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Does the Cognitive Fusion Questionnaire Measure More than Frequency of Negative Thoughts?

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Abstract

Cognitive fusion is a psychopathological process that appears to be relevant to a wide range of disorders. This process is frequently measured with the Cognitive Fusion Questionnaire (CFQ). However, the construct validity of similar measures has been criticized for substantial overlap with distress. It is possible the CFQ may excessively measure the presence of unwanted thoughts, rather than fusion per se. Therefore, this study examined the discriminant validity of the CFQ relative to a measure of automatic negative thoughts (the Automatic Thoughts Questionnaire) in a college student sample (n = 389). While the two measures were highly correlated (ρ = .74), exploratory factor analysis demonstrated that they consistently loaded onto separate factors. The CFQ also demonstrated incremental validity in predicting distress and anxiety over four weeks when controlling for baseline automatic negative thoughts. Overall findings are consistent with the CFQ measuring its intended construct, rather than the mere presence of negative thoughts. Major limitations to generalizability include the use of a college student sample with minimal racial and ethnic diversity, and the lack of additional comparator measures.

Keywords: assessment; psychometrics; acceptance and commitment therapy; psychological inflexibility; cognitive processes

Is the Cognitive Fusion Questionnaire Measuring More than Frequency of Negative Thoughts?

Leading voices in clinical psychology have argued for a shift toward a *process-based therapy* framework where researchers identify transdiagnostic pathological processes that broadly contribute to psychological dysfunction, helping clinicians to conduct functional analyses of diverse presenting concerns (Hofmann & Hayes, 2018). Identifying such core processes, that are shared across a range of psychological problems and can be modified through specific therapeutic procedures, may help to make psychotherapy more effective and efficient.

One pathological process that has received notable attention is *cognitive fusion* (Hayes et al., 2012), defined as a process in which the literal, evaluative functions of thoughts have excessive behavior regulatory effects (i.e., responding to thoughts as if they were very important and true). For instance, someone who is cognitively fused may have the thought "No one cares for me" and disengage from relationships. In contrast, someone who is less cognitively fused might have the exact same automatic thought, and continue reaching out to others anyway. Cognitive fusion is defined not by the content of one's thoughts, but the degree to which they rigidly govern behavior in maladaptive ways. Cognitive fusion is conceptualized as one component of the broader process of *psychological inflexibility*, in which rigid and avoidant responding to internal experiences such as thoughts and emotions restricts meaningful behavior (Hayes et al., 2012).

Cognitive fusion is a promising process for conceptualizing and treating psychopathology, as it is associated with a range of psychological outcomes including depression and anxiety (Bardeen & Fergus, 2016; Carvalho et al., 2019; Krafft et al., 2019), chronic pain (Bodenlos et al., 2020), and disordered eating (Ferreira et al., 2014). Moreover, interventions

designed to reduce cognitive fusion are effective (Deacon et al., 2011; Levin et al., 2012), and changes in fusion mediate the effects of acceptance and mindfulness-based interventions (Arch et al., 2012; Gaudiano et al., 2010; Gillanders et al., 2014; Zettle et al., 2011).

However, the validity of this body of research requires accurate measurement of cognitive fusion. The most commonly used measure is the Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). The CFQ is designed to assess cognitive fusion generally, rather than in a specific context (e.g., anxiety), and as a distinct process (i.e., separate from related constructs such as experiential avoidance; Gillanders et al., 2014). Initial validation of the CFQ provided evidence of sound internal consistency, unidimensionality, and incremental validity over related processes in predicting distress (Gillanders et al., 2014).

A growing body of research has found that the Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011), the most commonly used measure of global psychological inflexibility (of which cognitive fusion is one component) substantially overlaps with negative affect (Francis et al., 2016; Rochefort et al., 2018; Tyndall et al., 2019; Wolgast, 2014). The AAQ-II is intended to measure how individuals respond to internal experiences such as thoughts, memories, and emotions (i.e., overly attending to or avoiding them). However, AAQ-II items loaded similarly to items measuring distress in one factor analytic study (Wolgast, 2014), and the AAQ-II correlated more strongly with measures of negative affect than measures of psychological inflexibility in two studies (Rochefort et al., 2018; Tyndall et al., 2019). These findings suggest that the AAQ-II has serious limitations to its construct validity.

