COGNITIVE FUSION'S PREDICTIVE POWER OF DEPRESSIVE SYMPTOMS

Abstract

Cognitive fusion refers to the dominance of verbal processes over behavior regulation, in detriment of being sensitive to contextual contingencies and pursuing valued life goals. It is a core process within Acceptance and Commitment Therapy and seems to have a crucial role in the development and maintenance of psychopathology. The first goal of this investigation was to explore the factor structure, factorial invariance and psychometrics of the Portuguese version of the Cognitive Fusion Questionnaire (CFQ). A multigroup confirmatory factor analysis attested the invariant one-dimensional factor structure of the CFQ across three samples from the general population ($n = 408$; $n = 291$; $n = 101$) with different demographic characteristics. Additionally, the CFQ showed to be a psychometrically robust and reliable measure.

A second major goal was to investigate the convergent and incremental validity of this version of CFQ ($n = 408$). Convergent validity was explored and attested with several psychological indicators. Regarding incremental validity, the predictive power of depressive symptoms of cognitive fusion and three related processes, with origin in different conceptual frameworks, was tested. Results showed that even when the effects of decentering, mindfulness and metacognitions were controlled for, cognitive fusion consistently maintained a significant and unique predictive power over depressive symptoms. These findings suggest that these processes relate differentially and independently with depressive symptoms and, moreover, that cognitive fusion has a superior contribution to its explanation. Given the evidence that cognitive fusion plays an important role in the comprehension of depressive symptoms, conceptual and clinical implications were discussed.

Keywords: cognitive fusion, Cognitive Fusion Questionnaire (CFQ), factor analysis, concurrent validity, depressive symptoms.

Concurrent effects of different psychological processes in the prediction of depressive symptoms – the role of cognitive fusion.

Acceptance and Commitment Therapy (ACT; Hayes et al. 1999) is known for its emphasis on the contextual and experiential aspects of the experience and in the relation each individual establishes with his own private events (Hayes 2004; Hayes et al. 2006). ACT proposes that most of human suffering results from psychological inflexibility (Hayes et al. 1999, 2006), which is established through six key processes: cognitive fusion, experiential avoidance, loss of flexible contact with the present, attachment to a conceptualized self, lack of values clarity, and inaction, impulsivity, or avoidant persistence (Hayes et al. 2006, 2013).

In particular, cognitive fusion consists in an excessive influence and dominance of the literal meaning of thoughts over awareness, emotion and action, making behavior insensitive to contextual contingencies and behavioral responses progressively more rigid and inflexible (Blackledge and Hayes 2001; Hayes 2004; Hayes et al. 1999, 2006, 2013; Levin and Hayes 2011).

Despite the central role and relevance of cognitive fusion in the in the development and maintenance of psychopathology (e.g., Hayes and Strosahl 2004; Hayes et al. 2006; Zettle and Hayes 1986; Zettle et al. 2011), empirical research was scarce until recently due to the absence of an adequate instrument to measure it (Gillanders et al. 2014). In order to assess this particular psychological process and to apply it in a wider range of research and clinical settings, Gillanders and cols. (2014) have developed the Cognitive Fusion Questionnaire (CFQ). Although the initial version of CFQ comprised 44 items, subsequent exploration led to the elimination of most of its items, and results from this instrument concluding analyses led to a final promising version of CFQ with 7 items assessing cognitive fusion (Gillanders et al. 2014).

There is already some empirical evidence of the relation between cognitive fusion, mainly assessed with CFQ, and psychopathology and/or other related variables. This is the case of global distress (Bolderston 2013), depression and/or anxiety (Bolderston 2013; Cvetanovski 2014; Dinis et al. 2015; Gillanders et al. 2014; Kerr 2010), health anxiety (Fergus 2015), anxiety sensitivity (Solé et al. 2015a), stress (Cvetanovski 2014), burnout (Gillanders et al. 2014), pain-related variables (Solé et al. 2015b), experiential avoidance (Dinis et al. 2015; Gillanders et al. 2014; Reuman et al. 2016), rumination (Gillanders et al. 2014; Kerr 2010; Norman 2013), paranoia (Norman 2013), body image and eating disorder symptoms (Cvetanovski 2014; Trindade and Ferreira 2014), and obsessive beliefs and

symptoms (Reuman et al. 2016). Also, cognitive fusion and rumination were found to be predictors of depression severity (Kerr 2010), and the interactive effect between cognitive fusion and experiential avoidance was also found to be a predictor of different indices of psychological distress, such as anxiety, depression, stress, and posttraumatic stress (Bardeen and Fergus 2016).

