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Concept and Validation of the German Version of the Cognitive Fusion Questionnaire  
(CFQ-D)

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## Concept and Validation of the CFQ-D

### Abstract

Within the ACT model of psychological flexibility, cognitive fusion (CF) refers to individuals' attitudes towards their own thoughts and beliefs, more specifically, the extent to which they identify with and are behaviorally regulated by the form and content of their own thoughts and beliefs. This concept is of growing interest for those treating chronic conditions. Evidence supports the relevance of CF in the context of pathological conditions such as chronic pain. Recently developed measures of CF are available in English but so far, have been lacking in German. This study aims to explore the reliability and validity of the German translation of the Cognitive Fusion Questionnaire (CFQ) within a clinical sample (n = 216) of patients suffering from chronic pain at a rehabilitation clinic and a non-clinical sample (n=166). Participants also completed a set of standard clinical measures as well as the German translation of the Psychological Inflexibility in Pain Scale (PIPS) to assess concurrent and convergent validity. Confirmatory factor analysis (CFA) confirmed a one-factor solution, referred to as CF, which had been identified previously. The scale had good psychometric properties. Furthermore, the CFQ-D total sum score was correlated with measures of psychological inflexibility in pain, pain intensity, self-reported state of health and limitation of physical functioning, functional ability, quality of life, pain related self-instructions and depression. Further analyses indicate that CFQ-D is a reliable and valid instrument for assessing CF in a German-speaking population.

*Keywords:* Cognitive Fusion; Confirmatory Factor Analysis; Chronic Pain

## Concept and Validation of the CFQ-D

### Highlights

- The validation of the German translation of the Cognitive Fusion Questionnaire (CFQ), the CFQ-D, is presented.
- The CFQ-D has shown to be a feasible measure in a clinical and non-clinical context.
- Across a clinical sample of chronic pain patients and a non-clinical sample the CFQ-D shows good psychometric properties, and the one-factor structure of the original measure was confirmed.

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### 1. Introduction

Recent approaches to behavioral therapy from the so-called “third wave” (McCracken, 2005) highlight the influence of contextual factors and the importance of acceptance and mindfulness in dealing with private events like feelings, bodily sensations, thoughts and impulses. Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, Kirk, & Wilson, 2012) as one of these new approaches assumes that individual differences in people’s unwillingness to expose themselves to unpleasant psychological events (e.g., anxiety, sadness or pain) play a key role in dealing with the inevitable challenges of human life. Attempts to avoid such negatively valenced private events lead people to engage in activities that are expected to be conducive towards gaining short-term relief, though often at great cost to their long term well-being.

Within the framework of ACT, cognitive fusion (CF) plays a key role in the processes underlying an individual’s attempts to avoid private events. CF refers to individuals’ attitudes and responses towards their own thoughts and beliefs, more specifically, the extent to which their cognitive events dominate their direct experience in controlling behavior. ACT has developed in parallel with basic research that attempts to explain the influence of cognition on behavior from within a behavior analytic framework known as Relational Frame Theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001). From an RFT perspective, fusion is when behavior is more likely to be influenced by derived verbal relations between stimuli, compared to direct contingency learning. In plain language, this means that our thoughts, beliefs, self-narratives come to have greater behavioral influence than other sources of behavioral regulation such as our direct experience, our own personal learning history of direct interaction with the world, or vicarious reinforcement (modeling). RFT also describes that the relative dominance of verbal relations (fusion) over other sources of behavioral regulation is controlled by contextual cues that signal whether the current context is one in which cognitive events should be influential, or whether the current context is one in which mental events are not necessarily a useful source of behavioral regulation. Given the generalized utility of responding to thoughts and beliefs as though they carry important

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information, the range of contexts that cue 'fused' responding is large, such that such contexts are probably considered to be the default.

In contrast, contexts that contain cues to be aware of, but not dominated by cognitive events are relatively fewer. In ACT, practitioners use this to make therapy a special kind of context that cues responding from a place of direct experience and to learn how to hold cognitive events in awareness without them dominating behavior. The contextual cues that are developed by the ACT therapist in this setting include use of gesture, language, imagery and metaphor that cues a relation of distinction between the person and their own mental events. In practice, these relational cues are collectively termed 'defusion strategies' (e.g. Blackledge, 2015). Defusion strategies are used to help create distance between a person and their thinking, in order to afford greater choice of responding.

