



Volitional Action Control and Depression in Chronic Pain: Does Action versus State Orientation Moderate the Relations of Pain-Related Cognitions to Depression?

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Accepted: 24 May 2021
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Abstract

In this study, we examined the conditional indirect and direct relations of pain-related cognitions to depression. Subjective helplessness was included as presumably mediating the relations of catastrophizing and thought suppression to depression due to motivational deficits. In addition, moderating effects of dispositional action versus state orientation were analyzed, whereby state orientation indicates volitional deficits in coping with distress. The study was based on self-report data from 536 patients with chronic non-specific low back pain at the beginning of inpatient rehabilitation. Moderated mediation analyses were performed. The indirect catastrophizing- and thought suppression-depression relations were (partially) mediated by subjective helplessness; and moderated by failure-related action versus state orientation. Moreover, action versus state orientation moderated the direct relation of thought suppression to depression. Results suggest that catastrophizing, thought suppression, and subjective helplessness do not lead to depression unless associated with self-regulatory inability (i.e., state orientation). In contrast, action-oriented patients more effectively self-regulate pain-related emotions, disengage from rumination, and distract from pain and thus better avoid the debilitating effects of negative pain-related cognitions on depression. Future research and treatment may more strongly focus on the role of motivational and volitional deficits underlying learned helplessness and depression in chronic pain.

Keywords Chronic low back pain · Catastrophizing · Thought suppression · Helplessness · Depression · Action versus state orientation

Motivational Helplessness and Functional Helplessness

In the course of long-lasting reoccurring pain and life stress, patients with chronic pain often suffer from symptoms of

helplessness and depression such as perceived uncontrollability of pain, lost hope, and elevated levels of distress (Banks & Kerns, 1996). However, not all patients with chronic pain show persistent symptoms of helplessness and depression, suggesting that patients without such symptoms may have certain characteristics that protect them from further mental health problems. To better understand learned helplessness, Kuhl (1981, 2000) suggested to differentiate between and combine content- and function-focused approaches to motivation and depression.

Content-focused approaches explain human behavior from the first-person perspective (Koole et al., 2019; Kuhl, 2012). As such, they emphasize the role of cognitive beliefs, appraisals, expectations, attributions, and other cognitive contents. For example, it is assumed that specific thought contents, such as *subjective* evaluations of value (e.g., concerning importance, threats, and demands), contribute to depression. Furthermore, this effect is assumed to be mediated by specific expectations and subjective beliefs (e.g., expected uncontrollability of aversive life stress, or low expectancy of success to cope with it) (e.g., Abramson et al., 1978; Hülsebusch et al., 2016; Klasen et al., 2006; Wortman & Brehm, 1975).

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According to Kuhl (1981, 2000) and colleagues, content-focused approaches to learned helplessness mainly explain the variance of depressive symptoms related to task-specific *motivational deficits* (or lack of efforts mediated by subjective helplessness, termed ‘motivational helplessness’).

In comparison, *function-focused approaches* explain human behavior from the third-person perspective (Koole et al., 2019; Kuhl, 2012). As such, they emphasize *objective* psychological functions. For example, it is assumed that impairments in self-regulatory ability to cope with aversive life stress function as determinants of learned helplessness and depression (Kuhl, 1981, 2000). The function-focused approach to learned helplessness explains the variance of depressive symptoms related to more general *volitional deficits* (or low ability in volitional action control, termed ‘functional helplessness’). In the present study, we examined the contributions of individual characteristics related to both content- and function-focused approaches in patients with chronic non-specific low back pain by analyzing mediating and moderating influences on depression.

Subjective Helplessness Mediating the Relations of Pain-Related Cognitions to Depression?

Contents of pain-related cognitions play a crucial role in cognitive-behavioral models of pain chronification and depression (e.g., Hasenbring & Verbunt, 2010; Maxwell et al., 1998; Rudy et al., 1988; Vlaeyen & Linton, 2000). Chronic pain is usually defined as negative sensory experience that lasts more than three months and may be perceived as highly threatening and/or demanding (Eccleston & Crombez, 1999; Van Damme et al., 2008; Vos et al., 2012). Moreover, coping with chronic pain may be a situation similar to the exposure to uncontrollable aversive events in learned helplessness experiments (Banks & Kerns, 1996). Consistent with the content-focused approach to learned helplessness and depression (e.g., Abramson et al., 1978; Hiroto & Seligman, 1975; according to Kuhl, 1981, 2000), several studies in pain research therefore suggest a mediating role of perceived uncontrollability and lost options to successfully cope with pain (e.g., Fahland et al., 2012; Hülsebusch et al., 2016; Klasen et al., 2006; Rudy et al., 1988). In this study, we subsume subjective appraisals (as well as expectations, attributions, or beliefs) of no (ability to) control and lost options to cope with pain (e.g., help-/hopelessness) under the term “subjective helplessness”.

In line with the content-focused approach as well as the Fear-Avoidance and Avoidance-Endurance Models, catastrophizing in terms of exaggerated negative thoughts of pain-related *threats* was shown to be associated with higher

levels of emotional distress and depression (Chaves & Brown, 1987; Lee et al., 2008; Gamefski & Kraaij, 2006; Hasenbring & Verbunt, 2010; Richardson et al., 2009; Sullivan et al., 1995, 2001; Vlaeyen & Linton, 2000). Recent pain research further suggests that specific catastrophizing thoughts may contribute to enduring distress and depression only if perceived controllability of pain and/or expectancy of success in coping with pain is low (Fahland et al., 2012; Hülsebusch et al., 2016; Klasen et al., 2006). In accordance with the Transactional Theory of Stress by Lazarus and Folkman (1984), a specific type of pain catastrophizing thereby was proposed as referring to primary appraisals of stressfulness (i.e., evaluating chronic pain as a serious physical illness or threat; Fahland et al., 2012; Hasenbring et al., 2012; Hülsebusch et al., 2016; Klasen et al., 2006; Sullivan et al., 1995). In comparison, subjective helplessness was linked to secondary appraisals of coping options and found to mediate the influence of threat-related primary appraisals on depression (Fahland et al., 2012; Hülsebusch et al., 2016; Klasen et al., 2006). These effects may additionally be influenced by individuals’ objective ability to cope with pain-related life stress (i.e., threats and demands). Thus, partially in line with the content-focused approach and prior cognitive-behavioral studies, we assumed that the relation of pain catastrophizing to depression is *conditionally* mediated by subjective helplessness.

Concerning pain-related *demands*, recent pain research (e.g., related to the Avoidance-Endurance Model) further suggests that pain-related thought suppression contributes to depression (Hasenbring & Verbunt, 2010; Hülsebusch et al., 2016; Klasen et al., 2006; Konietzny et al., 2018). Pain interrupts ongoing activities, demands attention, and interferes with cognitive processing and goal attainment (Eccleston & Crombez, 1999; Van Ryckeghem et al., 2012). Therefore, thought suppression may be based on primary or re-/appraisals of pain (responses) as an important challenge (Lazarus & Folkman, 1984) that demands self-control followed by attempts to suppress pain, unwanted pain-related thoughts and emotions in order to persist in goal-oriented action (Rusu & Hasenbring, 2008; Wegner et al., 1987).

Research across diverse (non-)clinical cohorts including patients with chronic low back pain could show that attempts to suppress unwanted thoughts are associated with increased intrusions of suppressed thought contents (Abramowitz et al., 2001; Wang et al., 2020) and depression (Aldao & Nolen-Hoeksema, 2010; Gilliam et al., 2010; Hülsebusch et al., 2016; Klasen et al., 2006; Konietzny et al., 2018; Najmi & Wegner, 2008; Wenzlaff & Wegner, 2000). Likewise, Wegner et al. (1993) found that attempts not to be sad may lead to counter-intentional increases in negative mood. These so-called “rebound effects” occur especially under conditions of additional cognitive load and life stress (Wang et al., 2020; Wegner, 1988; Wegner et al., 1993; Wenzlaff & Luxton, 2003).

Because pain constitutes an additional load, patients' attempts to suppress unwanted pain-related thoughts and emotions may lead to rebound effects that aggravate distress and depression: Specifically, the attempt to suppress unwanted thoughts of subjective helplessness may lead to counter-intentional increases of these particular thought contents. In addition, subjective helplessness may mediate the relation of thought suppression to depression due to perceived uncontrollable failures to suppress pain-related thoughts in general (Hülsebusch et al., 2016). Furthermore, patients may differ in their self-regulatory ability to cope with (pain-related) life stress and *some* may perceive subjective deficits in action control accordingly (Kuhl, 1983, 2000; Kuhl & Quirin, 2011). Thus, thought suppression may be *conditionally* related to depression both directly and indirectly through subjective helplessness.