As for the relationship between cognitive fusion and other related concepts, it is less clear. In fact, within the context of distinct psychological models there is a set of constructs such as decentering (Fresco et al. 2007a), mindfulness (e.g., Kabat-Zinn 1990) and metacognitive beliefs (Wells and Matthews 1994, 1996; Wells 2000, 2009), among others, that resemble and, at some extent, overlap with cognitive (de)fusion (Luoma and Hayes 2003; Gillanders et al. 2014). Some authors argue that these constructs reflect a common mental phenomenon (Bernstein, Hadash, Lichtash, Tanay, Shepherd, and Fresco 2015) characterized as an open, objective, and distanced approach to internal experience (Naragon-Gainey and DeMarree 2017).

Common features between these constructs are clear when attending to the conceptualization of each one of them, as follows. Decentering is usually defined as the ability to be aware of and to relate to the private events of the experience from a distanced perspective. This is, recognizing them as transitory, not as truth, reality or the self, and being more acceptant and compassionate towards them, instead of acting upon them (Fresco et al. 2007a; Fresco et al. 2007b; Safran and Segal 1990; Sauer and Baer 2010; Segal et al. 2002; Teasdale et al. 2002). Bernstein and cols. go even further, adding a component of less reactivity to thought content, besides this meta-awareness and disidentification with one's subjective experience. For a more in-depth review of this broader conceptualization of decentering see Bernstein et al. (2015). Mindfulness is frequently described as the ability to experience the present moment, purposefully and consciously, by deliberately regulating attention and taking a receptive, curious, accepting and non-judgmental attitude towards experience (Baer et al. 2006; Bishop et al. 2004; Brown and Ryan 2003; Kabat-Zinn 1990; Shapiro et al. 2006). And lastly, metacognition is a multidimensional construct (Moses and Baird 1999) that encompasses beliefs about the content and nature of internal experiences; evaluations, categorizations, explanations and emotional states associated to them; and strategies aimed at responding, controlling and regulating the private experience (Wells 2000).

Additionally, the literature also shows these processes share a common fundamental role in the comprehension of psychopathology models. Studies show a strong association between depressive symptoms and cognitive fusion (e.g., Cvetanovski 2014; Dinis et al. 2015; Gillanders et al. 2014), decentering (e.g., Bieling et al. 2012; Fresco et al.

2007a; Fresco et al. 2007b; Linares et al. 2016; Mori and Tanno 2015), mindfulness (e.g., Baer et al. 2008; Brown and Ryan 2003; Carmody and Baer 2008), and metacognitive dimensions (e.g., Huntley and Fisher 2016; Lashkary et al. 2016; Sarisoy et al. 2014).

So, decentering, mindfulness, metacognition and cognitive fusion, reflect a particular way of relating with internal experience, and they have been widely investigated and empirically integrated into the specific field of psychotherapeutic models of depression (e.g., Fresco et al. 2007; Segal et al. 2002; Wells 2009; Zettle et al., 2011; respectively).

In line with the previous theoretical and empirical considerations centered in these constructs is pivotal to highlight the conceptual and empirical associations among them, and primarily to test the incremental value of cognitive fusion in comparison to the remaining processes. The comparison of their relative strength in the prediction of depression was the major aim of this investigation. To accomplish this, and since CFQ has not been previously adapted for the Portuguese general population, this investigation first examined the psychometric properties and the construct, factorial and convergent validities of the Portuguese version of the Cognitive Fusion Questionnaire for non-English speakers.

STUDY 1: FACTOR AND INVARIANCE ANALYSES OF THE PORTUGUESE VERSION OF CFQ

This study mainly aimed at exploring the factor invariance of the Portuguese version of CFQ across three different samples from the general population, as well as to investigate this non-English version of CFQ in its factor structure and psychometric characteristics.

Method

Participants

The first study included three different samples from the Portuguese general population (Table 1): the main sample of this investigation (sample I), and two supplementary samples (II and III) exceptionally collected for testing the factor invariance of CFQ across the general population.

Sample I comprised 408 subjects, 123 males (30.1%) and 285 females (69.9%), with a mean age of 25.19 years ($SD = 10.07$), and 14.27 completed years of education in average ($SD = 3.12$). In this sample, 295 (72.3%) subjects were

undergraduate students and the remaining participants reported having high ($n = 12$; 2.9%), middle ($n = 55$; 13.5%) or low class ($n = 46$; 11.3%) professions. Most of the participants were single ($n = 351$; 86%).

Sample II was constituted by 291 subjects, 112 males (38.5%) and 179 females (61.5%), with a mean age of 33.62 years ($SD = 9.87$), who reported an average of 14.17 years of education ($SD = 3.18$) and mainly having low ($n = 134$; 46%) or middle-class professions ($n = 138$; 47.4%). The majority of the sample was either single ($n = 135$; 46.4%) or married ($n = 140$; 48.1%).

Sample III was constituted by 101 participants, 8 (7.9%) males and 93 (92.1%) females, with a mean age of 21.42 years ($SD = 6.72$) and 14.16 complete years of education in average ($SD = 1.07$). All participants were undergraduate students recruited from the University of Coimbra. Regarding marital status, the major part of the sample was single ($n = 96$; 95%).