In this sense, CF is an important aspect of what has been referred to as Psychological Inflexibility in the ACT-model of psychopathology, i.e. person's inability to act effectively and persist or change behavior in the service of long term valued ends when facing aversive emotions. Accordingly, CF is often associated with suffering. In the context of pain management, ACT aims to support individuals in disengaging from futile efforts to control and avoid pain and instead engaging in efforts to reach individual goals and endorse personal values without aversive private events functioning as barriers (McCracken & Vowles, 2014a). Psychological Flexibility as promoted by ACT is the capacity to deliberately change or persist with behavior consistent with one's values and goals. Psychological flexibility therefore requires the willingness to consciously and openly experience and acknowledge the ongoing emotional context in its current state, without either counteracting or avoiding aversive thoughts, feelings and bodily sensations, or striving to evoke pleasant emotions.

The concept of psychological flexibility is of growing interest for those treating chronic conditions such as chronic pain. Recent evidence suggests that ACT can help adults with chronic pain enhance physical and emotional functioning and decrease distress (for a review, see Hann & McCracken, 2014). Chronic pain is a complex biopsychosocial problem subject

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to considerable psychological influence, including influence by processes such as experiential avoidance and CF. Accordingly, McCracken, DaSilva, Skillicorn and Doherty (2014b) showed that CF is correlated with pain related acceptance, measures of depression and mental health as well as measures of social functioning, vitality, and general health. Scott, Hann and McCracken (2016) found correlations of CF with the two components of pain acceptance, pain willingness and activity engagement (measured by means of the Chronic Pain Acceptance Questionnaire CPAQ), as well as daily functioning and depression.

The originally developed measure of CF, the CFQ (Gillanders et al., 2014), showed a unifactorial structure with good model fit across different samples including over 1,800 participants, good reliability, temporal stability, validity and discriminant validity, and sensitivity to treatment effects. It was specifically developed to measure CF as a process, is neither population nor content-specific, is brief, and its implementation does not require familiarity with the construct. Findings also support the reliability and validity for its use with individuals with chronic pain (McCracken et al., 2014).

In addition to the original English-language version, validated translations of the CFQ have been made available in Brazilian-Portuguese (Lucena-Santos, Carvalho, Pinto-Gouveia, Gillanders, & Silva Oliveira, 2017), Spanish (Romero-Moreno, Losada, Márquez-González, Gillanders, & Fernández-Fernández, 2014), Catalan (Solé et al., 2016), Korean (Kim & Cho, 2015) and French (Dionne et al., 2016), but not in German.

### The current study

The principal aim of the current study was to create a German version of the CFQ and to subsequently assess its psychometric properties in order to provide researchers and practitioners with a valid and reliable instrument to measure CF in German-speaking individuals.

## 2. Material and Methods

### 2.1 Translation of the CFQ (CFQ-D)

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In a first step, the comprehensibility of a preliminary translation of the original measure (Gloster, n.d.) was evaluated within a pilot sample of 30 patients at the rehabilitation clinic. Participants reported difficulties in understanding a number of items of the initial translation. Therefore, the translated items were further modified following translation guidelines (Wild et al., 2005). The preliminary adapted German version was translated back into English by a native English speaker and the resulting items were discussed and confirmed by a consensus conference of psychologists.

## 2.2 Measures

### 2.2.1 CFQ-D

Cognitive fusion was measured by means of the seven-item German version of the Cognitive Fusion Questionnaire (Gillanders et al., 2014), the CFQ-D (see appendix). Participants are asked to rate items on a seven-point scale ranging from “never true” (1) to “always true” (7). All items are positively keyed, that is, higher scores indicate a higher level of cognitive fusion, with possible total scores ranging from 7 to 49.

### 2.2.2 General health and physical functioning

Variables related to participants' health were assessed by means of the Questionnaire for the Evaluation of Employment-related Limitation of Physical Functioning (Fragebogen zur Evaluation des erwerbsbezogenen Leistungsvermögens, FELV; Deck, Kohlmann, & Raspe, 1999). The FELV compiles a number of self-report single and multi-item scales targeting participants' overall “*State of Health*”, “*Limitation of Physical Functioning*”, their ability to perform everyday practical activities (“*Functional Ability*”), diminished quality of life due to health-related problems, with the subscales “*Loss of Energy*” and “*Lack of Sleep*”, negative pain-related self-instruction (“*Catastrophizing*”), depressive symptoms (“*Depression*”) and “*Pain Intensity*”.