Action Control Moderating the Relations of Pain-Related Cognitions to Depression?

The personality disposition of action versus state orientation captures individual differences in volitional action control (Kuhl & Beckmann, 1994b). Whereas action-oriented people show high volitional action control, state-oriented people show low volitional action control especially under conditions of increased life stress (i.e., threats and demands) (Baumann et al., 2005; Gröpel & Kuhl, 2009; Jostmann & Koole, 2007, 2010; Kuhl & Beckmann, 1994b; Kuhl & Quirin, 2011). State-oriented people's inability to sustain top-down control under threatening and demanding conditions leads to unwanted perseverating thoughts and low initiative of intended action (Kuhl & Beckmann, 1994b). These volitional deficits are due to state-oriented participants' inability to self-regulate emotions and intuitively cope with distress (Baumann et al., 2007; Koole & Kuhl, 2008; Kuhl & Beckmann, 1994b; Kuhl & Quirin, 2011). Moreover, the functional mechanisms and diverse effects of action versus state orientation have been examined in various experiments with non-reactive methods (e.g., indirect measures, objective tests) from the third-person perspective (e.g., Jostmann et al., 2005; Jostmann & Koole, 2007, 2009; Kazén et al., 2008; Koole & Fockenberg, 2011; Kuhl, 1981; Kuhl & Beckmann, 1994a, 1994b; Kuhl & Goshke, 1994; Kuhl & Helle, 1986; Ruigendijk & Koole, 2014). Thus, state orientation represents the function-focused approach to motivation and depression (Kuhl, 1981, 2000).

Action versus state orientation has two dimensions. The *failure-related* dimension captures the ability to down-regulate negative emotions and voluntarily stop ruminating about past, present, and future states under threatening conditions (i.e., state-oriented preoccupation vs. action-oriented disengagement). The *prospective* dimension captures the ability to up-regulate positive emotions and

initiate goal-oriented action and proactive coping strategies under demanding conditions (i.e., state-oriented hesitation vs. action-oriented initiative) (Jostmann et al., 2005; Kuhl & Beckmann, 1994b; Kuhl & Quirin, 2011). Moreover, state orientation was found to be positively associated with distress and depression in pain patients (Kuhl, 1983; Luka-Krausgrill et al., 1992).

Volitional deficits in state-oriented individuals were further demonstrated in non-reactive measures such as the Stroop color naming task (Friederichs et al., 2020; Gröpel et al., 2014; Jostmann & Koole, 2007; Keller et al., 1994; Ruigendijk & Koole, 2014). For example, in a study by Jostmann and Koole (2007), action-oriented individuals showed a better self-regulatory performance (i.e., less Stroop interference reflecting a better top-down control of automatized unwanted responses) compared to state-oriented individuals. Importantly, objective impairments in action control (function-focused approach) can be differentiated from deficits in subjective beliefs (content-focused approach): Action versus state orientation was associated with differences in self-regulatory performance and mental health, but not with differences in cognitive beliefs (Brunstein, 2001). However, action versus state orientation may moderate or contribute to content-focused processes concerning subjective helplessness (Kuhl, 1981, 2000). For example, state-oriented patients may be less able to self-regulate pain-related emotions, disengage from unwanted pain-related thoughts (of no control), and initiate difficult intentions to distract from pain (Kuhl, 1983).

Objectives

In this study, we examined the conditional relations of both content- and function-focused risk factors to depression in patients with chronic non-specific low back pain. *Mediation* analysis was used to model the relations of pain-related cognitions to depression. *Moderation* analysis was used to model the relations between these cognitive contents and depression as a function of the ability to cope with perceived life stress (i.e., threats and demands). Thereby, we examined, whether the relations of catastrophizing and thought suppression to depression were (partially) mediated by subjective helplessness, and whether these relations varied as a function of action versus state orientation:

H1: The mediated relation of catastrophizing to depression through subjective helplessness is multiply moderated by action versus state orientation.

H2: The partially mediated relation of thought suppression to depression through subjective helplessness is multiply moderated by action versus state orientation.

Methods

Participants and Procedure

This study is a secondary analysis of self-report data from $n = 536$ patients with chronic non-specific low back pain at the beginning of inpatient rehabilitation. Participants attended an orthopedic rehabilitation program in one of three German rehabilitation clinics ($n_A = 328$, $n_B = 107$, $n_C = 101$) and were recruited for one year. The aim of the associated primary study by Semrau et al. (2015) was to evaluate a new interprofessional rehabilitation concept in comparison to a consecutive control group that received the current standard of orthopedic rehabilitation.

Patients with non-specific low back pain lasting more than 12 weeks were regarded as eligible. Exclusion criteria were age below 18 or above 65 years, inadequate German language ability, severe impairment of vision or hearing, poor health state precluding participation in additional patient education and filling out questionnaires, severe co-morbid psychiatric disorders, and an ongoing retirement application. In detail, of $n = 680$ patients, who were assessed for eligibility at time of admission, $n = 73$ did not meet the inclusion criteria. From a total of $n = 607$ eligible pain patients, who were informed about and invited to take part at the primary study by their rehabilitation physician, $n = 18$ did not receive allocated intervention, and $n = 53$ declined to participate. We found no differences regarding sex and age between the eligible patients who were willing to participate in the primary study and those who were not (non-responders). All participants provided written informed consent, and did not receive any financial reward for participating at the primary study. For more information concerning recruitment procedure see (Semrau et al., 2015). The primary study was approved by the Ethics Committee of the University of Erlangen-Nürnberg and performed following the Declaration of Helsinki.

Participants' mean age was 49 years ($SD = 8.1$), with ages ranging from 19 to 64 years. Fifty-one percent of the sample ($n = 275$) were women, 13% ($n = 67$) were single, 10% ($n = 52$) were in a relationship, and 68% ($n = 364$) were married. Fifty-one percent ($n = 272$) had a basic school education (less than 10 years), and 21% ($n = 112$) had a higher school education (more than 10 years). Ninety percent of the sample ($n = 481$) were in paid employment, 15% ($n = 81$) were sick-listed at the beginning of the study, 48% ($n = 255$) were sick-listed within the last six months. On average, patients reported 20 days ($SD = 38.5$) of work absence, and five medical visits ($SD = 5.6$) due to back pain within the last six months.

Measures

Our study was based on self-report data including the independent, and dependent, mediator and moderator variable/s, a

covariate, and a nested variable as well as demographic characteristics and social medical information.

Independent Variables

Catastrophizing (3 items, Cronbach's $\alpha = .85$), and thought suppression (4 items, Cronbach's $\alpha = .84$) were assessed by two subscales of the Avoidance-Endurance Questionnaire (AEQ) (Hasenbring et al., 2009). Items capture the frequency of automatically occurring cognitive responses to pain. Items were introduced by "When I become aware of my pain, this thought comes to my mind.", followed by specific thought contents, such as "It is a serious illness, is it?" (catastrophizing) or "It is important not to let myself go now." (thought suppression). Patients were asked to rate the frequency of these pain-related thoughts during the past two weeks on a seven-point rating scale ranging from "Never" (0) to "Every time" (6). Higher mean scores thus indicate a higher mean frequency of pain-related thought contents.

Mediator Variable

Likewise, the mediator variable subjective helplessness (9 items, Cronbach's $\alpha = .91$) was assessed by the subscale help-/hopelessness of the Avoidance-Endurance Questionnaire (AEQ) (Hasenbring et al., 2009). Again, items capture the frequency of automatically occurring cognitive pain responses during the past two weeks, for example: "Nothing helps anymore!" (helplessness) and "It seems the pain will never ease up" (hopelessness). Patients were asked to rate the frequency of such thought contents on a seven-point rating scale ranging from "Never" (0) to "Every time" (6) with higher scores indicating a higher mean frequency of thoughts concerning subjective helplessness.