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Measures

Cognitive Fusion Questionnaire (CFQ; Gillanders et al. 2014). This scale contains 7 items designed to measure cognitive fusion (e.g., "My thoughts cause me distress or emotional pain"; "I get so caught up in my thoughts that I am unable to do the things that I most want to do"). Each item is rated on a 7-point Likert scale from 1 (*never true*) to 7 (*always true*) and the final score is computed through the sum of all items, with higher scores reflecting higher fusion with the content of cognitive events. In its original study, CFQ has shown good internal consistency across five different samples, with Cronbach's alphas ranging between .88 and .93 (Gillanders et al. 2014).

Procedures

After obtaining the authors' consent, the Cognitive Fusion Questionnaire was translated into Portuguese by a bilingual speaker (English-Portuguese). In order to guarantee the functional equivalence of the Portuguese version two experts in the ACT model carried out an independent translation of the instrument. The two translated versions were compared and refined into a single version of the questionnaire, which was then back translated by a native speaker. It was not necessary to make significant alterations to the items, so the conceptual equivalence of the final version was maintained.

The recruitment of participants to this study went through different phases. Aiming at adapting the Portuguese version of CFQ, a first sample was collected reuniting both students and non-student participants from the Portuguese general population, who completed a set of several self-report measures apart from the CFQ (with the respective data being explored in Study 2 of this paper). In addition, 29 participants were randomly selected from Sample I for participating in the assessment of CFQ's temporal stability.

A second sample of non-student participants who only completed the CFQ was also gathered. This occurred in parallel to the development and refinement of the original CFQ, which assumed provisional different lengths over time, and so the first two samples were assessed with the 28 items version of the questionnaire. In order to ensure more validity to this investigation and to explore eventual differences in the psychometrics of different CFQ versions, a third sample of participants was recruited with subjects who exclusively completed the final 7-item version of the CFQ.

Differences between the three samples in study were explored through the one-way ANOVA statistic for continuous variables, and the Chi-square test for categorical variables.

Items from all the samples under investigation were tested for asymmetry, univariate and multivariate kurtosis according to Kline's recommended guidelines (2005); and the presence of multivariate outliers was assessed with the squared Mahalanobis Distance (MD^2).

A multigroup confirmatory factor analysis (MCFA) was used for testing the extent in which parameters of the measurement model varied across the three samples considering the difference in the chi-square estimates ($\Delta\chi^2$) as criteria (Marôco 2014), which when statistically significant is an evidence of non-invariance (Byrne 2010). Results from the MCFA led to the decision of reuniting all three samples into one overall sample for the remaining statistical procedures.

The CFQ's factor structure was tested through Confirmatory Factor Analysis (CFA), conducted through IBM SPSS AMOS (version 20.0), aiming at confirming the one-dimensional structure of the Cognitive Fusion Questionnaire found by its original authors. Maximum Likelihood (ML), a widely used estimator in these statistical procedures (Brown 2006), was chosen as estimation method. Global adjustment of the model was examined with the Chi-Square test (χ^2), the Normed Chi-Square (NC), the Iterative Fit Index (IFI), the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), and the Root-Mean Square Error of Approximation (RMSEA), in line with the original authors' election. The following reference values were considered to assess the goodness of fit of the

models under investigation: a statistically non-significant Chi-Square (Bollen 1989); the lowest NC possible or, at least, ranging between 2 to 5 (Bollen 1989; Wheaton et al. 1977; Tabachnick and Fidell 2007); IFI, TLI and CFI above .95 (Brown 2006; Hu and Bentler 1998); and RMSEA under .05 as indicative of an excellent model fit, ranging between .05 and .08 as indicative of reasonable error and acceptable fit, between .08 and .10 as indicative of mediocre fit, and above .10 as an unacceptable fit (Browne and Cudeck 1993; Hu and Bentler 1998; Marôco 2014). Local adjustment indices, namely standardized regression weights, squared multiple correlations and corrected item-total correlations, were checked according to authors' guidelines (e.g., Marôco 2014; Tabachnick and Fidell 2007). Internal consistency of the instrument was assessed through Cronbach's alpha coefficient, with values above .70 considered to be acceptable according to Nunnally (1978). And paired-samples t-tests were conducted to explore test-retest reliability in a subgroup of sample I. These specific analyses were conducted with the IBM SPSS Statistics (version 20.0) software.

Results

When testing for normality of data, acceptable values of asymmetry, univariate and multivariate kurtosis were found. Additionally, preliminary statistical analyses also showed that all three samples were found to be significantly different regarding demographic characteristics, more specifically age, gender, marital status, and professional class.

