Evidence for the reliability and validity, and some support for the practical utility of the two-factor Consideration of Future Consequences Scale-14

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Abstract

Researchers have proposed 1-factor, 2-factor, and bifactor solutions to the 12-item Consideration of Future Consequences Scale (CFCS-12). In order to overcome some measurement problems and to create a robust and conceptually useful two-factor scale the CFCS-12 was recently modified to include two new items and to become the CFCS-14. Using a University sample, we tested four competing models for the CFCS-14: (a) a 12-item unidimensional model, (b) a model fitted for two uncorrelated factors (CFC-Immediate and CFC-Future), (c) a model fitted for two correlated factors (CFC-I and CFC-F), and (d) a bifactor model. Results suggested that the addition of the two new items has strengthened the viability of a two factor solution of the CFCS-14. Results of linear regression models suggest that the CFC-F factor is redundant. Further studies using alcohol and mental health indicators are required to test this redundancy.

Keywords

Consideration of Future Consequences Scale; Exploratory Structural Equation Modeling; Bifactor Solution

1. Introduction

The psychometric validity and reliability issues associated with the 12-item Consideration of Future Consequences Scale (CFCS; Strathman, Gleicher, Boninger, & Edwards, 1994) have been well documented (e.g., Joireman, Schaffer, Balliet, & Strathman, 2012), with evidence for a one-factor (Hevey et al., 2010; Strathman et al., 1994), a two-factor (e.g., Joireman, Balliet, Sprott, Spangenberg, & Schultz, 2008), and a Bifactor solution (McKay, Morgan, van Exel, & Worrell, 2015). Joireman et al (2012) argued that having two factors, one assessing future orientation (so called CFC-Future; CFC-F), and one assessing present orientation (so called CFC-Immediate; CFC-I), would be theoretically and practically advantageous, allowing for the simultaneous assessment of the relationship between present and future orientation and other constructs. However, in respect of the 12-item CFCS, Joireman et al (2012) also pointed out that in studies reporting a two factor solution, reliability coefficients for the CFC-F factor tended to be suboptimal ($\alpha < .70$).

For these reasons the 12-item CFCS was recently transformed into a 14-item scale (CFCS-14; Joireman et al., 2012) with the addition of two further CFC-F items. Joireman et al (2012) hoped that this would result in a more reliable CFC-F factor, and that having a psychometrically valid two factor solution would "shed a more nuanced light on the relationship between CFC and a researcher's given outcome of interest" (p. 1282).

Within the temporal psychology literature, results have generally found that present orientation is a stronger predictor of health behaviors than future orientation (e.g., Adams, 2012; Hamilton, Kives, Micevski, & Grace, 2003). However, elsewhere, some have reported operational differences between CFC-I and CFC-F. For example, Arnocky et al. (2014) reported that low scores on the CFC-I predicted environmental concern and behavioral intentions, whereas the effects for CFC-F were non-significant. Across two studies Joireman et al (2012) reported that those scoring high on CFC-F had more favorable attitudes toward, and stronger intentions to engage in health-related behaviors (exercise and healthy eating) but that scores on the CFC-I subscale were not related to exercise and healthy eating outcomes. However, while these differences have been investigated in environmental studies, as well as studies of eating behavior (also see Dassen, Houben, & Jansen, 2015), we are not aware of any evidence for the conceptual utility of two CFCS-14 factors in respect of alcohol use or mental health indicators. This study aimed to address this gap in the literature.

2. Method

2.1 Participants

Participants were 250 adults (aged 18-75 [mean (+SD) 27.54 (12.66)]; 44.4% male), recruited from a University in the North West of England. Participants completed all measures in examination-like conditions using pen and paper format. No incentives were offered for participation and completion took between 25 and 30 minutes. The study was given ethical approval by the relevant university ethics committee and all participants gave informed consent.

2.2 Measures

The CFCS-14 (Joireman et al., 2012) is made up of seven positively worded items and seven negatively worded items. Responses were on a 7-point Likert-type scale from 1 (very unlike me) to 7 (very like me). In their development of the scale Joireman et al. (2012) reported two highly reliable factors; CFC-Future (α = 0.80; present study α = .78); and CFC-Immediate (α

= 0.84; present study α = .79). Scores for items in both factors were summed to give a score for CFC-F and CFC-I. For overall CFCS score, items on the CFC-I factor were reverse scored and scores on all 14 items summed.

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) yields scores for anxiety (HADS-A) and depression (HADS-D) on separate subscales with scores ranging from zero to twenty-eight, with a higher score indicating a greater degree of anxiety or depression. Reliabilities for HADS scores in the present study were as follows: (a) HADS-A α = .82 and (b) HADS-D α = .73.

The Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) is a 10-item questionnaire with valid and reliable scores across different contexts and cultures (e.g., de Meneses-Gaya, Waldo Zuardi, Loureiro, & Crippa, 2009). When used to detect problematic alcohol use in a population of university undergraduates, AUDIT demonstrated good sensitivity (.94) and specificity (.92; Adewuya, 2005). The reliability estimate for AUDIT scores in the present study was .82.

2.3 Analyses

Four CFA models were estimated for the CFCS-14 using the robust maximum likelihood estimator in Mplus 7 (Muthén & Muthén, 2012) see (Rhemtulla, Brosseau-Liard, & Savalei, 2012): a unidimensional model (all 12 items loading onto a single factor); a two-factor orthogonal model: Items 1, 2, 6, 7, 8, 13 and 14 were assigned to CFC-F and Items 3, 4, 5, 9, 10, 11, and 12 were assigned to CFC-I; the same two-factor model described above with the factor correlation freely estimated; finally, a bifactor model (see Authors blinded) in which a third, general factor was added in addition to the two specific factors (i.e., CFC-F and CFC-I). Each item was assigned to the general factor as well as its respective CFC-F or CFC-I factor. In the bifactor model, all factor correlations were constrained to zero. The metric was set in all models by setting the factor variances to one. Additionally, we used Exploratory Structural Equation Modelling (ESEM; Asparouhov & Muthén, 2009) to examine model fit, which enables the estimation of all cross-loadings.

Model fit was adjudged by broadly employing the recommendations of Hu and Bentler (1999), who recommended comparative fit index (CFI) and the Tucker–Lewis index (TLI), of close to .95, root mean-square error of approximation (RMSEA) close to .05, and standardized root mean-square residual (SRMR) values close to .08. Reliability was examined using Omega (ω), estimated within Mplus. Finally, and in order to examine what Joireman et al. (2012) described as *the conceptual utility* of having two factors, we examined the relationship between scores on the CFCS-14 and scores for alcohol-related problems, depression and anxiety. To this end a number of linear regressions were performed.

3. Results

Results for the ESEM and CFA models are displayed in Table 1. The relative fit indices for the unidimensional model, and the two uncorrelated factors model were inadequate with CFI and TLI values below .90. Results for the RMSEA and the SRMR were also inadequate for these two models. Fit indices for both the two-correlated factors model and the bifactor model were both acceptable. In both cases CFI values were >.90 and close to .95, RMSEA values = .05, and SRMR values were <.08. While there was a substantive improvement in model fit when the two factors were permitted to correlate, the improvement in model fit was limited when moving from the two correlated factors model to the bifactor CFA model. In fact, the bifactor ESEM model was a poorer fit than the two correlated factor CFA model.

Given these equivocal results for the CFCS-14, we examined the adequacy of the bifactor CFA model and the two-correlated factors CFA model in relation to their parameter estimates. As can be seen in Table 2, in the bifactor CFC model nine of the 14 loadings on the general CFC factor were in >.40 and were statistically significant (p<.001) except items 6, 7, 8, 12 and 14 although these items all loaded >.20. Further inspection of the item loadings for the two specific factors (CFC-F and CFC-I) provides critical information regarding the appropriateness of including these factors in the scoring of the CFCS-14. Reise et al. (2010) advise that when items load strongly onto a general factor, and comparatively weaker on each of the specific factors, this provides support for consideration of a unidimensional scoring scheme. Alternatively, when items load as strongly, or more strongly onto each of the respective specific factors than they do the general factor, creation of subscales is appropriate. In terms of CFC-I, all items loaded more strongly on the general factor than the specific factor, and, in fact, loadings for all CFC-I items were non-significant. With CFC-F, all items except for item 8 loaded more strongly onto the specific factor than the general factor. However, the differences in loadings were .143 for the largest (items 6 and 14) and 0.077 for the smallest (item 7). Evidence in support of a two-factor solution is provided by means of the Omega reliability estimates, where the following values were observed: General factor, ω = .61; CFC-I, ω = .79; CFC-F, ω = .82.

Table 3 presents the factor loadings for the two-correlated factors CFA model. While all loading are significant, loadings for items 7 (CFC-F) and 12 (CFC-I) were relatively low (<0.4). Items 5 (CFC-I) and 8 (CFC-F) were the only other factors to have standardized loading below .50.