Moderator Variables

To assess dispositional action versus state orientation as the moderator, the Action Control Scale (ACS-90; Kuhl, 1994) was administered. The ACS-90 comprises two main subscales concerning failure-related action versus state orientation (disengagement versus preoccupation, Cronbach's $\alpha = .82$) and prospective action versus state orientation (initiative versus hesitation, Cronbach's $\alpha = .79$). Each subscale consists of 12 items with a dual response format capturing either the action-oriented (1) or state-oriented mode of control (0). The subscale of failure-related action (versus state) orientation (AOF) captures the ability to stop perseverating thoughts related to a past, present, or future state; for example: "When I have lost something that is very valuable to me and I can't find it anywhere: I put it out of my mind after a while" (1), "I have a hard time concentrating on something else" (0). The subscale of prospective action (versus state) orientation (AOP)

captures the ability to initiate an intended activity; for example: “When I know I must finish something soon: I find it easy to get it done and over with” (1), “I have to push myself to get started” (0). Item responses on each subscale are added up to build sum scores ranging from 0 to 12, with higher scores indicating higher action orientation (i.e., a better self-regulatory ability to cope with life stress, or higher levels of volitional action control, respectively).

Dependent Variable

Depression was assessed by the eight-item version of the depression module of the Patient Health Questionnaire (PHQ; Cronbach's $\alpha = .83$) (Kroenke & Spitzer, 2002; Löwe et al., 2002). It measures the severity of depressive symptoms over the past two weeks (e.g., “Feeling down, depressed, or hopeless”) on a four-point scale ranging from “Not at all” (0) to “Almost every day” (3) with higher sum scores indicating more severe depression.

Covariate and Nested Variable

Pain as covariate was assessed by an eleven-point numerical rating scale (NRS; 3 items, Cronbach's $\alpha = .77$) adapted from Nagel et al. (2002). Patients were asked to rate their current, worst and average pain intensity during the last week. A mean score was computed, with higher scores indicating stronger pain. The nested variable clinic indicated data from one of three German orthopedic rehabilitation clinics.

Statistical Analysis

Statistical analyses were performed using SPSS Statistics version 23 (IBM, Armonk, NY, USA). Significance levels for all analyses were set to $\alpha = 0.05$. Missing data were imputed using a multiple imputation procedure. Means, standard deviations, bivariate correlations with all study variables were computed as well as partial correlations with subjective helplessness as covariate (see Table 1). To analyze (conditional) direct and indirect effects, regression-based path analyses were conducted using the PROCESS macro provided by Hayes (2018). All correlational and path analyses were conducted as multi-level models with clinic as nested variable (fixed effect approach) to partial out effects of the three different clinics as underlying organizational units with differences in patient allocation. Moreover, all path analyses were performed with z -standardized values producing standardized regression coefficients facilitating comparability between the different models. To evaluate significance of slopes, we generated bias-corrected 95% bootstrap confidence intervals using 5000 bootstrap samples, which overcomes problems with non-normally distributed variables (e.g., low power). We tested our hypotheses by taking into account the

product-of-coefficients method for mediation analysis as well as the concept and techniques for moderated mediation by Preacher and Hayes (Hayes, 2015, 2018; Preacher et al., 2007; Preacher & Hayes, 2004). As a final step, pain as covariate was included into path analyses to control its influence on all effects.

Simple Mediation

According to the product-of-coefficients method by Preacher and Hayes (2004), mediation is indicated when the product of the estimated regression coefficients a and b , which together quantify the indirect effect of X on Y mediated through M , is significantly different from zero (see Figure 1a). *Partial mediation* thereby occurs when the regression coefficient c representing the total effect of X on Y is not totally replaced by the indirect effect ab , which means that the direct effect c' is significantly different from zero (Hayes, 2015).

Simple Moderation

Simple moderation in terms of a conditional direct effect means that the effect of an independent variable on a dependent variable varies at different levels of the moderator W that significantly interacts with the independent variable (Hayes, 2015, 2018). Single moderator effects for the a , b and c paths were separately analyzed using PROCESS model 1. Besides tests for significant interaction effects, we additionally examined at which level of the moderator the conditional effects became (non-)significant by using the Johnson-Neyman technique, as recommended by Hayes (2018). For the graphical illustration of significant interaction effects, standardized slopes for $M = 0$ and $M = 0 \pm 1 SD$ were depicted.

Moderated Mediation and Mediated Moderation

In total, both hypotheses were examined using PROCESS model 59 for moderated mediation analysis including all potential conditional indirect and direct effects (Hayes, 2018). In this study, moderated mediation is used as a general term for diverse conditional indirect effects, and occurs if the indirect (and direct) effect is in any case dependent on a moderator variable w (see Figure 1b and 1c) (Preacher et al., 2007). As a special case of moderated mediation, mediated moderation particularly occurs if a moderated first stage effect is transmitted through a mediator variable (Edwards & Lambert, 2007; Muller et al., 2005). Similar to the Johnson-Neyman technique for simple moderation, we generated bootstrapped confidence intervals (CI's) for all indirect effects on different z -values of the moderator, with significant indirect effects indicated by CI's that do not include zero.

Table 1 Descriptive statistics, bivariate Pearson correlations of central study variables and covariates (below the diagonal) as well as partial correlations (above the diagonal) with subjective helplessness as covariate. All correlations were calculated with clinic as nested variable

Measures	Range	<i>M</i> (<i>SD</i>)	CAT	TS	SH	AOF	AOP	D	P
Catastrophizing	0-6	0.90 (1.13)		-.04	-	-.07	-.06	.02	-.09*
Thought suppression	0-6	3.46 (1.46)	.18***		-	-.05	.01	.09*	.05
Subjective helplessness	0-6	2.17 (1.18)	.48***	.45***		-	-	-	-
Failure-related action orientation	0-12	5.69 (3.42)	-.20***	-.16***	-.28***		.51***	-.36***	.01
Prospective action orientation	0-12	7.40 (3.15)	-.15***	-.09*	-.22***	.54***		-.32***	.10*
Depression	0-24	6.49 (4.32)	.20***	.25***	.39***	-.42***	-.38***		.13**
Pain	0-10	5.79 (1.61)	.09*	.20***	.34***	-.09*	.02	.24***	

Note. *M* = mean, *SD* = standard deviation, CAT = Catastrophizing, TS = Thought suppression, SH = Subjective helplessness, AOF = Failure-related action orientation, AOP = Prospective action orientation, D = Depression, P = Pain; * = $p < .05$, ** = $p < .01$, *** = $p < .001$; *r* classification of magnitude by Cohen (1988): $r = .10$ small, $r = .30$, medium, $r = .50$, large correlation.

Results

Descriptives, Bivariate, and Partial Correlations

As presented beneath the descriptives in Table 1, catastrophizing and thought suppression showed a small positive correlation that vanished after partialing out covariance with subjective helplessness. Additionally, catastrophizing, thought suppression, subjective helplessness, and depression showed small to medium negative correlations with action versus state orientation. After partialing out covariance with subjective helplessness, however, the correlations between catastrophizing, thought suppression and action versus state orientation disappeared except of medium negative correlations that remained between action versus state orientation and depression. Multi-collinearity was no problem due to correlations below $r = .60$.