#### 2.2.2.1 Single item measures



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Single item measures include *State of Health*, *Limitation of Physical Functioning* and *Pain Intensity*. Participants are asked to appraise their current state of health on a 5-point scale ranging from “very good” (1) to “bad” (5) and their current state of disability, or the extent to which they find their overall physical functioning to be limited, on a 10-point scale ranging from “not limited at all” (1) to “fully impaired” (10). *Pain Intensity* is measured as the average level of pain experienced during the past week on a 10-point scale ranging from “barely perceptible pain” (1) to “unbearable pain” (10).

### 2.2.2.2 Hannover Functional Ability Questionnaire – Backpain FfbH

In order to assess *Functional Ability*, the Hannover Functional Ability Questionnaire – Backpain (Funktionsfragebogen Hannover FfbH; Kohlmann & Raspe, 1996) is included in the FELV. This sub-questionnaire measures the extent to which pain interferes with participants’ ability to perform everyday activities. Each of twelve specific activities is rated on a 3-point scale ranging from “yes” (3) to “no, or only with outside help” (1). Raw scores are then multiplied by 100, summed, and divided by two times the number of answered items to compute total percentage scores. Total scores above 80% indicate normal ability, scores between 80 and 70% indicate moderately impaired ability, scores between 70 and 60% indicate significantly impaired ability, and scores below 60% represent a clinically relevant impairment.

### 2.2.2.3 Nottingham Health Profile NHP

Diminished quality of life due to *Loss of Energy* and *Lack of Sleep* are measured by means of subscales of the German version of the Nottingham Health Profile (NHP-E/SI; German version by Kohlmann, Bullinger, Kirchberger-Blumstein, 1997), also included in the FELV. All items require a “yes” (1) or “no” (0) answer. Scores for each subscale are summed and converted to a percentage score with a maximum score of 100 per scale, where high scores indicate diminished quality of life.

### 2.2.2.4 Pain Related Self Instructions Questionnaire FSS-CAT

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In order to measure pain-related catastrophizing thoughts, the “Catastrophizing” subscale of the Pain Related Self Instructions Questionnaire (FSS-CAT; Flor, 1991) was included in the assessment. The questionnaire consists of 9 items that are scored on a 6-point scale ranging from “almost never” (0) to “almost always” (6). Total scores range from 0 to 45, with higher scores indicating higher levels of pain catastrophizing.

### 2.2.2.5 Center for Epidemiological Studies Depression Scale CESD

Depression was assessed with the German version of the Center for Epidemiological Studies Depression Scale (CESD-D; Kohlmann & Gerbershagen, 1998). Fifteen items measure the occurrence of depressive symptoms within the last week before testing, using a 4-point scale ranging from “rarely/less than 1 day” (0) to “most of the time/5-7 days” (3). Three items are negatively keyed and are recoded prior to calculating the total score, while the rest are positively keyed.

### 2.2.3 Psychological Inflexibility in Pain Scale PIPS

The German translation of the Psychological Inflexibility in Pain Scale (PIPS; Barke, Riecke, Rief, & Glombiewski, 2015) consists of 12 items rated on a 7-point scale from 1 (“never true”) to 7 (“always true”). Eight of these items target pain avoidance behavior, forming an “Avoidance” subscale (PIPS-A). The four remaining items concern cognitive fusion, representing a “Fusion” subscale (PIPS-F). All items of the PIPS are keyed in the direction of avoidance and cognitive fusion, respectively. Total Scores for PIPS-A range from 8 to 56, and for PIPS-F from 4 to 28.

## 2.3 Participants

Two samples were collected: a clinical sample (N = 216; 91 male, Mean age = 52.55, SD = 7.42) consisting of consecutive referrals to an adult, 4-week, in-patient, interdisciplinary pain management group program at a comprehensive rehabilitation clinic of the German pension funds DRV-Nord. Patients began treatment between February and May 2017. In order to be referred to the program patients had to suffer from chronic pain in addition to

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having been diagnosed with a psychological disorder according to the International Classification of Diseases, ICD-10, chapter F. Participants in the non-clinical sample (N = 166; 53 male, Mean age = 43.34, SD = 16.66) were clinic employees, undergraduate university students and attendees at a scientific conference – most of them psychologists or physicians - who participated on a voluntary basis. Non-clinical participants differed significantly from clinical participants in variables indicative of general health such as state of health, limitation of physical functioning, and perceived pain intensity, as well as in pain avoidance and fusion, all  $F_s(1, 363) \leq 289.62, p_s < .001, \eta_{\text{partial}}^2 \geq .44$ . All participants gave their informed consent to have their data used for research purposes. See Table 1 for descriptive values.