Therefore, the first main statistical analysis was a multigroup confirmatory factor analysis conducted across all samples, and the goodness of fit indices of this statistical procedure can be seen at Table 2. Results are indicative of a very good adjustment for both the unconstrained and constrained models.

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Results from the MCFA corroborate the measurement invariance of the questionnaire across the three samples [$\Delta\chi^2$ = 20.77 < $\chi^2_{0.95;(12)}$ = 21.03; p = .054]. Given this result, the statistical analysis than proceeded with a CFA conducted in a unique sample, constituted by the three samples in study (N = 800). The model under test considers cognitive fusion as the latent variable and CFQ's seven items as the observed variables.

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Results from the confirmatory factor analysis can be seen in Table 3. The Chi-square test revealed to be statistically significant, what was expected since it is known to be highly influenced by different factors, as is the case of sample size (Bollen 1989). Value from the NC, used to minimize the impact of this particular factor, showed to be in accordance with the above-mentioned guiding principles (Bollen 1989; Wheaton et al. 1977; Tabachnick and Fidell 2007). IFI, TLI and CFI all presented values above the .95 cut-off point, indicative of an excellent model fit (Brown 2006; Hu and Bentler 1998). Lastly, regarding RMSEA, the overall sample showed an acceptable value of goodness of fit (Browne and Cudeck 1993; Hu and Bentler 1998; Marôco 2014), similar to the value found in a community sample in the original study (Gillanders et al. 2014).

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Investigation of the global adjustment of the model tested within the CFA was followed by the examination of local adjustment indices (Table 4). Particularly, the values of standardized regression weights (all above .63), squared multiple correlations (all superior to .40) and corrected item-total correlations (all greater than .59) confirmed that all the items have acceptable values (e.g., Marôco 2014; Tabachnick and Fidell 2007) and contribute for the measurement of cognitive fusion.

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Reliability analyses in CFQ's Portuguese version had already revealed an excellent level of internal consistency (Nunnally 1978) for the three samples under study (ranging from .89 to .94), and the Cronbach's alpha for the overall sample was found to be .90, similar in its magnitude to the original instrument.

The analysis of the questionnaire temporal stability in a 2-months period, in a subgroup of Sample I ($n = 29$), also confirmed its test-retest reliability: T1 M = 20.60 ($SD = 7.77$), T2 M = 20.93, ($SD = 8.16$), $r = .70$ ($p < .001$), t (28) = -0.96 ($p = .348$).

STUDY 2: CONVERGENT AND INCREMENTAL VALIDITIES OF THE PORTUGUESE VERSION OF CFQ

This study tests the convergent validity of CFQ by exploring its association with other psychological related constructs. The establishment of CFQ's incremental validity consisted in testing its predictive power of depressive symptoms when compared to some of the psychological processes that, from a theoretical point of view, seem to partially overlap with cognitive fusion, more specifically decentering, mindfulness, and metacognition.

Method

Participants

The analyses of this study were performed in sample I (n = 408) already described in the scope of study 1.

Measures

Cognitive Fusion Questionnaire (CFQ; Gillanders et al. 2014).

Experiences Questionnaire (EQ; Fresco 2007a; Portuguese version by Gregório et al. 2015). This questionnaire is constituted by 20 items rated on a 5-point scale from 1 (*never*) to 5 (*all the time*), and measures individual differences in decentering. It assesses three main dimensions, specifically the ability to distinguish oneself from one´s thoughts (e.g., "I can separate myself from my thoughts and feelings"), the ability to observe in a non-evaluating and non-reacting form one´s negative experiences (e.g., "I have the sense that I am fully aware of what is going on around me and inside me") and the capacity for self-compassion (e.g., "I can treat myself kindly"; Fresco et al. 2007a). In line with the authors' orientations, only the 11 items measuring decentering were used in the statistical analysis. Its total score is calculated via the sum of the items, with higher scores stating a greater ability to take a detached perspective and accept one´s private events. The original version demonstrated good psychometric properties with an internal consistency value of α = .83 (Fresco et al. 2007a). A value of .82 was found in this study.

The short form of the Metacognitions Questionnaire (MCQ-30; Wells and Cartwright-Hatton 2004; Portuguese version by Dinis and Pinto Gouveia 2011). This instrument has 30 items, rated in a 4-point Likert scale that ranges from 1 (*do not agree*) to 4 (*agree very much*), assessing individual differences in metacognitions. It comprises five subscales that evaluate different dimensions of this construct, more specifically: positive beliefs about worry (e.g.,

"worrying helps me to solve problems"); negative beliefs about worry pertaining to uncontrollability and danger (e.g., "my worrying thoughts persist, no matter how I try to stop them"); beliefs about cognitive confidence (e.g., "I do not trust my memory"); beliefs about the need to control thoughts (e.g., "if I could not control my thoughts, I would not be able to function"); and cognitive self-consciousness (e.g., "I am constantly aware of my thinking"). A total score is obtained by the sum of all 30 items and higher scores indicate greater levels of unnecessary and harmful metacognitive beliefs. The scale showed good internal consistency, both in the original version, with a Cronbach's alpha of .93 (Wells and Cartwright-Hatton 2004), and in this study (.91).