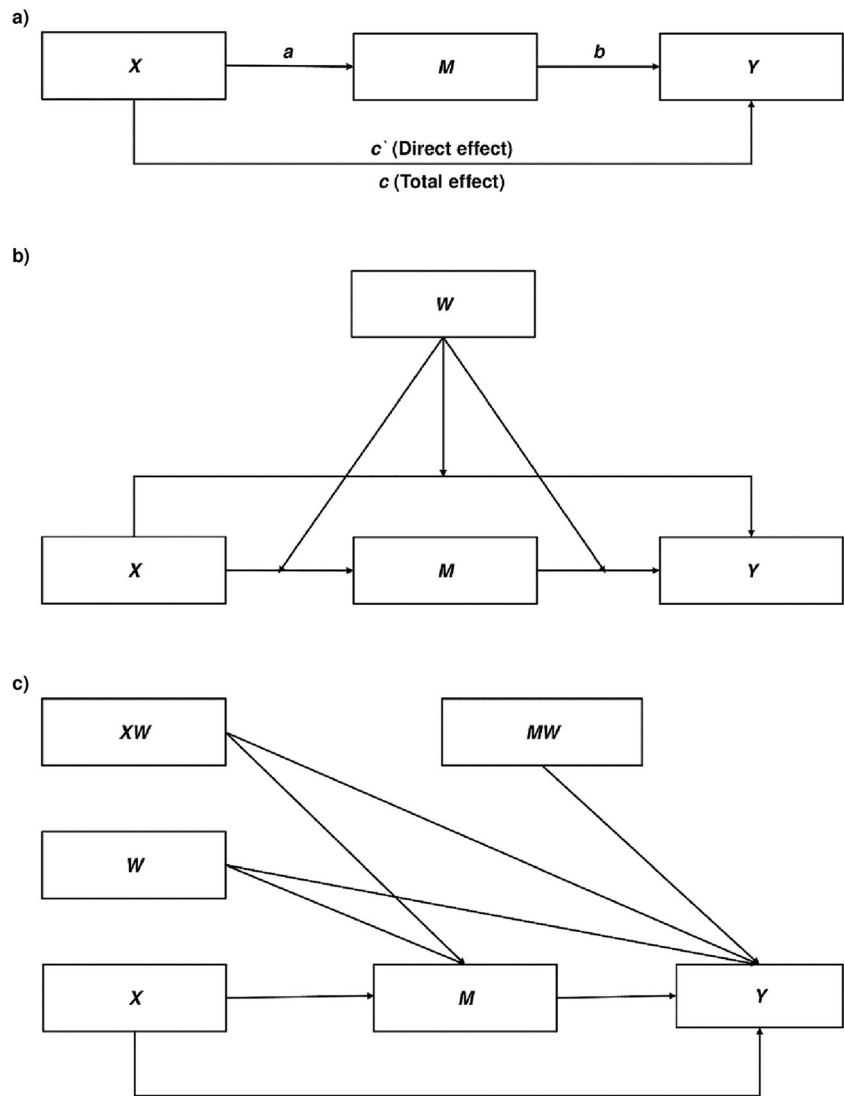
The Mediated Relation of Catastrophizing to Depression is Moderated by Action versus State Orientation

Partially confirming our first hypothesis, results revealed *failure-related action versus state orientation* as a moderator of the mediated catastrophizing-depression relation, especially at the second stage of mediation (see Figures 2a and 2b): Subjective helplessness was positively related to depression only in state-oriented persons; whereas in highly action-oriented persons, subjective helplessness was neither related to depression, nor did it mediate the relation from catastrophizing to depression

(see Figure 3c). The conditional indirect effect of catastrophizing on depression (*moderated mediation*) thereby increased in size at lower levels and vanished at higher levels of failure-related action versus state orientation at 1.5 *SD* above mean and higher (see Table 2). Likewise concerning simple moderation, the Johnson-Neyman (J-N) technique revealed a region of significance for subjective helplessness at 1.5 *SD* above mean (1.2 *SD* with pain as covariate) concerning values of failure-related action versus state orientation moderating the relation from subjective helplessness to depression.

Additionally, results revealed a moderation effect at the first stage of mediation in terms of a significant interaction of catastrophizing and failure-related action versus state orientation on subjective helplessness. Against our assumptions, however, the J-N technique did not yield any regions of non-significance for catastrophizing on subjective helplessness within the observed range of the hypothetical moderator failure-related action versus state orientation. Instead, results revealed a region of non-significance for failure-related action versus state orientation at 1.1 *SD* above mean and higher (1.0 *SD* with pain as covariate) concerning values of catastrophizing moderating the relation of failure-related action versus state orientation and subjective helplessness (see Figure 3a). Thus, at lower values of catastrophizing, state-oriented patients reported higher values of subjective helplessness than did action-oriented patients; whereas at higher values of catastrophizing, state-oriented patients did not differ from action-oriented patients concerning their values of subjective helplessness. The variance of depression explained by

Fig. 1 Illustration of a) simple mediation model as well as b) conceptual and c) statistical models for multiple moderated mediation underlying H1 and H2



the included variables was $R^2 = 27\%$ (29% with pain as covariate).

Likewise, results revealed a significant interaction effect of catastrophizing and *prospective action versus state orientation* on subjective helplessness (see Figures 2c and 2d). However, again there was no region of non-significance for the slopes of catastrophizing on subjective helplessness within the observed range of the moderator prospective action versus state orientation. Instead, the J-N technique yielded a region of significance for the slopes of prospective action versus state orientation at 0.7 *SD* above mean and higher (0.8 *SD* with pain as covariate) concerning values of catastrophizing moderating the relation of prospective action versus state orientation and subjective helplessness, similar to the moderated relationship between failure-related action versus state orientation and subjective helplessness (see Figure 3b). This indicates that there is no relationship between prospective action versus

state orientation and subjective helplessness for highly catastrophizing patients.

Against our first hypothesis, we did not find any substantial indication for the assumption that prospective action versus state orientation moderates the indirect effect of catastrophizing on depression (see also Table 2). The variance of depression explained by this model was $R^2 = 25\%$ (27% with pain as covariate).

The Partially Mediated Relation of Thought Suppression to Depression is Moderated by Action versus State Orientation

Partially confirming our second hypothesis, path analysis yielded *failure-related action versus state orientation* as (marginally) moderating the partially mediated thought suppression-depression relation at the second stage of mediation (see Figures 4a and 4b). A conditional indirect effect of

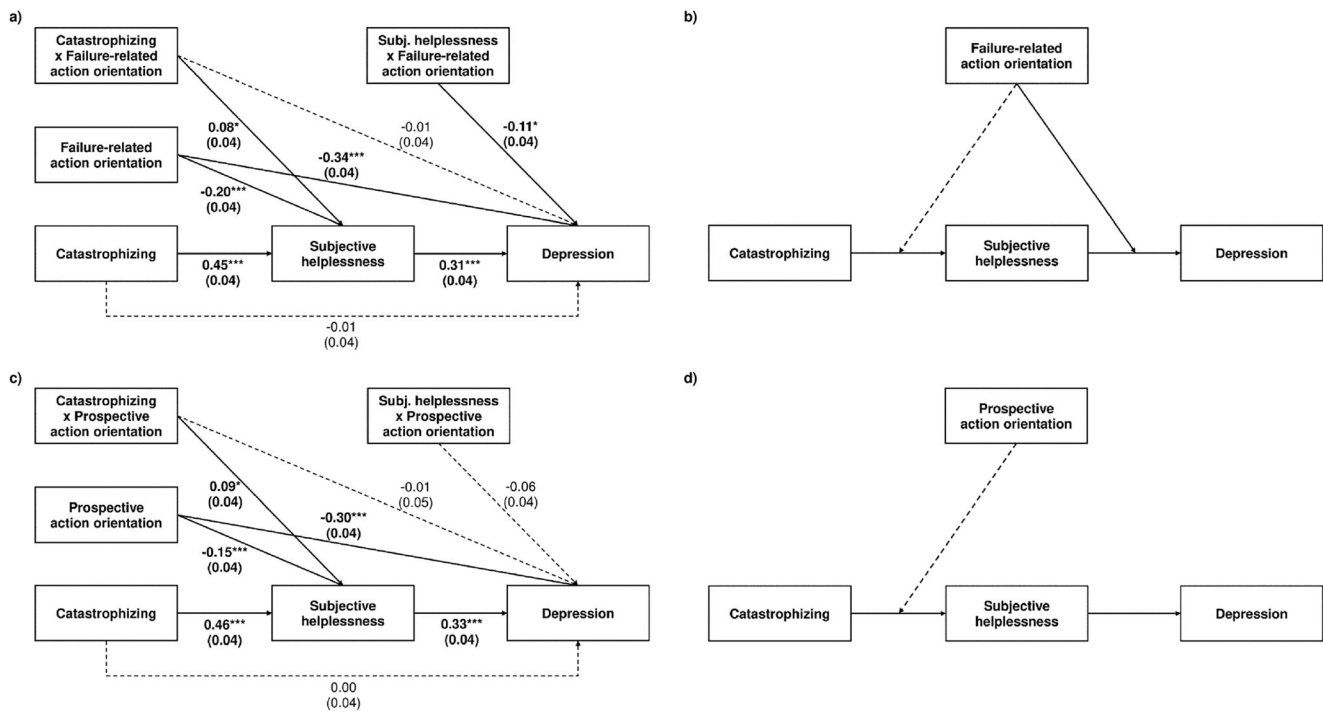


Fig. 2 a-d. Results of moderated mediation analyses concerning H1: statistical models with standardized slopes and standard errors in brackets (left panel) and their translation into conceptual models. *Note.* The *dashed arrows* in the statistical models 2a/c symbolize non-significant direct and interaction effects. In comparison, the *dashed*

arrows in the conceptual models 2b/d symbolize significant interaction effects, but unexpectedly with catastrophizing moderating the relation of action versus state orientation to subjective helplessness; * = $p < .05$, ** = $p < .01$, *** = $p < .001$

thought suppression on depression (*moderated mediation*) emerged that increased in size with higher levels of failure-related state orientation; and vanished at higher levels of failure-related action orientation at 1.5 *SD* above mean and higher (see Table 3). Thereby, the interaction effect of subjective helplessness and failure-related action versus state orientation on depression became marginally significant: subjective helplessness was positively related to depression only in state-oriented persons; whereas in highly action-oriented persons, subjective helplessness was neither related to depression, nor did it mediate the relation of thought suppression on depression (see Figure 3c).