Table 1. Descriptive values for clinical and non-clinical participants

Sample	CFQ-D	PIPS-A	PIPS-F	State of Health	Limitation of Physical Functioning	Pain Intensity
Clinical <b>Mean</b>	<b>25.25</b>	<b>33.84</b>	<b>28.19</b>	<b>3.89</b>	<b>6.21</b>	<b>5.98</b>
SD	(10.45)	(12.73)	(7.64)	(0.66)	(1.82)	(1.84)
Non-Clinical	<b>17.82</b>	<b>16.77</b>	<b>15.48</b>	<b>2.09</b>	<b>2.09</b>	<b>2.57</b>
	(8.75)	(8.27)	(6.99)	(0.77)	(2.07)	(2.00)

(CFQ-D Cognitive Fusion Questionnaire - German version; PIPS-A/-F Psychological Inflexibility in Pain Scale – subscale Avoidance / Fusion; State of Health, Limitation of Physical Functioning and Pain Intensity NRSs)

## 2.4 Procedure

Patients received their FELV questionnaire together with written information about the in-patient rehabilitation program several weeks before the start of the program. They were asked to complete the questionnaires and post the completed forms to the clinic prior to the beginning of the program. Within the first three days of the treatment course patients were asked to complete the CFQ-D as well as the German version of the PIPS. There were no missing data.

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The research study and database were granted approval by the chief privacy officer of the German pension fund DRV-Nord and the ethics committee of the University of Luebeck. Patients were asked to complete the same questionnaires (the FELV, CFQ-D and PIPS-D) once again during the last week of the program. However, the data used here are from the pre-treatment baseline assessment only.

### 2.5 Analyses

The factor structure of the CFQ-D was examined using Confirmatory Factor Analyses (CFA). CFA were performed using “lavaan” for R, version 3.1. Based on the empirical structure of the original scale in English, all items were expected to load on a single factor. Initially, unique errors were assumed to be independent. The following fit measures were considered in order to assess model fit: (a) the chi-square value ( $\chi^2$ ), (b) the root mean square error of approximation (RMSEA), (c) the comparative fit index (CFI), (d) the Tucker-Lewis-Index (TLI) and (e) the standardized root mean square residual (SRMR). As the  $\chi^2$  - significance test is highly sensitive to sample size, a more meaningful indicator of model fit is calculated by dividing  $\chi^2$  by its degrees of freedom, with  $\chi^2/df < 2$  indicating good model fit and  $\chi^2/df < 3$  indicating acceptable model fit. Regarding the measures of absolute fit, the RMSEA should be below .06 for good model fit, below .08 for fair model fit, and no greater than .10 to still be acceptable, and the SRMR should be below .08 (Hu & Bentler, 1995; 1998), whereas relative fit indices (CFI, TLI) above .95 indicate good fit. We used maximum likelihood estimation to fit the model. In order to assess convergent and predictive validity of cognitive fusion as assessed by the CFQ, bivariate correlation analyses between CFQ scores on the one hand, and the pain and fusion scales of the Psychological Inflexibility in Pain questionnaire, depression and catastrophizing, as well as measures indicative of general health such as self-assessed state of health, limitation of physical functioning, functional ability to perform everyday activities, loss of energy, lack of sleep and pain intensity on the other hand were carried out.