Five Facet Mindfulness Questionnaire (FFMQ; Baer et al. 2006; Portuguese version by Gregório and Pinto Gouveia 2011). This questionnaire comprises 39 items that assess five facets of mindfulness, in particular: observing (e.g., "I remain present with sensations and feelings, even when they are unpleasant or painful"), describing (e.g., "My natural tendency is to put my experiences into words"), acting with awareness (e.g., I find it difficult to stay focused on what's happening in the present"), non-judging of inner experience (e.g., "I tend to make judgments about how worthwhile or worthless my experiences are") and non-reactivity to it (e.g., "In difficult situations, I can pause without immediately reacting"). Items are rated on a 5-point Likert scale ranging from 1 (*never or rarely true*) to 5 (*very often or always true*). Each facet is rated through the mean of the items that compose it and higher scores point to higher levels of mindfulness. In the original version (Baer et al. 2006) the questionnaire demonstrated Cronbach´s alpha values ranging from .75 to .91 indicating an adequate to good level of internal consistency. In this particular study the Cronbach's alphas found ranged between .78 and .92.

Satisfaction With Life Scale (SWLS; Diener et al. 1985; Portuguese version by Neto et al. 1990). This instrument is constituted by 5 items, rated in a 7-item Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). SWLS encompasses items such as "In most ways my life is close to my ideal" and "I am satisfied with my life", to assess global life satisfaction, a cognitive component of subjective well-being. A total score is calculated via the sum of all five items, and higher scores reflect greater satisfaction with life. Diener and cols. (1985) have shown that this one-factor scale possesses good reliability ($\alpha = .87$), and in this study SWLS presented a similar level of internal consistency ($\alpha = .88$).

The short-form version of the Depression, Anxiety and Stress Scales (DASS-21; Henry and Crawford 2005; Lovibond and Lovibond 1995; Portuguese version by Pais-Ribeiro et al. 2004). This instrument is constituted by 21 items that are rated on a 4-point Likert scale that ranges between 0 (*did not apply to me at all*) and 3 (*applied to me very much, or most of the time*). The questionnaire encompasses three different scales intended to measure levels of depression (e.g., "I felt that life was meaningless"), anxiety (e.g., "I felt I was close to panic"), and stress (e.g., "I found it hard to wind down'). The total score of each scale is obtained by the sum of its items, with higher scores being indicative of greater levels of depression, anxiety and stress. Henry and Crawford (2005) found a good level of internal consistency for the depression (.88), anxiety (.82), and stress (.90) scales, and the same was found in this study (.89, .87, and .90, respectively).

Procedures

Convergent validity of the CFQ was assessed through Pearson product-moment correlations, conducted with IBM SPSS Statistics (version 20.0), and the magnitude of the associations between variables was interpreted according to Cohen's (1988) guidelines: .10 (weak), .30 (moderate), and .50 (strong). Preliminary data analyses were conducted to assess the normality of the variables and the collected data showed to be suitable for further analyses (Marôco 2010; Tabachnick and Fidell 2007).

To determine the incremental validity of CFQ in comparison to EQ, FFMQ and MCQ-30, three models were tested to explore the predictive power of cognitive fusion explaining depressive symptoms, when competing with one of these three well-known psychological processes. For this purpose, structural equation models (SEM) were tested using the IBM SPSS AMOS (version 20.0), with the parameters estimation method of Maximum Likelihood (ML). Cognitive fusion, decentering, metacognitions and mindfulness facets were considered exogenous variables and depressive symptoms were entered as an endogenous variable. Since all models were just-identified/saturated (with zero degrees of freedom) and fitted perfectly, global adjustment indices were not analyzed or reported because they didn't add any useful information and were unnecessary to the model interpretation. Path coefficients were interpreted as multiple regression coefficients and considered statistically significant at $p < .050$ level (Kline 2005). Preliminarily to these analyses, outlier detection was conducted with Mahalanobis' distance (DM^2). Data was also screened for asymmetry and multivariate kurtosis to ensure the normality of the variables (Kline 2005).

Results

The pattern of associations between cognitive fusion and some cognitive and emotional variables, namely decentering, metacognitions, mindfulness, satisfaction with life and psychopathological symptoms (depression, anxiety and stress), can be observed at Table 5.

Results showed a negative strong correlation between cognitive fusion and both decentering and the non-judging mindfulness facet. Also, negative but with a moderate magnitude were the associations found between cognitive fusion and satisfaction with life, as well as between this construct and act with awareness mindfulness facet. A weak negative correlation was found between cognitive fusion and the mindfulness facet describe. Finally, a non-significant association was found between cognitive fusion and the non-reacting mindfulness facet.

