnaire: A Brief, Theory-Based Measure of Consummatory Desire and Craving

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Abstract

Aims: Research into craving is hampered by lack of theoretical specification and a plethora of substance-specific measures. This study aimed to develop a generic measure of craving based on Elaborated Intrusion (EI) Theory. Confirmatory Factor Analysis (CFA) examined whether a generic measure replicated the 3-factor structure of the Alcohol Craving Experience (ACE) scale over different consummatory targets and timeframes.

Design: Twelve studies were pooled for CFA. Targets included alcohol, cigarettes, chocolate and food. Focal periods varied from the present moment to the previous week. Separate analyses were conducted for Strength and Frequency forms.

Setting: Nine studies included university students, with single studies drawn from an Internet survey, a community sample of smokers, and alcohol-dependent outpatients.

Participants: A heterogeneous sample of 1230 participants.

Measurements: Adaptations of the Alcohol Craving Experience (ACE) questionnaire.

Findings: Both craving Strength (CFI .974; RMSEA .039, 95%CI .035-.044) and Frequency (CFI .971, RMSEA .049, 95%CI .044-.055) gave an acceptable three-factor solution across desired targets that mapped onto the structure of the original ACE (Intensity, Imagery, Intrusiveness), after removing an item, reallocating another and taking intercorrelated error terms into account. Similar structures were obtained across timeframes and targets. Preliminary validity data on the resulting 10-item Craving Experience Questionnaire (CEQ) for cigarettes and alcohol were strong.

Conclusions: The Craving Experience Questionnaire (CEQ) is a brief, conceptually grounded and psychometrically sound measure of desires. It demonstrates a consistent factor structure across a range of consummatory targets in both laboratory and clinical contexts.

242 words

Introduction

Intense desire or craving is increasingly recognised as a core feature of addiction, as shown by its inclusion in DSM-5 Substance Use Disorder criteria [1] and in ICD-10 [2]. While substance use does not require that intense desires precede it [3], craving presents a cue for addictive behaviour and a challenge for attempts at control [4]. Kavanagh, Andrade and May [5] proposed Elaborated Intrusion (EI) Theory as a description of processes underpinning desires, bringing together multiple strands of research. EI theory proposes that craving to consume drugs, food or drink, and desire for other activities, is a cognitive-affective phenomenon that involves an initial, apparently spontaneous intrusive thought (triggered by cues from the environment, mind and body), followed by controlled processes of elaboration, which tend to include construction of multisensory imagery [6]. These embodied cognitions are initially experienced as pleasurable, but if acquisition of the target is prevented or delayed, the sensory imagery becomes aversive, because it makes physiological deficits more salient.

Sensory imagery is common to the phenomenology of craving in addiction and for food and drink [7-9]. Since craving imagery loads limited capacity working memory processes, craving can be reduced by cognitive tasks that compete for those same working memory processes. This competition is greater in the imagery's modality: so, imagery of neutral visual or olfactory stimuli reduces craving strength for cigarettes [6, 10], coffee [11] and food [12], relative to auditory or verbal tasks.

A barrier to progress in the understanding of desires has been a lack of conceptually sound and agreed approaches to their measurement. Kavanagh, Statham, Feeney et al. [13] reviewed existing measures of alcohol craving, demonstrating that many can be confounded with correlated but separate phenomena (drinking behaviour, intentions to drink, outcome

expectancies about perceived benefits or consequences of drinking, and perceptions of behavioural control or self-efficacy). Similar issues apply to craving measures in other domains: for instance, the Questionnaire on Smoking Urges (QSU) [14] and state version of the Food Craving Questionnaire (FCQ-S) [15] include items on expectancy and intention (QSU) or control (FCQ-S). Kavanagh et al. proposed that craving measures should avoid such separate phenomena, but include inherent craving attributes such as the frequency and intensity of episodes, and the salience of craving thoughts. The measure should be sufficiently brief to allow repeated use during experiments or in high-risk situations for addictive behaviours, and should capture key features of the subjective experience.