## 3. Results

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### 3.1 Confirmatory Factor Analysis (CFA)

For the clinical sample, chi-square was significant,  $\chi^2(216) = 33.273$ ,  $p = .003$ , with  $\chi^2/df = 2.38$ , indicating acceptable model fit. In regards to the other fit indices, the following values were observed:  $RMSEA = .08$ ,  $CFI = .986$ ,  $TLI = .979$ ,  $SRMR = .021$ . For the non-clinical sample, fit indices were  $\chi^2(166) = 35.306$ ,  $p < .001$ , with  $\chi^2/df = 2.52$ ,  $RMSEA = .096$ ,  $CFI = .979$ ,  $TLI = .969$ ,  $SRMR = .025$ . To establish (partial) measurement invariance across samples, we additionally fitted a model where factor loadings were restricted to be equal for the clinical and non-clinical group, respectively. The following fit indices were observed for this model,  $\chi^2(382) = 73.823$ ,  $p < .001$ ,  $\chi^2/df = 2.171$ ,  $RMSEA = .078$ ,  $CFI = .983$ ,  $TLI = .979$ ,  $SRMR = .035$ . Together, the combined indices indicate adequate model fit for the 1-factor solution as well as partial measurement invariance across samples. For factor loadings, see Figure 1 (values for the non-clinical sample are presented in parenthesis).

[Insert Figure 1]

### 3.2 Convergent validity

Correlation analyses revealed that cognitive fusion showed significant relations with Psychological Inflexibility in Pain as well as variables indicative of physical and psychological health. Correlations with depression, catastrophizing, as well as the Avoidance and Fusion scales of the PIPS-D were particularly prominent in both samples and tended to be higher in the clinical compared to the non-clinical sample. See Table 2 for the results of the correlation analyses.

Table 2. Correlations between the CFQ and external variables

	PIPS-A	PIPS-F	Catastrophizing	Depression	Limitation of Physical Functioning
Clinical	.49**	.42**	.44**	.60**	.33**
Non-Clinical	.49**	.48**	.63**	.60**	.35**
	State of Health	Functional Ability	Lack of Sleep	Loss of Energy	Pain Intensity

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Clinical	.23**	-.19**	.33**	.28**	.34**
Non-Clinical	.18 (n.s.)	-.21*	.31**	.44**	.21*

(\* p<.05; \*\*p<.01; PIPS-A/-F Psychological Inflexibility in Pain Scale – Avoidance/- Fusion; Catastrophizing FSS-CAT; Functional Ability FbH; Depression CESD-D; Limitation of Physical Functioning NRS; State of Health NRS; Pain Intensity NRS; Lack of Sleep NHP-SI; Loss of Energy NHP-E)

### 3.3 Reliability

Cronbach's alpha in the clinical sample was .95, in the non-clinical sample .94 indicating excellent internal consistency.

## 4. Discussion

The study presented here aimed to validate a German version of the CFQ, a questionnaire designed to assess cognitive fusion (CF), i.e. the extent to which a person becomes unhelpfully dominated by the content of their own thoughts, beliefs and emotional states, relative to other sources of behavioral regulation. Recently, CF has gained relevance in clinical research and practice as a factor that appears to be intimately related to behavioral responses to cognitive events and, therefore, to psychological problems. McCracken et al. (2014) pointed out that CF can create great disadvantages in the context of chronic pain, as it is negatively correlated with pain-related acceptance, that is a basic variable in terms of physical functioning (see also Rovner, Vowles, Gerdle, & Gillanders, 2015 and Scott, Hann, & McCracken, 2016 ). Higher levels of pain acceptance were shown to be associated with a reduced increase in pain intensity and more pronounced improvements in physical functioning in the long term (Jensen et al., 2016). Thus, assessing CF at the beginning of treatment for chronic pain may allow clinicians to more effectively target the need for awareness and defusion skills, particularly in time limited clinical or educational settings. Anecdotal evidence from clinical practice suggests that participants tend to experience difficulties in accepting chronic pain as non-threatening in terms of physical integrity as it counteracts the learned perception of pain as indicating bodily harm. Therefore, directly addressing cognitive fusion in the therapeutic context can provide another way to approach

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pain acceptance and serve affected individuals to live their lives according to their values in different contexts and cope with chronic pain in beneficial ways.