Furthermore, we found a conditionally direct effect of thought suppression on depression moderated by failure-related action versus state orientation: The positive thought suppression-depression relation was mainly evident in state-oriented individuals; whereas in highly action-oriented individuals, thought suppression was not related to depression (see also Figures 4a and 4b). The J-N technique yielded a region of significance for thought suppression at 0.9 *SD* above mean and higher (0.7 *SD* with pain as covariate) concerning values of failure-related action versus state orientation moderating the thought suppression-depression relation (see Figure 3d). Likewise, thought suppression moderated the direct relation of failure-related action versus state orientation and depression with a region of non-significance for failure-related action

versus state orientation at -1.9 *SD* below mean and lower (-1.9 *SD* with pain as covariate) concerning values of thought suppression. Against our assumptions, we did not find an interaction effect of thought suppression and failure-related action versus state orientation on subjective helplessness. The variance of depression explained by this model was $R^2 = 29\%$ (30% with pain as covariate).

Partially in line with our second hypothesis, *prospective action versus state orientation* moderated the partially mediated thought suppression-depression relation only in terms of a conditional direct effect of thought suppression on depression (see Figures 4c, 4d, and 3e): Thought suppression was positively related to depression only in state-oriented persons; whereas in highly action-oriented persons, thought suppression was not related to depression. The J-N technique revealed a region of significance for thought suppression at 1.2 *SD* above mean and lower (0.9 *SD* with pain as covariate) concerning values of prospective action versus state orientation moderating the thought suppression-depression relation. Likewise, thought suppression moderated the direct relation of prospective action versus state orientation and depression with a region of non-significance for prospective action versus state orientation at -1.8 *SD* below mean and lower (-1.8 *SD* with pain as covariate) concerning values of thought suppression. Not in line with our assumptions, prospective action versus state orientation did not moderate the indirect thought

Table 2 Conditional indirect effects of catastrophizing on depression via subjective helplessness for z-values of the moderators failure-related (AOF) and prospective action versus orientation (AOP)

z-values of AOF and AOP	β	SE	95% CI (lower)	95% CI (upper)
Failure-related action versus state orientation (AOF)				
+2 SD	.06	.06	-.06	.19
+ 1.5 SD	.08	.05	-.00	.18
+1 SD	.11	.04	.04	.18
+ 0.5 SD	.13	.03	.07	.18
<i>M</i> = 0	.14	.02	.09	.19
- 0.5 SD	.15	.03	.10	.20
- 1 SD	.15	.03	.09	.22
- 1.5 SD	.15	.04	.08	.24
-2 SD	.15	.05	.06	.26
Prospective action versus state orientation (AOP)				
+2 SD	.13	.07	-.00	.29
+ 1.5 SD	.14	.06	.04	.26
+1 SD	.15	.04	.07	.24
+ 0.5 SD	.15	.03	.09	.22
<i>M</i> = 0	.15	.03	.10	.21
- 0.5 SD	.15	.03	.10	.21
- 1 SD	.15	.03	.08	.21
- 1.5 SD	.14	.04	.07	.22
-2 SD	.13	.05	.05	.23

Note. β = standardized regression coefficient, SE = standard error, *M* = mean, SD = standard deviation, *p* = *p*-value, 95% CI = 95% confidence interval of bootstrapped estimates. Results above the *dashed line* with 95% CI's including zero indicate that indirect effects disappear for higher levels of action orientation.

suppression-depression relation (see also Table 3). The variance of depression explained by this model was $R^2 = 26\%$ (28% with pain as covariate).

Finally, repeated path analyses with pain as covariate revealed similar results compared to the prior analyses without the covariate. All effects remained significant (or significant as a trend) after including pain as covariate (data not shown).

Discussion

In the present study, we combined content- and function-focused approaches to (learned) helplessness and examined conditional indirect and direct effects on depression due to motivational and volitional deficits (moderated mediation). We found that subjective helplessness (partially) mediated the relations of both catastrophizing and thought suppression to depression, while failure-related action versus state orientation moderated these indirect effects: Patients who reported higher levels of pain catastrophizing (and thought suppression) also showed higher levels of subjective helplessness. However, only failure-related state-oriented patients who

reported higher levels of subjective helplessness (marginally significantly) also showed more severe depression. In contrast, in more action-oriented patients, subjective helplessness was not related to depression. In addition, the direct relation of thought suppression and depression was moderated by both failure-related and prospective action versus state orientation: Only state-oriented – but not highly action-oriented – patients, who reported higher levels of thought suppression, also showed more severe depression.

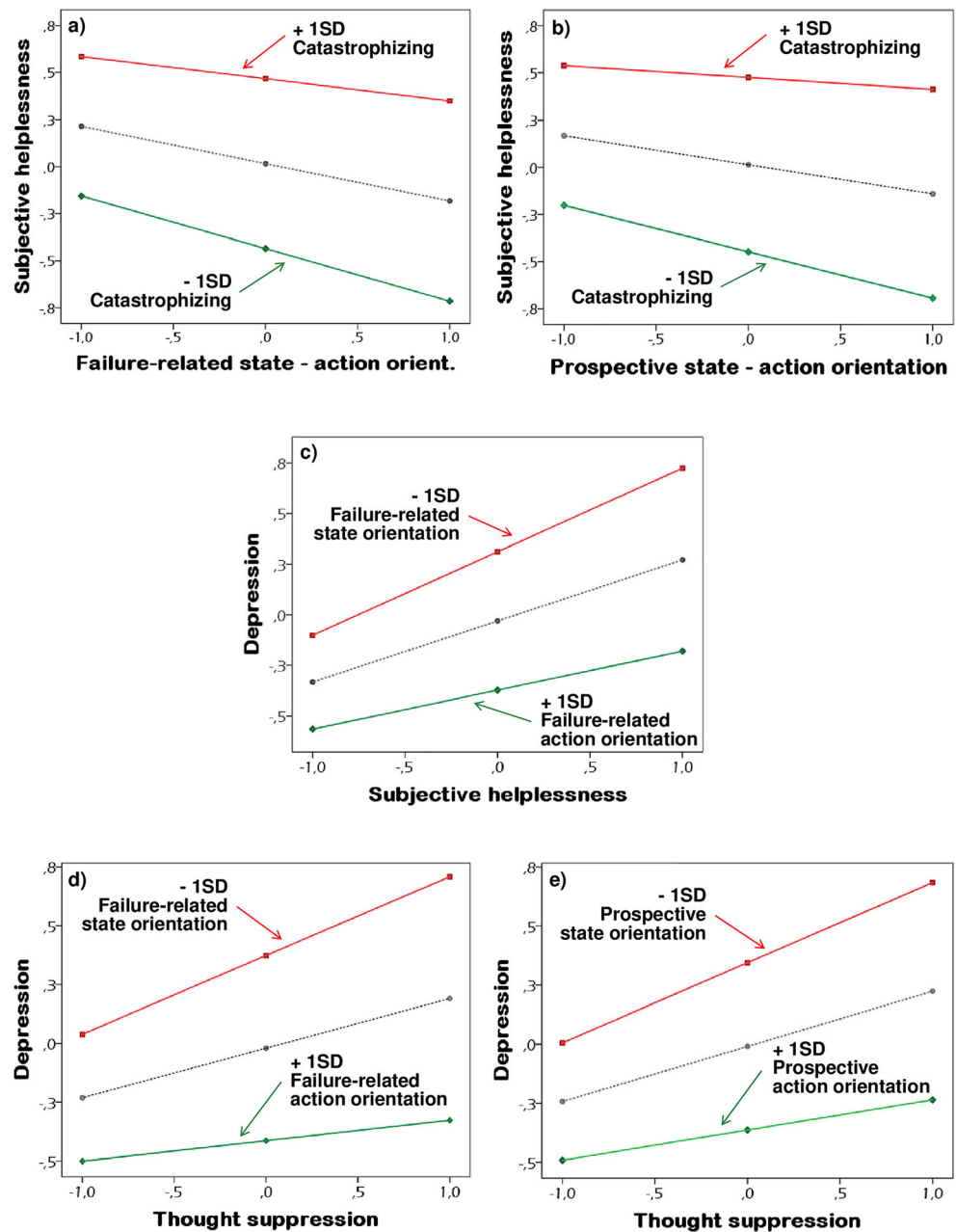
In line with prior research, findings indicate that state orientation is an additional function-focused risk factor associated with poor coping, learned helplessness, and/or depression (Beckmann & Kellmann, 2004; Brunstein, 1990; Kuhl, 1981, 1983; Kuhl & Beckmann, 1994b; Kuhl & Helle, 1986; Luka-Krausgrill et al., 1992). Hence, in line with Kuhl (1981, 2000), cognitive-behavioral approaches to depression emphasizing the mediating role of cognitive contents, such as subjective helplessness, may be valid only for state-oriented patients. In contrast, action-oriented patients' better self-regulatory abilities seem to protect them from developing more severe depression in the face of (chronic) pain and uncontrollable failure.