More broadly, such findings suggest difficulty in distinguishing psychological *content* (i.e., thoughts and feelings) from psychological *processes* (i.e., rigid responding to such content). The same issues may be relevant to the CFQ, which includes items such as “My thoughts cause

me distress or emotional pain" and "I struggle with my thoughts." It is possible that people may highly endorse such items based only on how frequently they experience distressing thoughts, rather than how much they are fused with those thoughts when they arise. Directly evaluating the discriminant and incremental validity of the CFQ would help clarify whether cognitive fusion is being assessed as intended.

Thus, this study investigated whether the CFQ measures a construct distinct from the frequency of automatic negative thoughts, in terms of factor loadings and predictive validity. If findings support the proposition that the CFQ measures cognitive fusion specifically, it will provide further clarity on how to accurately measure cognitive fusion.

Methods

Participants

This study was conducted in a sample of college students age 18 or older (n = 389) at the authors' institution (a midsize university in the Mountain West region of the USA); there were no other inclusion or exclusion criteria. Participants were recruited through an online research participation platform and received credit as applicable through their courses. Two participants self-reported random responding on a screening question, leaving a sample of 387 for analysis. Of these, 352 (90.96%) responded to the follow-up survey.

Participants were young (age M = 20.07, SD = 3.49) and mostly female (70.03%, compared to 29.97% male). Participants were typically non-Hispanic (95.87%, versus 4.18% Hispanic) and White (95.30%, compared to 0.52% American Indian/Alaska Native, 2.35% Asian, 0.52% Native Hawaiian or other Pacific Islander, 1.31% Black, and 1.57% other). Income was assessed across 6 categories, with median household income of $40,000-59,999. Some respondents were unsure of their household income (32.64%) and there was a bimodal

distribution with many reporting income under $20,000 (20.89%) or over $100,000 (16.45%). A minority of students (13.02%) reported significant distress according to the elevated cutoff on the Counseling Center Assessment of Psychological Symptoms-34 indicating a high likelihood of a clinical problem (CCAPS-34; Center for Collegiate Mental Health, 2012). Nearly half (43.8%) reported significant distress according to the low cutoff on the CCAPS-34, which represents the point at which scores are more similar to a clinical than nonclinical sample.

Procedures

All procedures were approved by the Institutional Review Board of the authors' university. Participants first provided informed consent through an online form, then were automatically directed to complete a battery of survey measures administered online. Four weeks later, participants were asked to complete a follow-up survey. Data were collected from September 2016 to December 2016.

CFQ (Gillanders et al., 2014)

The CFQ is a 7-item measure of overall cognitive fusion. Items are rated from 1 (never true) to 7 (always true) and all items are summed to derive a total score, which ranges from 7 to 49. The CFQ has support for its psychometrics including good temporal stability and convergent and divergent validity with appropriate measures (i.e., negative relationships with mindfulness, positive relationships with psychological symptoms; Gillanders et al., 2014). In this sample, based on observed baseline data, internal consistency was excellent (α = .95), and average CFQ score was 24.71 (SD = 10.34).

Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980)

The ATQ is designed to measure the frequency of automatic negative thoughts typical of depression. It comprises 30 items, which consistent of different thoughts, and participants are

asked to rate how often such thoughts occur from 1 (not at all) to 5 (all the time); items are summed to generate a total score ranging from 30 to 150. While some items may be relatively specific to depression (i.e., "Nothing feels good anymore") many are consistent with distress broadly (i.e., "My life is a mess") and the ATQ is very highly correlated with general measures of distress (Cristea et al., 2013). In this sample, internal consistency was excellent (α = .97), and the average ATQ score was 57.81 (SD = 24.76).

CCAPS-34

The CCAPS-34 is a 34-item measure of psychological symptoms in college students, including subscales for depression and generalized anxiety, and a distress index evaluating overall distress (Center for Collegiate Mental Health, 2012). The CCAPS-34 has good concurrent validity and acceptable internal consistency in college students (Locke et al., 2012). Items are rated from 0 (not at all like me) to 4 (extremely like me), and the subscales and distress index are calculated as the means of relevant items. In the present study, internal consistency was good to excellent (depression α = .89, generalized anxiety α = .82, distress index α = .92).