Thus, our principal aim was to assess the validity and reliability of the CFQ-D, as well as structure and dimensionality of the underlying construct. The results of our study show adequate psychometric properties of the German translation of the CFQ (Gillanders et al., 2014). It showed excellent reliability, as assessed via the internal consistency coefficient. In terms of concurrent validity, we found moderate positive correlations between CFQ-D scores on the one hand and psychological inflexibility in pain (Pain Avoidance as well as Fusion). Although we expected a higher correlation between the CFQ-D and the Fusion scale of the PIPS – seen that both are designed to measure the same construct –, it should be noted that a number of methodological issues have been reported for the German translation of the PIPS-Fusion. In particular, one item failed to correlate with the rest of the scale and showed a substantially larger standard deviation (Barke et al., 2015), possibly indicating a large degree of variation in participants' interpretation of the item. Unlike the Swedish version, the German fusion scale does not predict disability, suggesting a potential failure to fully capture the target construct. In addition, this version of the PIPS was translated from a non-validated English version without back-translation to the Swedish (validated) original, thus limiting its validity. These issues, in addition to the fact that the CFQ-D, by definition, draws on a broader scope of Cognitive Fusion (i.e., fusion with cognitive content in general) than the PIPS-Fusion (i.e., fusion with pain-related cognitive content in particular) might explain why both scales are only moderately correlated in the present sample. Nonetheless, the PIPS fusion scale was the only available measure on CF in German.

In terms of convergent validity, we found moderate positive correlations between CFQ-D scores and pain related catastrophizing self-instructions and depression on the other hand. Cognitive styles associated with depression and catastrophizing conceptually overlap with CF in that depressive or catastrophizing thinking are characterized not only by a negative bias but also in viewing these negative attributions as reality (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). This is in line with the ACT theory suggesting that higher

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levels in CF correlate with depressed mood. Moreover, similar to the original CFQ, the CFQ-D showed weak to moderate correlations with variables indicative of physical and psychological health such as limitation of physical functioning, functional ability and variables related to quality of life, i.e. loss of energy, lack of sleep and pain intensity. This outcome supports the idea that CF contributes to these processes, although they may be influenced by a multitude of factors such as physical and lifestyle conditions, among others.

The unidimensional structure of the CFQ obtained by Gillanders and colleagues (2014) held true for the German translation in both the clinical and the non-clinical sample. A confirmatory factor analysis indicated an overall good model fit in both samples, further validating the CFQ-D. Factor loadings were high for all items. Several translations of the original CFQ are currently in use. Versions of the CFQ are available in Greek, Dutch, Persian/Farsi, Italian, Polish, Turkish and European Portuguese (<https://contextualscience.org/CFQ>). To our knowledge, the only published studies on translated versions of the CFQ comprise a version in Brazilian Portuguese, tested with a sample of Brazilian women from the general population, college students and a medical sample with obese or overweight participants (Lucena-Santos et al., 2017), a Spanish version based on caregivers to patients with dementia (Romero-Moreno et al., 2014), a French version with undergraduates and individuals with chronic pain (Dionne et al., 2016), a Korean version, tested with university students (Kim & Cho, 2015) and a Catalan version tested on a sample of adolescents (Solé et al., 2016). In accordance with the original CFQ and the CFQ-D, the findings of these studies also support unifactorial solutions.

We conclude that the CFQ-D is a reliable and valid tool to measure CF in German-speaking populations and hope that providing this measure for the German speaking community will lead to further research on the construct itself as well as the significance of CF in clinical and non-clinical contexts. The CFQ-D has good psychometric properties, despite being a short questionnaire. It thus allows practitioners to efficiently and economically identify individuals with high levels of CF.



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Limitations of this study lie in its cross-sectional design, which does not allow one to draw conclusions regarding causalities between the variables. The particularly low scores of the non-clinical sample, which is unrepresenting in terms of the population, are in line with findings of other studies (e.g. Flynn, Hernandez, Hebert, James, & Kusick, 2018) and might be due to the fact, that many or at least some of the participants of the non-clinical sample are familiar with concepts concerning cognitive processes.

Furthermore, we exclusively used self-report measures, and thus subjective, measurement instruments. It would be of interest to conduct future studies on chronic pain samples with measures of more objective outcomes such as, for example, return to work rate, rate of days on sick leave, exercising or intake of pain killers. Finally, future studies should extend the current results to different contexts and populations. The temporal stability and sensitivity to treatment effects remain to be shown in further studies. We are currently planning a longitudinal study in order to evaluate whether CF as assessed by the CFQ-D might help predict treatment outcomes. Overall, further insight into the role of CF in the therapeutic process might help provide clinicians with useful information for more tailored interventions at the very start of the treatment.

### **Conflict of interest**

The authors declare no conflicts of interest.

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### **Compliance with Ethical Standards**

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The study protocol has been approved by the ethical review committee of the University of Luebeck and the chief privacy officer of the German pension fund DRV-Nord.

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## Appendix