On the opposite, cognitive fusion correlated positively and strongly with stress and depressive symptoms, and with metacognitive beliefs. Equally positive but moderate was the association between cognitive fusion and anxiety symptoms. And finally, a weak positive correlation was found between cognitive fusion and the observe mindfulness facet.

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Pearson product-moment correlation coefficients revealed that cognitive fusion significantly associated with decentering, metacognitions and mindfulness. Path analyses were conducted to test the hypothesis of cognitive fusion being a significant and independent predictor of depressive symptoms above and beyond the effect of each of the other psychological constructs.

Preliminary statistics testing for normality confirmed the data suitability for proceeding with the path analyses. The first path analysis was conducted to examine the predictive power of cognitive fusion in depressive symptoms when controlling for the effect of decentering. The previous study showed a strong correlation coefficient between both predictors ($r = -.53$, $p < .001$; Table 5). Results from the path analysis revealed that both cognitive fusion ($\beta = .45$, $p < .001$) and decentering ($\beta = -.22$, $p < .001$), have an independent and unique effect on depression, and together explain 35% of the variance in depressive symptoms (Figure 1).

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Figure 1. Predictive power of cognitive fusion (CFQ) and decentering (EQ) on depressive symptoms (DASS-21 Depression subscale) in a sample of 408 subjects.

A second path analysis explored the predictive power of cognitive fusion and metacognitions on depressive symptoms. The same procedure was repeated, and results showed a strong correlation between cognitive fusion and metacognitions ($r = .54$, $p < .001$; Table 5) and a significant effect of both in depressive symptoms ($\beta = .42$, $p < .001$ and $\beta = .26$, $p < .001$, respectively). Together this model explained 36% of the variance of depressive symptoms.

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Figure 2. Predictive power of cognitive fusion (CFQ) and metacognitions (MCQ-30) on depressive symptoms (DASS-21 Depression subscale) in a sample of 408 subjects.

To explore a final model in which the five mindfulness facets and cognitive fusion predict depression a final path analysis was conducted. Results showed that describe ($\beta = -.17$, $p < .001$), act with awareness ($\beta = -.12$, $p = .009$), and nonjudge ($\beta = -.24$, $p < .001$) mindfulness facets significantly predicted depressive symptoms. Simultaneously cognitive fusion revealed an independent and significant effect ($\beta = .29$, $p < .001$) beyond the effect found for the mindfulness facets. This model explains 41% of depressive symptoms variance.

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Figure 3. Predictive power of cognitive fusion (CFQ) and mindfulness facets (FFMQ) on depressive symptoms (DASS-21 Depression subscale) in a sample of 408 subjects.

GENERAL DISCUSSION

The present investigation integrated two main studies. In study 1, the measurement invariance of CFQ was tested and established through a multigroup confirmatory factor analysis across three samples, demonstrating that these

different groups of subjects interpreted and responded to the measure in a similar way. This is, equivalence of the measurement model was established across groups with different demographic characteristics, what is a result of crucial importance in the context of this particular cross-cultural study of the CFQ, with a non-English version of the instrument. Results of a confirmatory factor analysis in a total sample of all subjects corroborated the unidimensional factor structure originally found by the authors of the measure (Gillanders et al. 2014), and evidenced consistent and acceptable global and local adjustment indices, altogether indicative of a stable factor structure and of the goodness of fit of the model under investigation. Besides the factor analyses, reliability was also explored in this study and results indicated that CFQ has a good internal consistency and an adequate temporal stability in a two-month period. Altogether, findings from this study of a non-English version of CFQ add evidence that cognitive fusion might be a universal construct, and not culturally specific.

The second study of this investigation firstly explored the convergent validity of CFQ. Results showed that, as a measure of dominance of verbal relations over direct experience, CFQ related with indices of psychological distress, more specifically with symptom measures of anxiety, stress and depression (DASS-21; Henry and Crawford 2005; Lovibond and Lovibond 1995). These findings are in accordance with some previous investigations which explored the correlations between cognitive fusion and psychopathological symptoms (Bolderston 2013; Cvetanovski 2014; Dinis et al. 2015; Gillanders et al. 2014; Kerr 2010). SWLS, that assesses global life satisfaction, the cognitive-judgmental evaluative component of subjective well-being (Diener et al. 1985; Pavot and Diener 1993), revealed to be a convergent measure of CFQ, replicating the results found in the original study of the scale (Gillanders et al. 2014).