Analysis Plan

As preliminary steps, descriptive statistics were calculated (see Table 1) and variables were inspected for normality and missingness. Rates of missing data for variables of interest ranged from 0.78% to 3.35% at baseline and 9.04% to 9.30% at follow-up. Little's MCAR test (Little, 1988) was consistent with the hypothesis of data missing completely at random ($\chi^2(109) = 95.92$, $p = 0.81$), and this pattern of missingness is also plausible given the simple procedure and use of an unscreened college student sample.

The correlation between the CFQ and ATQ was calculated, employing pairwise deletion given the low amount of missing data at baseline.

Exploratory factor analysis was used to evaluate to what extent the CFQ and ATQ items measure distinct latent constructs. Principal axis factoring with oblimin rotation using Kaiser normalization was conducted in SPSS statistical software with all CFQ and ATQ items included. Pairwise deletion was also employed for factor analysis given minimal rates of missing data at baseline. Eigenvalues and scree plot results were inspected to select the appropriate number of factors. The results were evaluated relative to the cutoff of .30 to .40 suggesting meaningful factor loadings (Floyd & Widaman, 1995).

Finally a series of linear regressions tested whether the CFQ was predictive of outcomes longitudinally when entered into a regression model alongside ATQ and initial outcome score. As there was approximately 9% missing data at follow-up, prior to these analyses, multiple imputation was employed using the mice () function in R (van Buuren & Groothuis-Oudshoorn, 2011). Multiple imputation methods provide accurate parameter estimates when data are missing completely at random (MCAR) or missing at random (MAR; Enders, 2011). All variables used in these analyses, as well as demographics reported above, were used to generate 20 multiply imputed datasets. Linear regressions were then computed for each dataset and pooled for summary results. Given the use of highly correlated predictors, collinearity was assessed for all models.

Sensitivity analyses were conducted for relevant models based on number of complete observations using G*Power software (Faul et al., 2007). For the bivariate correlation, 374 complete pairwise observations were available, allowing good power (= 0.95) to detect a correlation with an absolute value of 0.10 or greater. For the multivariate linear regressions, 344 complete cases were available, providing acceptable power (= .80) to detect coefficients equivalent to Cohen's f^2 of 0.02, a small effect. Use of multiple imputation increases power (van

Ginkel et al, 2020); thus, this estimate provides a floor for achieved power. Finally, the present sample size is adequate for exploratory factor analysis, as sample sizes of 300-400 participants are needed when factor loadings are around .40 (Floyd & Widaman, 1995).

Results

The ATQ was slightly positive skewed at both time points (skewness = 1.10-1.17), and CCAPS-34 Depression was slightly positively skewed at follow-up (skewness=1.05). Other variables approximated normality. Exploratory factor analysis is robust to this degree of skew (Havlicek & Peterson, 1976; Watkins, 2018). Residuals for linear regressions were plotted to assess whether the assumption of normality was met.

The CFQ and ATQ had a large positive Spearman correlation at baseline ($\rho = .74$, $p < .001$). The non-parametric Spearman correlation was used as the ATQ was skewed.

Factor Analysis

Four factors were identified with eigenvalues > 1; visual inspection of the scree plot also supported a 4-factor solution and these four factors together explained 69.57% of variance in the items. CFQ items all loaded onto Factor 2 (see Table 2) with loadings $\geq .778$, and no cross-loadings greater than .093 on other factors composed of ATQ items. The largest item for an ATQ factor loading on Factor 2 was .257, indicating no meaningful cross-loadings (Floyd & Widaman, 1995). Factor 2 shared medium-to-large correlations with Factor 1 ($r = .599$), 3 ($r = .426$), and 4 ($r = .618$).