The Alcohol Craving Experience (ACE) questionnaire [16] was developed from EI Theory. It assesses the intensity and intrusiveness of alcohol craving, along with vividness of imagery during the craving episode. The ACE is an eleven-item scale with two forms: Strength (ACE-S), where respondents rate the strength of craving experiences during a specific episode, and Frequency (ACE-F), where they rate how often they experienced strong urges, intrusive desires, and vivid imagery of alcohol use. Both forms include an explicit timescale. Each form has the same factor structure, with items divided between correlated subscales measuring craving Intensity, Imagery vividness, and cognitive Intrusiveness. Frequency and Intensity are assessed separately to allow detection of both infrequent, intense craving and frequent but weaker episodes. The ACE discriminated between clinical and non-clinical populations, and within the non-clinical sample, it discriminated those who screened positive for higher risk of alcohol dependence from those who did not.

The similar processes by which craving is triggered and maintained may allow development of a measure with broad application across consummatory targets. Such a measure would contribute to research on commonalities across addictions (e.g. 'food addiction' [17, 18]). A version of the ACE may fulfil this role. Like other craving scales, the

original ACE focused on a single target (alcohol). However, because it was derived from a general theory of desire, it should be possible to decontextualize items, to produce a measure with wider application. As a first step, we used variations of the ACE 'translated' for cigarettes, food, or chocolate, analogous to adaptations of the QSU to the Questionnaire of Alcohol Urges [19] and Alcohol Craving Questionnaire [20].

This paper pools data from twelve studies using variants of the ACE, to test whether the measure has the same factorial structure, independent of consummatory target and timescale. We used Confirmatory Factor Analysis (CFA) to compare a 3-factor and single-factor model, and examined modification indices to evaluate other possible structures.

Method

Twelve studies conducted between 2008 and 2012 in Plymouth, UK, and Brisbane, Australia are summarized in Table 1. Each provided data on the eleven ACE items identified by Statham et al. [16]: Ten are in Table 3; the eleventh was 'Body' (How vividly/often did you imagine how your body would feel if you had [the target]?). All studies gave responses to Strength items, and six also contributed data on Frequency. Only Studies 1 to 3 have already been published [7, 21]. The primary purpose of the studies was to compare effects of various interventions upon craving. Wording of the ACE items was modified for each study, but all had the original 11-point visual analogue scales (anchored 0 = not at all; 10 = extremely /constantly). While sample sizes of each study were appropriate for their primary aims, none were sufficiently large to permit factor analyses. Samples are therefore pooled in the current paper to provide a large, albeit heterogeneous, sample for analysis.

Table 1

Participants and Procedures: Studies 1- 9 were conducted at Plymouth University (UK) and recruited undergraduate psychology students, rewarding them with points to recruit other students for their own research. Participants were recruited through an online system advertising research studies to psychology undergraduates. Overall, 496 students took part (330 females, 109 males, 57 unknown), aged 18-50 years (M= 23). Studies 1-4 used an incidental craving induction method, where participants chose a chocolate to eat later, and then rated craving for chocolate 'now' (Studies 1, 2) or 'in the last 10 minutes' (Studies 3, 4). In Studies 3 and 4, ratings were obtained after participants completed an experimental task to test hypotheses that visual tasks would reduce craving, but verbal tasks would have little effect.

Study 5 recruited people who reported smoking ≥10 cigarettes/day, and asked them either to rate cigarette cravings 'now' or 'over the last week'.

Studies 6-9 tested participants who had not eaten for 2-5 hours (except Study 8) after an indirect craving induction asking about their plans to eat (except in Study 7). In Studies 6-8, cravings 'now' were rated, (in Study 8 after a visual task), while in Study 9 cravings 'in the last 10 minutes' were rated (after experimental tasks).

Study 10 (N = 399 aged 19-60 years, M= 28; 66 males) was an online survey advertised to staff and students at Plymouth University. No incentive was offered for completing the survey. Respondents identifying themselves as current or former smokers were asked about cigarette cravings, while the remainder rated their food or chocolate cravings. Current smokers all reported smoking >6 cigarettes/day.

Study 11, at Queensland University of Technology, used an opportunity community sample of current smokers who wanted to quit smoking (N = 59 aged 18-60 years, M= 31, 27

females). Participants were recruited via e-mails or flyers at Brisbane universities and workplaces, and approaching smokers individually. Participants reported smoking ≥15 cigarettes/day and were not currently using nicotine replacement or receiving smoking treatment. They were asked to abstain from smoking for five hours prior to testing, and then completed the QSU, the Revised Fagerström Tolerance Questionnaire (RTQ; [22]) and the ACE.