Furthermore, in what concerns related constructs, as expected, individuals who get entangled with the content of their thoughts reported difficulty to perceive their internal events as automatic, idiosyncratic and temporary, and to adopt a decentered perspective with acceptance and compassion towards their private experiences (measured by EQ; Fresco 2007a). Results from this study corroborate some previous empirical studies (Gregório et al. 2015; Naragon-Gainey and DeMarree 2017; Norman 2013). Additionally, and in line with other studies (Bolderston 2013; Cvetanovski 2014; Gillanders et al. 2014), taking a judgmental attitude toward private events, together with the incapacity of being aware and acting consciously in the present moment (captured particularly by the nonjudge and actaware mindfulness facets of FFMQ; Baer et al. 2006) showed to be related with cognitive fusion. And finally, also linked to fusion with cognition were the metacognitive beliefs and evaluations (e.g., beliefs about need to

control negative, beliefs about uncontrollability of thoughts and danger) done by the individuals in relation with their thoughts, as well as the strategies applied by them to monitor, control and regulate their cognitive processes (captured by MCQ-30; e.g., Wells and Cartwright-Hatton 2004). As far as we know there is no previous empirical evidence on this specific association with cognitive fusion being measured by the CFQ. Altogether the majority of the correlation coefficients found attested for the convergence of this particular measure of cognitive fusion. However, in the particular case of the association between cognitive fusion and other psychological constructs, the magnitude of the correlation coefficients found is not strong enough to assume the possibility that they measure the same underlying construct.

Study 2 also intended to explore the incremental validity of CFQ. One of the major aims of this investigation was to determine the specific predictive power of cognitive fusion explaining depressive symptoms in comparison to three similar and relevant psychological processes, in a large mixed sample from the general population.

Attending to the first path analysis result, individuals who demonstrate higher cognitive fusion and present an inability to notice their thoughts as products from the thinking process itself (Hayes et al. 2004; Hayes et al. 1999; Luoma and Hayes 2003; Fletcher and Hayes 2005) and who also show an incapacity of relating to them from a distanced perspective (Fresco et al. 2007a) seem to have a higher risk to experience depressive symptoms. Second, individuals with the tendency to get caught up by the content of their own private events, generally involving a self-evaluative component (Bond et al. 2011; Luoma et al. 2007), and who also have difficulty in having their attention focused in the experience of the present moment, acting consciously and non-judgmentally towards it (Kabat-Zinn 1990) present a greater probability of experiencing depressive symptomatology. Considering the last path, individuals with excessive entanglement with the literal content of unwanted cognitions (Blackledge and Hayes 2001), who have unhelpful metacognitive beliefs and use strategies to monitor and control thoughts (Wells 2000; Wells and Cartwright-Hatton 2004) are also particular prone to present depressive symptoms.

In general, results from all path analyses were highly consistent, showing that cognitive fusion together with decentering, mindfulness or metacognitions significantly predict depressive symptoms. Additionally, cognitive fusion's predictive power magnitude was consistently superior to the effect of the remaining predictor variables. These results are particularly relevant because even sharing similarities with these other constructs, cognitive fusion demonstrated a unique contribution in the ability to predict depression when competing with the remaining concurrent predictor effects. These findings seem to suggest that these processes share a common perspective

towards internal events operating through different levels of metacognitive processes, with cognitive fusion particularly related to less reactivity to private experience (Bernstein et al. 2015). It might be that EQ, FFMQ and MCQ-30 do not reflect this particular aspect, as CFQ does.

Also, a possible explanation for this unique variance explained by cognitive fusion might have to do with one of the underlying assumptions of ACT model, stating that cognitive fusion is a key process to explain psychopathology. Individuals in fusion with their cognitions take their thoughts literally, lose flexible contact with both their experience and contextual contingencies, and have their behavior overly regulated by verbal processes (Hayes 2004; Hayes et al. 2006, 2013). In turn, this results in an incapacity to take values-based actions in the presence of unpleasant internal events (Blackledge and Hayes 2001; Bond et al. 2011; Hayes et al. 1999), conducts to psychological inflexibility and, ultimately, to psychopathology.

There are some limitations inherent to this investigation that should be mentioned. First, the psychometrics and factor structure of CFQ were only explored in non-clinical samples. Future research should explore psychometrically this version of the instrument as well as its invariance across groups in different samples (e.g., both genders, different ages, clinical settings). Second, a transversal design was used to test the unique predictive value of cognitive fusion, therefore establishing the temporal sequence of relationships between variables in the context of a longitudinal design deserves further attention. Finally, given this study only explored depression, the predictive role of cognitive fusion with different outcomes still remains unclear.

In conclusion, given the inexistence of any instrument to measure cognitive fusion in the Portuguese population this investigation centered in the exploration of CFQ's psychometric characteristics, factor structure and invariance, and convergent validity. CFQ is a psychometrically robust, reliable and valid instrument for assessing fusion with cognition in different samples of the Portuguese general population. Moreover, this paper adds empirical evidence on the incremental validity of the measure. Results elucidated that even though cognitive fusion, decentering, mindfulness and metacognitions can share some theoretical overlapping, cognitive fusion remains as a distinct process, and crucial in the understanding of depressive symptoms.