Our study was the first that examined action versus state orientation as a function-focused moderator of the indirect and direct relations of pain-related cognitions to depression in patients with chronic non-specific low back pain. In line with previous studies, we found that state orientation is associated with higher levels of distress and depression in pain patients (Kuhl, 1983; Luka-Krausgrill et al., 1992). In addition, we found significant negative correlations between subjective helplessness and action (versus state) orientation. The negative relations of catastrophizing and thought suppression with action orientation, however, vanished after controlling for subjective helplessness. Given that subjective helplessness was assessed by the frequency of appraisals of no control and lost options, it may reflect specific contents of perseverating state-oriented cognitions. Moreover, individuals may intuitively recognize the consequences of functional deficits in action control, such as low efficiency and uncontrollable failure in coping with pain. This, in turn, may contribute to a higher frequency of perceived threats and demands as well as increased attempts to suppress unwanted pain-related thoughts and emotions. In line with Kuhl (2000), our path-analytical results additionally indicate content- and function-focused variables as complementary due to their own unique contributions to severity of depression, basically confirming the assumption of different constructs and approaches.

Moderated Mediation of the Catastrophizing-Depression Relation

In line with our first hypothesis, the indirect relation from catastrophizing through subjective helplessness to depression

Fig. 3 a-e. Conditional direct effects at different values ($-1\ SD$, $M = 0$, $+1\ SD$) of the moderator variables action versus state orientation, and catastrophizing, with clinic as nested variable. Note. M = mean, SD = standard deviation



varied as a function of failure-related action versus state orientation, especially at the second stage of mediation. Moreover, the relations between action versus state orientation and subjective helplessness varied as a function of catastrophizing, similar to a function-focused diathesis-stress relation: At low levels of catastrophizing, state-oriented patients were more prone to subjective helplessness compared to action-oriented patients. In contrast, at high levels of catastrophizing, both state- and action-oriented patients reported equal levels of subjective helplessness.

Presumably, catastrophizing thoughts about pain-related threats, once aroused, lead to rapid increases in pain-related fears as well as selective attention towards mood-congruent

pain-related stimuli and, in turn, increases in pain (Vlaeyen & Linton, 2000). These increases in pain-related distress eventually exceed patients' coping abilities, resulting in ruminating thoughts of subjective helplessness and depression. Especially state-oriented patients quickly reach the limits of coping due to their low ability to self-regulate unpleasant emotions, disengage from failure-related rumination, and initiate proactive, self-congruent coping strategies (Baumann et al., 2007; Kuhl, 1983; Kuhl & Beckmann, 1994b; Kuhl & Quirin, 2011). In contrast, due to their better self-regulatory abilities, in action-oriented individuals elevated life stress may even be accompanied by facilitated top-down control (Jostmann & Koole, 2007, 2009; Kuhl & Quirin, 2011). At high levels of

Table 3 Conditional indirect effects of thought suppression on depression via subjective helplessness for z-values of the moderators failure-related (AOF) and prospective action orientation (AOP)

z-values of AOF and AOP	β	SE	95% CI (lower)	95% CI (upper)
Failure-related action versus state orientation (AOF)				
+2 SD	.04	.03	-.03	.11
+ 1.5 SD	.06	.03	.00	.11
+1 SD	.07	.02	.03	.12
+ 0.5 SD	.09	.02	.05	.13
<i>M</i> = 0	.11	.02	.07	.15
- 0.5 SD	.13	.03	.08	.18
- 1 SD	.15	.03	.08	.22
- 1.5 SD	.17	.04	.09	.26
-2 SD	.19	.06	.09	.31
Prospective action versus state orientation (AOP)				
+2 SD	.10	.05	.20	.20
+ 1.5 SD	.11	.04	.04	.18
+1 SD	.11	.03	.06	.17
+ 0.5 SD	.12	.02	.07	.17
<i>M</i> = 0	.12	.02	.08	.17
- 0.5 SD	.13	.03	.08	.18
- 1 SD	.13	.03	.07	.20
- 1.5 SD	.14	.04	.06	.22
-2 SD	.14	.05	.04	.26

Note. β = standardized regression coefficient, SE = standard error, *M* = mean, SD = standard deviation, *p* = *p*-value, 95% CI = 95% confidence interval of bootstrapped estimates. Results above the dashed line with 95% CI's including zero indicate that indirect effects disappear for higher levels of action orientation.

catastrophizing, however, attentional disengagement from aversive pain stimuli was demonstrated to become increasingly impossible, which explains equal levels of subjective helplessness for both state- and action-oriented patients at high levels of catastrophizing (Van Damme et al., 2004).

On the one hand, this is in line with the Fear-Avoidance Model (Asmundson & Taylor, 1996; Vlaeyen & Linton, 2000), which rather emphasizes *affect sensitivity*, that is, how quickly someone enters negative emotional states, such as increased pain-related fear and distress as a consequence of catastrophizing. On the other hand, failure-related action orientation, for example, captures *emotion regulation*, that is, how quickly someone is able to leave negative emotional states such as fear and feeling helpless (Beckmann & Kuhl, 1984; Jostmann et al., 2005; Koole & Jostmann, 2004; Kuhl & Quirin, 2011). Accordingly, action-oriented patients' better ability to cope with emotional distress may especially protect them from persisting symptoms of depression in terms of feeling helpless over a longer period of time (Baumann & Kuhl, 2005; Biebrich & Kuhl, 2004; Biebrich & J., 2002; Koole & Fockenberg, 2011; Kuhl & Beckmann, 1994b; Kuhl & Helle, 1986; Kuhl & Quirin, 2011).

Furthermore, our results are partially in line with the Transactional Model of Stress by Lazarus and Folkman (1984), and several longitudinal or cross-sectional studies with sub-/acute to chronic pain patients (Fahland et al., 2012; Hülsebusch et al., 2016; Klasen et al., 2006), based on the Kiel Pain Inventory (Hasenbring, 1994). Only in state-oriented patients with problems in intuitive emotion regulation, primary appraisals of high pain-related threats (i.e., catastrophizing) contribute to *enduring* distress and depression if patients have secondary appraisals of no control of and lost options to cope with pain (i.e., subjective helplessness).

In contrast to previous studies (e.g., Rosenstiel & Keefe, 1983; Severeijns et al., 2001; Sullivan & D'eon, 1990; Sullivan et al., 1995; Turner et al., 2000), however, we did not find a direct relationship of pain catastrophizing with depression. This may be attributable to different definitions and measures of pain catastrophizing. The cited studies used measures of catastrophizing such as the Coping Strategies Questionnaire (Rosenstiel & Keefe, 1983) and Pain Catastrophizing Scale (Sullivan et al., 1995) that contain items similar to those in the subscale help-/hopelessness from the Kiel Pain Inventory, or Avoidance-Endurance-Questionnaire (Hasenbring et al., 2009), respectively. Thus, the measures from Coping Strategies Questionnaire and Pain Catastrophizing Scale rather capture subjective helplessness instead of more specific catastrophizing thoughts about an underlying severe illness (Fahland et al., 2012; Hülsebusch et al., 2016).