Results of the linear regression models using a two-factor (Table 4) and a single-factor CFC score (Table 5) are revealing. Firstly for AUDIT scores, controlling for sex and age, there was a significant association between higher AUDIT score and higher CFC-I score, but not CFC-F score. Results for the overall CFCS score in Table 5 show that controlling for sex and age, higher AUDIT score was significantly related to lower CFC score. Slightly different patterns of results were observed for the relationship between HADS-A and HADS-D and CFCS scores. Controlling for age and sex, only CFC-I scores were significantly related to HADS-A scores, and neither CFCI nor CFC-F scores were significantly related to HADS-D score (Table 4). Overall CFCS score was not significantly related to HADS-A score. However, overall CFCS score was significantly related to HADS-D score, controlling for sex and age.

4. Discussion

This study examined the psychometric properties of the CFCS-14 and as far as we are aware is the first to examine bifactor (CFA and ESEM) solutions for this version of the scale. The study found that both the bifactor and two correlated factor CFA models achieved adequate model fit for the CFCS-14. In fact, the fit indices for the two models were very similar. However, on closer inspection, limitations were identified within the bifactor solution (high factor loadings and a large omega on a specific factor relative to the general factor) suggesting that the two factor model was the most appropriate measurement model for the CFCS-14. This study did not find empirical support for a unidimensional solution to the CFCS-14, either in the form of a single factor or within a bifactor solution. The addition of the two new items appears to have stabilized a two factor solution within the CFCS-14 not previously observed within the CFCS-12. The findings that the CFC-I items had higher loadings on the general factor and lower loadings on the CFC-I factor (Table 2) appears, in the first instance, to support a bi-factor model. However, in view of the additional evidence regarding the operationalization of the two factors in the regression models, this conclusion cannot be substantiated. Additional to the psychometric there is also a case to be made for using two separate factors on a conceptual basis. Our examination of the relationship of overall CFCS score to other measures in the present study was only for the purpose of examining the 'practical utility' argument advanced by Joireman et al. (2012).

In their development of the CFCS-14, Joireman et al (2012) argued that adding two additional items CFC-F items would result in a more reliable CFC-F factor, and that having a psychometrically valid two factor solution would be theoretically and practically useful for the development of the study of temporal psychology. While the results of the present study support the increased reliability for the CFC-F factor, results also suggest that the CFC-F factor is somewhat redundant in terms of its relationship with AUDIT and HADS scores. While it might be unwise to draw definitive conclusions based on one study, the results raise questions about the theoretical and practical utility of the CFCS-14 in terms of predicting alcohol-related problems and psychopathology. Indeed, the fact that overall CFCS score was significantly related to HADS-D score (Table 5), but neither of the CFC subscales were (Table 4), does not support a 'practical utility' argument. Further research will be required in other samples. Moreover, that the two factors are oppositely worded (CFC-F is positive and CFC-I is negative), one could argue that their relative internal consistency and separation is an artefact of their wording rather than their independence. It is not possible to examine this in the present study but future research should seek to test this. For example, alternative versions of the CFCS could be tested, wherein half of the CFC-F and CFC-I items would be negatively and positively worded, respectively.

The study is not without limitations. Firstly, the sample size is smaller than ideal, although even with the use of the CFCS-14 the participant/item ratio is almost 18:1. Secondly, the generalizability of the findings beyond an academic population (for example to an adolescent population as in McKay et al., 2015) remains uncertain. Finally, the study relies entirely on self-report. However, in conclusion we suggest that while the CFCS-14 is a psychometrically valid and the CFC-F factor is reliable, it’s theoretical and practical utility in terms of alcohol use and psychopathology remains uncertain.

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Table 1
CFA, ESEM and bifactor model fit indices for alternative models of the CFCS-14 (n = 250).

	χ^2	df	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR
CFCS-14							
Unidimensional Model	253.928***	77	0.768	0.725	0.096	(0.083 - 0.109)	0.076
2 uncorrelated factors CFA	192.843***	77	0.848	0.820	0.078	(0.064 - 0.091)	0.158
2 correlated factors CFA	128.657***	76	0.931	0.917	0.053	(0.036 - 0.068)	0.048
2 factors ESEM	126.900***	64	0.917	0.883	0.063	(0.047 - 0.079)	0.045
Bifactor CFA	103.657**	63	0.947	0.923	0.051	(0.032 - 0.068)	0.042
Bifactor ESEM	110.813***	52	0.923	0.865	0.067	(0.050 - 0.085)	0.035

Note: CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual;
CI = Confidence Interval; *** p<.001; ** p<.01; * p<.05.

Table 2

Standardized and unstandardized factor loadings and item R^2 for the general CFC factor and the two specific factors in the bifactor model.