Knowing that one of the main targets of ACT is to promote psychological flexibility and greater choice of action in the context of each individual values and purposes; and that the ability to take action in valued life directions has been designed as the "explicit function" of cognitive defusion (Gillanders et al. 2014), a major clinical implication of

this investigation and this unique influence of cognitive fusion in depressive symptoms, is that cognitive fusion needs to be addressed in therapeutic settings.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Oral informed consent was obtained from all individual participants included in the study.

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Table 1. *Sociodemographic variables of samples I, II and III.*

	Sample I (*n* = 408)		Sample II (*n* = 291)		Sample III (*n* = 101)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Age	25.19	10.07	33.62	9.87	21.42	6.72
Years of education	14.27	3.12	14.17	3.18	14.16	1.07
	n	*%*	*n*	*%*	*n*	*%*
Marital status						
Single	351	86	135	46.4	96	95.0
Married	44	10.8	140	48.1	2	2.0
Divorced	12	2.9	15	5.2	0	0.0
Widowed	1	0.2	1	0.3	1	1.0
Professional class						
Low	46	11.3	134	46.0	0	0.0
Middle	55	13.5	138	47.4	0	0.0
High	12	2.9	19	6.5	0	0.0
Student	295	72.3	0	0.00	101	100
Gender						
Male	123	30.1	112	38.5	8	7.9
Female	285	69.9	179	61.5	93	92.1

COGNITIVE FUSION'S PREDICTIVE POWER OF DEPRESSIVE SYMPTOMS

Table 2. *Measurement invariance across samples I (n = 408), II (n = 291), III (n = 101).*

	χ^2	df	$\Delta\chi^2$	Δdf	NC (χ^2/df)	IFI	TLI	CFI	RMSEA (90% CI)
Unconstrained (baseline)	122.36	42			2.91	.97	.96	.97	.05 (.04-.06)
Constrained model (measurement weights)	143.13	54	20.77	12	2.65	.97	.97	.97	.05 (.04-.06)

Note: χ2 = Chi-square test; df = Degrees of freedom; Δχ2 = Chi-square differences test; Δdf = Degrees of freedom difference; NC= Normed Chi-square; IFI= Iterative Fit Index; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; RMSEA = Root-Mean Square Error of Approximation; 90% CI = Confidence Interval for RMSEA.

Table 3. *Global adjustment indices for the CFQ 7-items model in the overall sample (N = 800).*

χ^2 (df = 14)	p	NC (χ^2/df)	IFI	TLI	CFI	RMSEA (90% CI)
73,33	<.001	5,24	.98	.96	.98	.07 (.06-.09)

Note: χ2 = Chi-square test; NC= Normed Chi-square; IFI= Iterative Fit Index; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; RMSEA = Root-Mean Square Error of Approximation; 90% CI = Confidence Interval for RMSEA.

Table 4. *Means (M), standard deviations (SD), standardized regression weights (λ), squared multiple correlations (R², and corrected item-total correlations (r) for the 7-items CFQ's Portuguese version (N = 800)*

Items	M(SD)	λ	R²	r
CFQ1	3.18 (1.40)	.76	.57	.72
CFQ2	2.62 (1.37)	.77	.60	.72
CFQ3	2.16 (1.53)	.70	.50	.66
CFQ4	2.60 (1.55)	.81	.65	.75
CFQ5	3.45 (1.56)	.63	.40	.59
CFQ6	3.24 (1.45)	.72	.52	.68
CFQ7	2.98 (1.56)	.84	.71	.79
Total	21.23 (8.21)			

COGNITIVE FUSION'S PREDICTIVE POWER OF DEPRESSIVE SYMPTOMS

Table 5. *Mean (M), standard deviation (SD) and Pearson correlations between cognitive fusion and decentering, metacognitive beliefs, mindfulness, satisfaction with life, depression, anxiety, and stress for the sample under study (n = 408).*

Variables	*M*	*SD*	*r*
Cognitive fusion (CFQ)	20.63	7.76	na
Decentering (EQ)	37.92	5.37	-.53[**]
Metacognitions (MCQ-30)	63.09	14.22	.54[**]
Observing (FFMQ)	2.92	0.74	.18[**]
Describing (FFMQ)	3.31	0.70	-.23[**]
Acting with awareness (FFMQ)	3.55	0.78	-.46[**]
Non-judging (FFMQ)	3.60	0.79	-.70[**]
Non-reacting (FFMQ)	2.84	0.64	-.08
Satisfaction with life (SWLS)	25.47	6.15	-.41[**]
Depression (DASS-21)	3.91	4.03	.56[**]
Anxiety (DASS-21)	3.73	3.91	.47[**]
Stress (DASS-21)	6.63	4.60	.51[**]

Note: ** $p <.001$; na = not applicable.