Remarkably, a majority of studies concerning (learned) helplessness and depression in chronic pain solely refer to the research of Seligman and colleagues (Abramson et al., 1978; Hiroto & Seligman, 1975; Seligman, 1972), who attributed depression-like performance deficits following exposure to uncontrollable failure to a generalized *motivational deficit* (i.e., lack of effort) mediated by subjective helplessness (e.g., Banks & Kerns, 1996; Hülsebusch et al., 2016; Klasen et al., 2006; Love, 1988; Pellino & Oberst, 1992; Samwel et al., 2007; Skevington, 1983; Smith et al., 1994). Kuhl and colleagues (Brunstein, 1990; Kuhl, 1981; Kuhl & Weiß, 1994), however, showed that the transfer of depression-like performance deficits from training tasks to (compared to the training) dissimilar test tasks in learned helplessness experiments rather were due to a *volitional deficit*: a general self-regulatory inability to cope with uncontrollable failure, state-oriented cognitions, and emotional distress.

Moderated Partial Mediation of the Thought Suppression-Depression Relation

Consistent with our second hypothesis, thought suppression was especially related to depression directly (and indirectly marginally moderated) for state-oriented pain patients. For

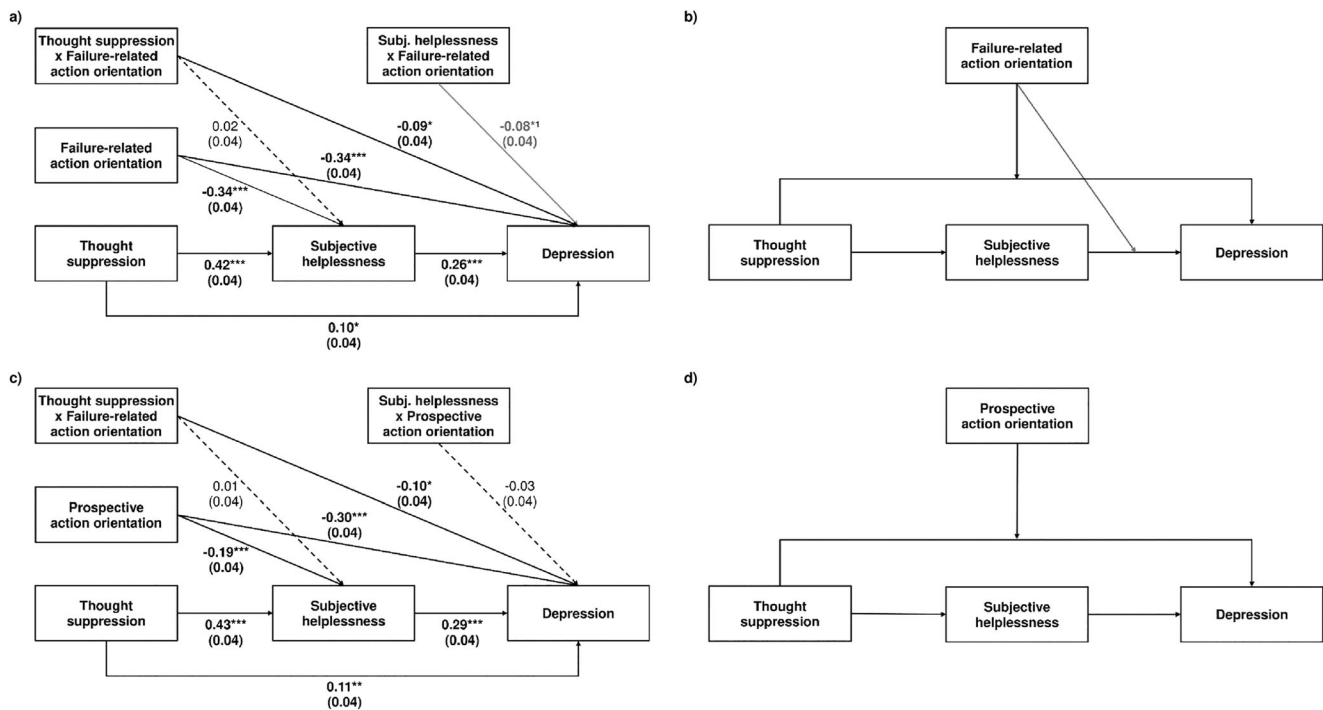


Fig. 4 a-d. Results of moderated mediation analyses concerning H2: statistical models with standardized slopes and standard errors in brackets (left panel) and their translation into conceptual models. *Note.* The dashed arrows in statistical models 4a/c symbolize non-significant

interaction effects, *1 grey arrows in both the statistical and conceptual model of Fig. 4 a/b symbolize marginally significant interaction effects with $p = .06$, $* = p < .05$, $** = p < .01$, $*** = p < .001$

highly action-oriented patients, in contrast, thought suppression was not related to depression. Moreover, our results also support the assumption of a more function-focused diathesis-stress relation: In line with prior research, state- compared to action-oriented patients showed more distress – especially at higher levels of subjective demands (Baumann et al., 2005). In line with Action Control Theory, these results suggest stress-dependent rebound effects because of state orientation. This is (partly) consistent with other (content-focused and cognitive-behavioral) research that suggests suppression to be associated with problems in emotion regulation and depression (Aldao & Nolen-Hoeksema, 2010; Dalgleish et al., 2009; Hasenbring et al., 2014; Hülsebusch et al., 2016; Mehrabi et al., 2014; Wegner et al., 1993).

Up to date, only a few cognitive-behavioral studies exist that solely examined subjective helplessness as a potential mediator of the effects of thought suppression on depression in pain patients: Two cross-sectional studies either only found a direct effect from thought suppression to depression (Klasen et al., 2006), or, partially consistent with our results, a partially mediated effect through subjective helplessness (Hülsebusch et al., 2016). In line with the Theory of Ironic Processes (Wegner, 1994; Wegner et al., 1993), both the indirect and direct effect may represent unsuccessful attempts to suppress pain-related thoughts and/or emotions. According to our assumptions, the indirect path from thought suppression through subjective helplessness to depression may especially represent

rebounding thought contents of subjective helplessness and associated emotional distress. In addition, subjective helplessness may increase because of counter-intentional intrusions of other suppressed thought contents (i.e., further rebound effects), which, in turn, lead to increases of distress and depression (Hülsebusch et al., 2016). According to Wegner and colleagues (Wegner & Erber, 1992; Wegner, 1994), such rebound effects occur due to an inadequate search for distractors, unfocused distraction attempts, and failure-related automatic monitoring of suppressed thoughts, which increase accessibility of these very thought contents. Moreover, rebound effects especially occur when capacity for mental control is diminished due to stress and additional cognitive load (Kuhl & Beckmann, 1994b; Wang et al., 2020; Wegner, 1988, 1994; Wegner et al., 1993; Wenzlaff & Luxton, 2003).

Action Control Theory extends this explanation by specifying self-regulatory functions and conditional processes that either facilitate or impair volitional action control and recovery from life stress (Beckmann & Kellmann, 2004; Kuhl, 1983, 2001; Kuhl & Beckmann, 1994a; Kuhl & Quirin, 2011). According to Beckmann and Kellmann (2004), self-regulatory processes of volitional action control that underlie recovery (and likewise successful distraction efforts in the course of thought suppression) require two basic steps: (1) deactivating unrealistic intentions as well as (2) selecting and initiating adequate coping activities. First, as long as the

unrealistic intention to suppress unwanted thoughts is not deactivated, the accessibility of unwanted thought contents may be increased and these thus are likely to intrude into consciousness (Jostmann & Koole, 2009; Kuhl & Beckmann, 1994a). Consistent with this assumption, rebound effects were shown to be associated with uncompleted intentions to suppress unwanted thoughts (Förster et al., 2005). Second, selecting adequate distraction activities requires access to implicit self-representations of own preferences, needs, and goals (Kuhl, 1983; Kuhl & Beckmann, 1994a; Kuhl & Kaschel, 2004). Access to implicit self-representations enables an overview of coping strategies that have helped in the past, discriminating one's own from others' preferences, and therefore choosing more self-congruent goals and distraction activities (Baumann et al., 2005; Beckmann & Kellmann, 2004; Kuhl & Kazén, 1994a). More self-congruent distractors that satisfy personal needs can reduce rebound effects (Wang et al., 2018).