Study 12, at an alcohol and drug outpatient service in Brisbane, drew from 542 participants (178 female, aged 18-70 years, M=40) meeting DSM-IV-TR criteria for current Alcohol Dependence. Participants were not dependent on other substances (except nicotine), and were not taking anti-craving medication. They completed the ACE at their first clinical session of a 12-week cognitive behavioural program for alcohol dependence, along with the Obsessive-Compulsive Drinking Scale—Obsessions Subscale (OCDS-Obsessions) [23]. Since some had contributed to development of the ACE [16], the current confirmatory factor analyses presented below only used the 276 who had not been in the earlier study (90 female, aged 19-69 years, M=40). The full sample was used for preliminary tests of convergent validity.

Craving Timeframe: For studies where the reported timeframe was 'now', only the Strength form (ACE-S) was administered. Studies referring to a timeframe allowed the Frequency form, ACE-F to be administered as well. The timeframe of 10 minutes in some studies reflects the duration of the experimental tasks being compared for their impact on craving cognitions. Studies 10-12 were correlational in design. Study 10 asked people to rate 'the last time' they experienced a craving for ACE-S, but 'the last week' for ACE-F. Study 11 asked participants to report the strength and frequency of cravings over the previous 5 minutes. The clinical sample in Study 12 rated the previous week. The differing timeframes

reflect the varied purposes of the original studies, and provide an opportunity to examine stability of factor structures over short (5-10 minutes) and longer (last time/last week) periods.

Preliminary validity data. Examples of relationships with other variables were provided by Studies 11 (on current smokers) and 12 (on alcohol-dependent outpatients). Study 11 provided data from Factor 1 ('Desire to Smoke') of the QSU and nicotine dependence on the RTQ. Study 12 provided correlations with the OCDS—Obsessions Subscale and with a single-item rating of the extent respondents currently felt like a drink [24].

Confirmatory Factor Analyses

Combining the twelve samples provided 1230 participants on the ACE-S (330 chocolate, 312 food, 276 alcohol, 312 cigarettes): 968 of these also completed the ACE-F (250 chocolate, 170 food, 276 alcohol, 272 cigarettes). Maximum Likelihood Confirmatory Factor Analyses were conducted using SPSS AMOS Version 20 (IBM Corp, Armonk, NY, USA), with multigroup analyses on the four craved substances. We compared models using change in χ^2 values, χ^2/df ratios (values >3 indicating poor fit), comparative fit indices (CFI, values <.95 indicating poor fit), Akaike Information Criterion (AIC), where lower values indicate better fit and parsimony, and root mean square error of approximation (RMSEA, values >.05 indicating poor fit), with pClose being used to test whether RMSEA was greater than the .05 threshold.

Tests of multivariate normality indicated that data were non-normal, with most items having non-normal univariate skewness or kurtosis. As reported by Gao, Mokhtarian and Johnston [25], removing a large number of cases or transforming the data can create more fundamental problems in model interpretation. Henly [26] provides a rule of thumb that samples showing multivariate non-normality should be ≥ 600 to obtain unbiased parameter

estimates. As our sample size exceeded this threshold, we chose to proceed with analyses on the complete, untransformed data.

Results

We began by applying the 3-factor model reported by Statham et al. [16], with items Want, Need, Urge and Think loading on Intensity; Picture, Taste, Smell, Mouth and Body on Imagery; and Not Think and Intrusive on Intrusiveness (see Table 3 for full items).

We first included all items from ACE-S and ACE-F within a single analysis to see if it was appropriate to treat the forms separately (Table 2). A six-factor model with separate Intensity, Imagery and Intrusiveness factors for each form fitted the data better than a three-factor model combining subscales over the two forms (change $\chi^2(48) = 2879$, p< .001). We therefore proceeded to analyse the forms separately.

We next compared the ACE three-factor model with one where all eleven items were linked to a single Craving factor. For both forms, the three-factor model produced a significantly better fit than the single factor (ACE-S: change $\chi^2(12) = 2032$, p <.001; ACE-F: change $\chi^2(12) = 1315$, p <.001). We then added correlations between pairs of error components within a factor that showed a high and consistent pattern of modification indices over the substance groups. This further improved fit for both forms (ACE-S: change $\chi^2(16)=201$, p<.001; ACE-F: change $\chi^2(20)=287$, p<.001), with ACE-S now meeting CFI and RMSEA fit criteria, although still exceeding 3 on CMIN/df. ACE-F also met the CFI criterion, but not RMSEA or CMIN/df criteria.