Linear Regressions

Three separate models tested the discriminant validity of the CFQ relative to the ATQ (Table 3). In the model predicting overall distress, baseline CFQ also predicted later distress ($b = 0.009$, SE = 0.004, $p = .02$) controlling for baseline distress ($b = 0.52$, SE = 0.06, $p < .001$) and

baseline ATQ (b = 0.004, SE = 0.002, p = .02). In the model predicting generalized anxiety, baseline CFQ again predicted later anxiety (b = 0.01, SE = 0.005, p = .005) controlling for baseline anxiety (b = 0.58, SE = 0.05, p < .001) and baseline ATQ, which was not significant (b = 0.001, SE = 0.002, p = .66). Residuals approximated normality for these two models. However, residuals for the initial model predicting depression at follow-up appeared to violate the assumption of homogeneity of variance. A square root transformation was applied to depression scores, after which residuals adequately approximated normality. In the model predicting depression at follow-up, baseline CFQ was not a significant predictor (b = 0.005, SE = 0.003, p = .056) when controlling for baseline ATQ (b = 0.004, SE = 0.001, p = .001) and baseline depression (b = 0.47, SE = 0.05, p < .001).

The highest variance inflation factor observed in any model in any of the 20 multiply imputed datasets was 2.95, below the range that would suggest problematic multicollinearity even according to conservative rules of thumb (O'Brien, 2007).

Discussion

This study assessed the discriminant validity of the CFQ, a measure of cognitive fusion, relative to the ATQ, a measure of the frequency of automatic negative thoughts. The two measures were very highly correlated, supporting the need to investigate whether the CFQ can appropriately distinguish cognitive fusion from the mere presence of automatic negative thoughts. Results of exploratory factor analysis indicated that, although factors shared large correlations, CFQ items very consistently loaded onto a separate latent factor relative to ATQ items. This suggests that the CFQ does indeed measure a latent variable that is distinct from the frequency of negative thoughts. This is an important finding given a related measure, the AAQ-II, has been found in multiple studies to be more strongly related to distress than to other

measures of psychological inflexibility or its components, suggesting serious limitations to its construct validity (Tyndall et al., 2019; Wolgast, 2014).

The distinguishability of these two measures was further assessed in terms of the incremental validity of the CFQ in predicting distress (i.e., depression, anxiety, and overall distress) longitudinally in a series of linear regression models controlling for negative thoughts. The CFQ predicted later distress and anxiety controlling for the same variables and the ATQ at baseline, although not depression. This is generally consistent with the proposition that the CFQ measures a distinct psychopathological process, that contributes to increased suffering over time. However, the nonsignificant result for depression does suggest its incremental validity may be more limited when compared to a measure of cognitive content that is closely related to depressive symptoms.

While it is important to establish that the CFQ measures a distinct construct, cognitive content is undoubtedly related to cognitive fusion (e.g., an individual with social anxiety may be highly fused with worries about how others perceive them, and rarely fused with other thoughts). Understanding how thoughts impact an individual requires precise assessment that fully considers the context, including their thought content and frequency, how they respond to their thoughts (e.g., cognitive fusion, overt behavior), and how their learning history and environment fosters and maintains these patterns. Thus, future research focusing on how to better evaluate cognitive fusion in a context-sensitive manner without losing rigor, for example through the use of ecological momentary assessments, is needed.

Questions of generalizability are a particularly major limitation in the present study. Participants were college students and very limited in racial and ethnic diversity, thus differing from the general population on important dimensions. It is unclear if findings would generalize

to other populations (e.g., clinical populations, those with less education, racially and culturally diverse groups). Evaluation in clinical populations is particularly crucial as cognitive fusion is most important to target when it contributes to significant obstruction in valued living. Furthermore, only one measure was employed as a specific comparator: the ATQ, which is intended to measure thoughts typical of depression. It would be useful to compare the CFQ to a greater breadth of measures, including validated measures relevant to specific samples (e.g., beliefs about belongings in hoarding disorder).

Overall, these findings are promising in suggesting that the CFQ adequately measures cognitive fusion distinct from the frequency of negative thoughts. Greater confidence can be placed in research that has been conducted with the CFQ. More broadly, results suggest that cognitive processes can be distinguished from cognitive content using self-report measures, which is important given recent findings suggesting problems in the discriminant validity of a related measure, the AAQ-II (Tyndall et al., 2019; Wolgast, 2014).