	General Factor			CFC-F Specific Factor			CFC-I Specific Factor			R^2
Item	β	B	SE	B	B	SE	β	B	SE	
1	0.466	0.584	0.081	0.564	0.708	0.119				0.535
2	0.457	0.647	0.100	0.558	0.789	0.132				0.520
3	-0.810	-1.115	0.070				0.075[1]	0.103[1]	0.230	0.662
4	-0.725	-1.070	0.148				0.392[1]	0.579[1]	0.326	0.679
5	-0.429	-0.598	0.112				0.255[1]	0.355[1]	0.219	0.249*
6	0.319	0.444	0.097	0.462	0.644	0.120				0.315
7	0.225*	0.314*	0.112	0.302*	0.421*	0.125				0.142*
8	0.321	0.360	0.085	0.280*	0.315*	0.096				0.182*
9	-0.627	-0.919	0.105				-0.205[1]	-0.301[1]	0.237	0.435
10	-0.635	-0.856	0.123				-0.332[1]	-0.448[1]	0.266	0.514
11	-0.747	-0.982	0.092				-0.166[1]	-0.218[1]	0.203	0.585
12	-0.235*	-0.262*	0.086				0.027[1]	0.030[1]	0.146	0.056[1]
13	0.412	0.462	0.078	0.489	0.548	0.099				0.409
14	0.376	0.469	0.093	0.519	0.649	0.114				0.411

Note: β = Standardized coefficient (StdYX); B = unstandardized coefficient; SE = standard error of B; All factor loadings are statistically significant ($p < .001$) except *$p < .01$ and [1]non-significant.

Table 3

Standardized and unstandardized factor loadings and item R^2 for the 2 correlated factor model

	CFC-F			CFC-I			R^2
Item	β	B	SE	β	B	SE	
1	0.736	0.923	0.076				0.542
2	0.728	1.030	0.084				0.530
3				0.821	1.129	0.064	0.673
4				0.686	1.013	0.089	0.471
5				0.425	0.593	0.100	0.181
6	0.551	0.767	0.084				0.304
7	0.373	0.521	0.110				0.139*
8	0.430	0.482	0.077				0.184
9				0.619	0.906	0.086	0.383
10				0.618	0.833	0.088	0.382
11				0.748	0.984	0.072	0.560
12				0.236*	0.264*	0.086	0.056[1]
13	0.636	0.713	0.072				0.405
14	0.631	0.788	0.078				0.398

Note: β = Standardized coefficient (StdYX); B = unstandardized coefficient; SE = standard error of B; All estimates are statistically significant (p < .001) except *p < .01 and [1]non-significant.

Table 4 ***Summary of Linear Regression Analysis of Association Between Consideration of Future Consequences Subscales and scores on the AUDIT, HADS-A and HADS-D.***

		B	*SE* B	β	*p*-value
AUDIT					
	CFC-I	1.25	.47	.18	.008
	CFC-F	-.96	.51	-.13	.062
	Sex	-2.88	.74	-.22	.000
	Age	-.16	.03	-.32	.000
HADS-A					
	CFC-I	.66	.31	.15	.033
	CFC-F	.25	.34	.05	.462
	Sex	.61	.49	.08	.217
	Age	-.05	.02	-.16	.015
HADS-D					
	CFC-I	.18	.24	.05	.461
	CFC-F	-.42	.27	-.12	.115
	Sex	-.08	.38	-.01	.841
	Age	.03	.02	.11	.082

Note: CFCS14 = Consideration of Future Consequences Scale -14 (-I = Immediate; -F = Future); AUDIT = Alcohol Use Disorders Identification Test; HADS = Hospital Anxiety & Depression Scale (A = Anxiety; D = Depression).

Table 5. ***Summary of Linear Regression Analysis of Association Between Consideration of Future Consequences Total Score and scores on the AUDIT, HADS-A and HADS-D.***

		B	SE B	B	*p*-value
AUDIT					
	CFC	-2.23	.49	-.26	.000
	Sex	-2.88	.74	-.22	.000
	Age	-.16	.03	-.32	.000
HADS-A					
	CFC	-.47	.33	-.09	.149
	Sex	.60	.49	.08	.220
	Age	-.05	.02	-.18	.006
HADS-D					
	CFC	-.58	.25	-.15	.022
	Sex	-.08	.38	-.01	.842
	Age	.03	.02	.12	.057

Note: CFCS14 = Consideration of Future Consequences Scale -14 (-I = Immediate; -F = Future); AUDIT = Alcohol Use Disorders Identification Test; HADS = Hospital Anxiety & Depression Scale (A = Anxiety; D = Depression).