Table 2

We therefore examined the modification indices for item loadings. These suggested removing the Body item, and reassigning Think from the Intensity to the Intrusiveness factor. The modified three-factor model resulted in improved fit for both forms on all criteria, with the ACE-S producing a CMIN/df ratio below 3, and ACE-F now meeting the criterion for RMSEA. (Table 2).

Following this reorganisation and item reduction, and to reflect the generic nature of the questionnaire, we refer to the two forms of the ten-item scale as the Craving Experience Questionnaire (CEQ).

Invariance over substances

The analyses reported so far treated the four groups of participants who had reported cravings to alcohol, cigarettes, chocolate and food as separate groups. Constraining measurement weights and structural covariances to force factor loadings between items and the three factors to be identical over the four substance groups worsened model fit significantly (CEQ-S constrained: χ^2 Change (39) = 131, p <.001; CEQ-F, constrained: χ^2 Change (39) = 172, p < .001). So, while the overall factor structure remained invariant over different consummatory targets, specific loadings changed.

Invariance over timeframes

We then examined invariance over the different timescales referred to in variants of the CEQ, pooling over substances. Of those who had completed both CEQ-S and CEQ-F, 695 rated their experiences over a long timespan ('the last week', 'the last time' or 'since the last time'), whereas 293 rated a short timescale (the last 5 or 10 minutes). On the CEQ-S, an additional 242 rated their craving 'now' (or 'at this time'). We thus conducted multigroup analyses using two timeframes for the CEQ-F and 3 timeframes for the CEQ-S (Table 2).

For both forms, these analyses produced acceptable fit. Constraining measurement weights and structural covariances made fit worse (CEQ-S: χ^2 Change (26) = 73, $p < .001$; CEQ-F: χ^2 Change (13) = 44, $p < .001$). In both cases, CMIN/df and RMSEA improved in constrained models, but CFI and AIC worsened slightly. This suggests that different timeframes resulted in similar patterns of response.

Invariance over studies

To confirm that it was appropriate to pool the twelve studies into a single dataset despite their heterogeneity, we conducted multigroup analyses by study. All twelve studies used the CEQ-S, and six the CEQ-F. Constraining measurement weights and structural covariances had a small effect upon fit (CEQ-S: χ^2 Change (39) = 51, $p = .016$; CEQ-F: χ^2 Change (13) = 49, $p < .001$), with indices changing negligibly or improving. This indicates that study heterogeneity is not a problem.

Final version of the Craving Experience Questionnaire (CEQ).

The CEQ, with modified wording to avoid reference to a specific substance, is shown in Table 3. For CEQ-S, participants either rate current craving or the strongest craving over a timeframe; CEQ-F requires a timeframe to be specified. Total scores summarise strength and frequency of craving, respectively. Coefficient alphas are .91 for CEQ-S (corrected item/total correlations: .43-.75), and .94 for CEQ-F (.57-.84). The lowest item-total correlations were for the 'Not Think' item, which is primarily relevant when people are trying to suppress desire thoughts. The CEQ-S and CEQ-F totals correlated .72, and within each form, the three subscale intercorrelations ranged from .52-.61 for CEQ-S and .63-.73 for CEQ-F. Between the CEQ-S and the CEQ-F, the two imagery subscales correlated .72; intensity correlated .67, and intrusiveness .71.

Insert Tables 3 and 4

Preliminary validity data

The Total CEQ-S and CEQ-F over the previous 5 minutes were strongly correlated with the QSU Desire to Smoke factor (the subscale most closely according with our definition of cigarette craving) and with current nicotine dependence on the RTQ (Table 4, Study 11). Relationships were particularly strong with Intensity and Imagery subscales.

In Study 12, the Total CEQ-S and CEQ-F had the timeframe of the previous week. Both forms had robust correlations with OCDS Obsessions, which does not specifically specify a timeframe (e.g. 'How much of your time when you're not drinking is occupied by ideas, thoughts, impulses or images related to drinking?'). Unsurprisingly, it was more moderately associated with a cross-sectional measure of the extent that Session 1 attendees currently felt like a drink.