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Table 1

Descriptive Statistics for Study Variables at Baseline and Follow-up

	Baseline		Follow-up	
Measure	*M*	SD	*M*	SD
CFQ	24.73	10.40	23.20	10.22
ATQ	57.81	24.76	58.35	27.39
CCAPS-34 Depression	1.07	0.95	0.92	0.88
CCAPS-34 General Anxiety	1.34	0.90	1.20	0.85
CCAPS-34 Distress Index	1.18	0.76	1.08	0.73

Table 2

Factor Loadings

	Factor			
	1	2	3	4
CFQ1 - My thoughts cause me distress or emotional pain	.063	**.813**	.013	.026
CFQ2 - I get so caught up in my thoughts that I am unable to do the things that I most want to do	.046	**.839**	.026	.003
CFQ3 - I over-analyze situations to the point where it's unhelpful to me	-.004	**.778**	.093	-.064
CFQ4 - I struggle with my thoughts	-.014	**.974**	-.049	-.022
CFQ5 - I get upset with myself for having certain thoughts	.073	**.824**	-.08	.012
CFQ6 - I tend to get very entangled in my thoughts	-.077	**.938**	-.077	.023
CFQ7 - It's such a struggle to let go of upsetting thoughts even when I know that letting go would be helpful	-.039	**.873**	-.060	.041
ATQ1 - I feel like I'm up against the world.	-.037	.162	.193	**.438**
ATQ2 - I'm no good.	**.714**	.114	.177	-.041
ATQ3 - Why can't I ever succeed?	**.502**	.094	.342	.029
ATQ4 - No one understands me.	.238	.247	.166	.243
ATQ5 - I've let people down.	**.443**	.257	.178	.056
ATQ6 - I don't think I can go on.	.182	.045	-.066	**.569**
ATQ7 - I wish I were a better person.	**.518**	.151	.268	-.069
ATQ8 - I'm so weak.	**.591**	.142	.113	.039
ATQ9 - My life's not going the way I want it to.	.315	.014	**.406**	.197
ATQ10 - I'm so disappointed in myself.	**.613**	.088	.287	.016
ATQ11 - Nothing feels good anymore.	.085	.094	.099	**.620**
ATQ12 - I can't stand this anymore.	.137	.154	-.031	**.571**
ATQ13 - I can't get started	-.154	.134	.206	**.686**
ATQ14 - What's wrong with me?	.326	.221	.224	.297
ATQ15 - I wish I were somewhere else.	.087	.073	.283	**.445**
ATQ16 - I can't get things together	.110	.130	**.472**	.339
ATQ17 - I hate myself	**.889**	.017	-.154	.039

ATQ18 - I'm worthless	**.846**	.079	-.161	.074
ATQ19 - Wish I could just disappear	**.553**	.059	-.218	.350
ATQ20 - What's the matter with me?	**.412**	.187	.180	.220
ATQ21 - I'm a loser	**.771**	-.044	-.029	.109
ATQ22 - My life is a mess	.229	.060	**.432**	.243
ATQ23 - I'm a failure	**.885**	.022	.014	-.017
ATQ24 - I'll never make it	**.550**	-.044	.049	.302
ATQ25 - I feel so hopeless	**.470**	.095	.036	.369
ATQ26 - Something has to change	.092	.118	**.434**	.343
ATQ27 - There must be something wrong with me	.329	.104	.166	**.420**
ATQ28 - My future is bleak	.293	.016	-.065	**.572**
ATQ29 - It's just not worth it	.049	-.010	-.177	**.880**
ATQ30 - I can't finish anything	.094	.047	.146	**.605**

Note. Bold text indicates factor loadings ≥ .4.

Table 3

Longitudinal Linear Regressions

	Predicting CCAPS-34 Distress at Follow-up		
	b	SE	*p*
CFQ	0.009	0.004	.01
ATQ	0.004	0.002	.009
Baseline CCAPS-34 Distress	0.50	0.06	< .001
	Predicting CCAPS-34 Anxiety at Follow-up		
	b	SE	*p*
CFQ	0.01	0.005	.005
ATQ	0.001	0.002	.66
Baseline CCAPS-34 Anxiety	0.58	0.05	<.001
	Predicting CCAPS-34 Depression at Follow-up		
	b	SE	*p*
CFQ	0.005	0.003	.06
ATQ	0.004	0.001	.001
Baseline CCAPS-34 Depression	0.47	0.05	<.001