Discussion

The Strength and Frequency forms of the ten-item CEQ show a robust three-factor structure which, with the exception of one reallocated and one omitted item, replicates the structure of the alcohol-specific ACE. Together, the CEQ-S and CEQ-F measure the core desire components of frequency, intensity and the salience or dismissability of related intrusive thoughts, as identified in the recent review by Kavanagh et al. [13]. They also track a key cognitive feature of craving—desire-related imagery—the theoretical and empirical importance of which is demonstrated in other work [5, 27], and by the close association of the Imagery subscale and QSU Desire to Smoke.

Specific structural weights varied across substances and timeframes, but the factor structure was invariant, giving confidence that CEQ subscales apply across contexts. The

stability over timeframes occurred despite their different demands upon memory. Frequency and strength forms were statistically distinct, showing that respondents were not conflating intensity with frequency, although there is inevitably an association between these two facets of craving that leads to substantial correlations between the two forms, and between CEQ-F and the QSU, which is a measure of craving strength. Future research could assess the accuracy of the CEQ-F, to see if it is actually measuring craving frequency or if it is simply a rephrased measure of craving strength. The stability of the overall factor structure provides further evidence that normal, everyday desires lie on the same continuum as dysfunctional ones, and are driven by similar cognitive mechanisms.

While pooling of data from different studies provided a total sample size sufficient for factorial analyses, the heterogeneity of samples and studies is a potential limitation to the study, although our multigroup analysis indicated invariance over studies. Now that we have demonstrated the feasibility of adapting the ACE to a more generic format, studies with more balanced sampling are essential to corroborate the CEQ's factor structure, and examine the possible value of the Body item in substance-dependent contexts other than alcohol. Recent data using the imagery items in a large community sample [28] indicates that the Body item consistently predicted alcohol consumption, and that although the more specific Mouth/Throat item also correlated with drinking, it did not uniquely predict it. These two items would seem to be tapping the same aspects of imagery, and it may be that a rephrasing of the more general Body item will prove appropriate on contexts beyond oral consumption. Only one of the studies reported here used substance-dependent participants: further research is needed to give greater confidence that factor structures are invariant across degree of dependence.

The sensory foci of the CEQ restrict its current form to consummatory targets. Since the specific senses most strongly implicated in craving imagery are likely to change for non-

consummatory targets such as sport or gambling [7, 9], different items may be needed for the imagery subscale in those contexts. However, there is no a priori reason to expect that Intensity or Intrusiveness factors will need to change.

The CEQ forms provide sensitivity to two central features of desires: that they occur with differing frequency and intensity. The retrospective CEQ-F will be especially valuable in contexts where the number of spontaneous thoughts and their salience are the critical phenomena (e.g. where maintenance of resistance to recurring desires is being examined).

The CEQ-S represents a distinct departure from most previous measures, which ask people to make average ratings of intensity over long or undefined time periods [13]. Instead, it focuses on the current experience or on a highly salient episode in the recent past, e.g. strongest craving in the last day or week. This focus should help respondents recall a concrete experience rather than responding on the basis of generic knowledge or attempting to derive an average. The flexibility of timeframes allows the repeated use of the full form or the intensity subscale in self-monitoring or experimental sessions. Together, Strength and Frequency forms allow researchers to test whether frequency of craving episodes or intensity of the worst episodes determines consumption and relapse.

In current smokers, versions of the CEQ-S and CEQ-F that focused on the previous 5 minutes had strong relationships with current cigarette craving and nicotine dependence. The correlation between CEQ Intensity and QSU Desire to Smoke was especially high. In the alcohol sample, differences in the timeframes used for the respective measures probably restricted the size of correlations, especially for the single-item measure obtained in the treatment session, when 57% of those answering the question had no current craving. However, intercorrelations of the 'last-week' CEQ with OCDS Obsessions were moderate to strong, and even those with current desire in Session 1 were highly significant.

This study provides robust data on the internal structure of the CEQ and offers preliminary data on its convergent validity. This brief, flexible and conceptually grounded measure provides a tool for assessing craving experience independently of behavioural variables and allows comparisons across desires for a range of consummatory behaviours.

Acknowledgements

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Table 1. Summaries of the studies.

Target	Study	Abstention	Induction	Context	Timeframe	CEQ-S			CEQ-F		
						N	M	SD	N	M	SD
Chocolate	1	No	Yes	--	now	35	3.92	1.65		--	
Chocolate	2	No	Yes	--	now	45	5.22	1.74		--	
Chocolate	3	Yes	Yes	verbal (digits)	last 10 mins	19	4.74	2.38	19	4.80	2.72
Chocolate	3	Yes	Yes	visual (matrix)	last 10 mins	17	4.22	2.27	17	4.06	2.36
Chocolate	4	No	Yes	verbal (counting)	last 10 mins	45	4.12	2.42	45	3.70	2.26
Chocolate	4	No	Yes	visual (DVN)	last 10 mins	45	3.34	2.51	45	2.68	2.26
Chocolate	4	No	Yes	visual (clay)	last 10 mins	48	3.44	2.36	48	2.77	2.31
Chocolate	10	No	no	--	last time	76	5.50	1.88	76	4.36	2.02
						330	**4.40**	**2.28**	**250**	**3.62**	**2.37**
Cigarette	5	No	no	--	now	20	5.24	1.87		--	
Cigarette	5	No	no	--	last week	20	5.97	1.96		--	
Cigarette	10	No	no	smoker	last time	89	4.53	2.14	89	3.89	2.08
Cigarette	10	No	no	exsmoker	last time	124	4.20	2.24	124	1.17	1.86
Cigarette	11	Yes	No	--	last 5 minutes	59	4.57	2.35	59	4.74	2.55
						312	**4.54**	**2.23**	**272**	**2.83**	**2.61**

Table 1 (Cont.)

Target	Study	Abstention	Induction	Context	Timeframe	CEQ-S			CEQ-F		
						N	M	SD	N	M	SD
Food	6	Yes	Yes	--	now	56	3.78	2.22		--	
Food	7	Yes	No	--	now	30	4.42	1.91		--	
Food	8	No	Yes	visual (clay)	now	56	3.79	2.05		--	
Food	9	Yes	Yes	verbal (counting)	last 10 mins	20	4.41	2.38	20	4.05	2.34
Food	9	Yes	Yes	mindwandering	last 10 mins	20	5.03	2.20	20	4.32	1.80
Food	9	Yes	Yes	visual (clay)	last 10 mins	20	4.99	1.87	20	4.64	2.16
Food	10	No	No	--	last time	110	5.61	1.57	110	4.02	2.08
						312	**4.68**	**2.07**	**170**	**4.11**	**2.09**
Alcohol	12	No	No	--	last week	**276**	**5.22**	**2.22**	**276**	**4.04**	**2.33**
All Substances						**1230**	**4.69**	**2.22**	**968**	**3.60**	**2.43**

Target indicates the substance for which cravings were being reported;

Study identifies the Study described in the text of the Method;

Abstention and Induction indicate whether participants had abstained from the target substance before completing the questionnaire or if they

had been subjected to a craving induction procedure;

Context describes any experimental task that had been experienced before completing the questionnaire

Timeframe indicates the period over which cravings were being reported;

For both the CEQ-Strength and CEQ-Frequency forms M indicates the mean scale total over all ten items (0-10) and SD the standard deviation

of these scale totals. Ns are given for both forms to allow the pooled sample sizes to be shown.

Table 2 Comparison of models over different substances and timeframes

Model	df	χ^2	CMIN/df	CFI	RMSEA (95%CI)	pClose	AIC
Combined forms, 3 factors	824	6730	8.17	.721	.086 (.084 to .088)	<.001	7106
Combined forms, 6 factors	776	3851	4.96	.855	.064 (.062 to .066)	<.001	4323
Strength form							
ACE-S 1 factor	176	2765	15.7	.737	.110 (.106 to .113)	<.001	2941
ACE-S 3 factors	164	733	4.47	.942	.053 (.049 to .057)	.087	933
ACE-S covarying errors	148	532	3.60	.961	.046 (.042 to .050)	.939	764
CEQ-S Final Model	**124**	**359**	**2.90**	**.974**	**.039 (.035 to .044)**	**1.00**	**551**
CEQ-S constrained	163	490	3.00	.963	.040 (.036 to .045)	1.00	604
CEQ-S 3 timeframes	87	303	3.49	.975	.045 (.040 to .051)	.929	459
Ditto, constrained	113	376	3.33	.970	.044 (.049 to .048)	.985	480
CEQ-S 12 studies	556	1431	2.57	.902	.036 (.034 to .038)	1.00	1639
Ditto, constrained	595	1482	2.57	.901	.035 (.033 to .037)	1.00	1612

Table 2 (continued)

Model	df	χ^2	CMIN/df	CFI	RMSEA (95%CI)	pClose	AIC
Frequency form							
ACE-F 1 factor	176	2194	12.5	.800	.109 (.105 to .113)	<.001	2370
ACE-F 3 factors	164	879	5.36	.929	.067 (.063 to .072)	<.001	1079
ACE-F covarying errors	144	592	4.11	.956	.057 (.052 to .062)	.009	832
CEQ-F Final Model	**112**	**372**	**3.32**	**.971**	**.049 (.044 to .055)**	**.604**	**588**
CEQ-F constrained	151	543	3.60	.957	.052 (.047 to .057)	.246	681
CEQ-F 2 timeframes	52	202	3.88	.983	.055 (.047 to .063)	.161	318
Ditto, constrained	65	246	3.79	.980	.054 (.047 to .061)	.185	336
CEQ-F 6 studies	248	807	3.25	.939	.048 (.045 to .052)	.755	971
Ditto, constrained	261	856	3.28	.936	.049 (.045 to .052)	.722	993

df: Degrees of Freedom for χ^2

χ^2: model vs. saturated

CMIN/df: Ratio of Chi-squared value to degrees of freedom

CFI: Comparative fit index

RMSEA: Root mean squared error of approximation with 95% confidence interval

pClose: probability of RMSEA being greater than .050 criterion; values of pClose >.05 indicate a close-fitting model.

AIC: Akaike's information criterion

[1] ACE: Alcohol Craving Experience questionnaire adapted for different consummatory targets

[2] CEQ: Craving Experience Questionnaire, modified from the ACE after removal of the 'Body' item and reassignment of 'Think'

Table 3. Composition of the 10-item Craving Experience Questionnaire (CEQ).

Factor/Item	Strength Form, CEQ-S[1]	Frequency Form, CEQ-F[1]
Intensity	**Right now…/At that time…**	**Over the last [timeframe] how often …**
Want	…how much do/did you want it?	…did you want it?
Need	…how much do/did you need it?	…did you need it?
Urge	…how strong is/was the urge to have it?	…did you have a strong urge for it?
Imagery	**Right now/At that time, how vividly do/did you**	**Over the last [timeframe] how often did you …**
Picture	…picture it	…picture it
Taste	…imagine its taste?	…imagine its taste?
Smell	…imagine its smell?	…imagine its smell?
Mouth	…imagine what it would feel like in your mouth or throat?	…imagine what it would feel like in your mouth or throat?
Intrusiveness	**Right now…/At that time…**	**Over the last [timeframe] how often…**
Not Think	…how hard are/were you trying not to think about it?	…were you trying not to think about it?
Intrusive	…how intrusive are/were the thoughts?	…were the thoughts intrusive?
Think	…how hard is/was it to think about anything else?	…was it hard to think about anything else?

1. Also tested in the analyses, but not included in the final CEQ, was 'Body' (How vividly/often did you imagine how your body would feel if you had a drink/cigarette etc.?).

Table 4. Correlations between the CEQ and other measures

| CEQ Form and Subscale | Study 11: Current smokers[1] | | Study 12: Alcohol dependent outpatients[1] | |
	QSU Desire to Smoke[2]	RTQ[3] Nicotine dependence	OCDS Obsessions[4]	Borg Scale at Treatment Session 1[5]
CEQ-S Total	.75	.67	.59	.34
CEQ-S Intensity	.74	.64	.55	.33
CEQ-S Imagery	.65	.60	.50	.31
CEQ-S Intrusiveness	.48	.43	.53	.27
CEQ-F Total	.76	.61	.62	.38
CEQ-F Intensity	.77	.61	.59	.40
CEQ-F Imagery	.67	.55	.53	.33
CEQ-F Intrusiveness	.52	.41	.56	.30

All $p \leq .001$

1. In Study 11, the CEQ referred to the *previous 5 minutes*: In Study 12, it referred to the *previous week*. In both cases, respondents rated Strength items in relation to the time when they most wanted a cigarette/alcohol drink in that period.
2. Questionnaire on Smoking Urges, Factor 1 (Desire to Smoke)
3. Revised Fagerström Tolerance Questionnaire
4. Obsessive-Compulsive Drinking Scale—Obsessions Subscale (Items 1-6, 13).
5. How much respondents currently felt like a drink (Single item, 0-5).