Because (pain-related) life stress may diminish capacity for volitional action control (Kuhl & Beckmann, 1994b; Wegner, 1988, 1994; Wenzlaff & Luxton, 2003), distancing from unattainable goals and initiating self-congruent distraction activities bears a huge challenge to pain patients' self-regulatory abilities (Kuhl, 1983). Both self-regulatory steps are easier to make for action-oriented participants (Beckmann & Kellmann, 2004; Kuhl, 1983; Kuhl & Beckmann, 1994a) and, in line with our results, should remove the link from thought suppression to depression. Action Control Theory proposes several self-regulatory deficits in state-oriented individuals under demanding conditions that may explain the interaction effects found (e.g., Baumann & Kuhl, 2002, 2003; Baumann et al., 2005; Jostmann et al., 2005; Kazén et al., 2008; Koole, 2009; Koole & Kuhl, 2008; Kuhl et al., 2020; Kuhl & Kaschel, 2004; Ruigendijk & Koole, 2014). For example, the inability to down-regulate negative emotions (failure-related state orientation) impedes sustainable disengagement from unwanted failure-related thoughts and emotional distress, and inhibits access to implicit self-knowledge resulting in impaired self-discrimination and false self-ascriptions (i.e., latent alienation). In addition, the inability to up-regulate positive affect (prospective state orientation) impedes initiating self-congruent coping activities (i.e., manifest alienation) and automatic goal shielding against counter-intentional impulses and action alternatives (e.g., monitoring unwanted thoughts instead of positive distraction effects).

Together, our results indicate, in line with Action Control Theory, that state- (versus action-) oriented pain patients are more prone to depression because they are less able to regulate pain-related emotions, disengage from pain-related thoughts, select and initiate adequate distraction activities, and monitor task-related progress by avoiding interfering intrusions. Consistent with this notion, Kuhl (1983) found that

state-oriented patients reported more rumination and monitoring of their wounds, profited less from a distraction intervention after a surgery of hernia, and experienced more distress, compared to their action-oriented counterparts. Moreover, state- (versus action-) oriented patients' tendencies toward over-maintaining unrealistic intentions as well as impaired self-discrimination and initiative were found to be associated with increased depression, psychosomatic symptoms, and low well-being (Baumann et al., 2005; Kuehner & Huffziger, 2013; Kuhl & Helle, 1986).

Limitations

Our study has some methodological limitations. First, this study is based on cross-sectional, correlative self-report data obtained at the beginning of rehabilitation. Thus, causal claims cannot be made and other models are possible including more function-focused perspectives. For example, besides the partially confirmed (moderated) appraisal-depression relations, our results also support the assumptions of underlying diathesis-stress relations. Moreover, our correlational cross-sectional data also include the radically function-focused approach to learned helplessness: In contrast to the content-focused approach by Seligman and colleagues, Kuhl and colleagues (Kuhl, 1981, 2000; Kuhl & Helle, 1986; Kuhl & Weiß, 1994) originally postulated that more generalized expectations of uncontrollability in learned helplessness are a consequence of (former and/or latent) depression due to state orientation, rather than the antecedent of it.

Second, generalizability of results is limited to the population of patients with chronic non-specific low back pain. In addition, the study's power to detect larger effects may be reduced due to low base rates of depressed patients in orthopedic samples, and the exclusion criteria of the primary study concerning patients with more severe depression (see Semrau et al., 2015). State-oriented pain patients' self-regulatory inability may further be associated with performance deficits in filling out questionnaires. Moreover, there were floor effects in catastrophizing. A high number of patients at low levels of catastrophizing may lead to better estimates and significant effects of small to random differences, whereas a low number of patients at high levels of catastrophizing may lead to less valid estimates and insignificant effects of potentially existing differences. Estimates further contain measurement errors due to manifest path analysis (Cole & Preacher, 2013). Finally, measures and results may be biased due to response and retrospective memory biases in self-report data as well as suppressor effects (e.g., social desirability, underrated occurrence of unwanted thoughts due to thought suppression) (Bortz & Schuster, 2010; Logan et al., 2008; Schwarz, 2012).

Implications for Future Research and Treatment

Our study's implication that cognitive-behavioral content-focused theories of learned helplessness and depression in pain patients may primarily be valid approaches for state-oriented individuals has to be confirmed in future studies. Likewise, the role of action versus state orientation in moderating rebound effects as well as relations with affect-sensitivity, pain-related cognitions, emotions, pain, and depression need further investigation. Future prospective and experimental studies may further examine whether certain characteristics of (chronic) pain and pain-related life stress (e.g., interruption, uncertainty of pain causes, pain chronicity, chronic exposure to external control, need frustration, perceived threats and demands) reinforce different performance deficits, helplessness and depression, especially in state-oriented pain patients (Kuhl, 1983; Kuhl & Kazén, 1994b; Kuhl & Weiß, 1994).

In line with other research, the present findings suggest developing tailored treatment approaches that more strongly focus on improving volitional action control and self-regulatory deficits that interact with life stress (Baumann & Kuhl, 2005; Friederichs et al., 2020; Kuhl, 1983). In contrast, cognitive-behavioral treatment approaches with a main focus on changing negative appraisals and beliefs without improving volitional action control might counter-intentionally increase rumination and performance deficits associated with learned helplessness and depression (Kuhl, 1981, 1983, 2000). This also implies that evaluated tailored treatment approaches require diagnostic assessments of individual self-regulatory ability, competencies and life stress in order to improve volitional action control and patients' quality of life (Beckmann & Kellmann, 2004; Kuhl, 1983; Kuhl & Fuhrmann, 1998).

Conclusions

To our knowledge, this is the first study that differentiated between and combined content- and function-focused variables, and examined effects of moderated mediation due to motivational and volitional deficits to better understand (learned) helplessness and depression in patients with chronic non-specific low back pain. Function-focused relations of action versus state orientation to depression were of similar or higher strength compared to those of content-focused appraisals and beliefs, whereas pain intensity appeared to be largely irrelevant. Largely in line with prior research and Action Control Theory, our results further suggest that negative appraisals of pain-related life stress may not lead to ongoing distress and depression unless individuals have a disposition towards state orientation (Kuhl, 1983; Kuhl & Beckmann, 1994b; Luka-Krausgrill et al., 1992).

Future research and treatment may therefore more strongly focus on the role and interaction of motivational and volitional

deficits underlying learned helplessness and depression in state-oriented pain patients (i.e., state orientation as organismic risk factor). In contrast, action-oriented individuals may more effectively self-regulate pain-related emotions, disengage from rumination, and distract from pain (Kuhl, 1983), and thus better avoid the debilitating effects of negative life stress appraisals on depression (i.e., action orientation as organismic resilience factor).

Acknowledgements The authors wish to thank Michael Schuler, Roland Küffner, Christian Gerlich, Miguel Kazén and Laura Killian for helpful comments on a previous draft of the manuscript as well as the clinics, patients, and students, who participated in the primary study (Semrau et al., 2015).

Authors' Contribution K.P., J.S., K.M., J.B., H.V. and H.F. developed the concept and design of the primary study. Data collection was performed by J.S. and J.B., and supervised by K.P., K.M., J.K. and H.F. J.B. developed the concept of this secondary study, performed the data analysis and interpretation under the supervision of H.F., N.B., and J.K. J.B. drafted the paper. All authors provided critical revisions and approved the final manuscript.

Funding Open Access funding enabled and organized by Projekt DEAL. The data acquisition for this project was funded by the German Pension Insurance (Deutsche Rentenversicherung Bund) and the Federal Ministry of Education and Research (BMBF) within the research priority "Chronic diseases and patient orientation" - Grant number: 0421-FSCP-0529.

Availability of material, data, and SPSS syntax The material and SPSS syntax is available from: j.buchmann@mail.de and nicola.baumann@uni-trier.de

The data associated with the current study are available on the zenodo.org repository, [<https://doi.org/10.5281/zenodo.4442062>]

Declarations

Conflicts of Interests No financial or other relation may pose a conflict of interest. Therefore, we have no conflicts of interest to disclose.

Ethics Approval and Informed Consent The primary study (Semrau et al., 2015) was approved by the Ethics Committee of the University of Erlangen-Nürnberg and performed following the Declaration of Helsinki.

All participants were informed about the anonymized data collection and provided written informed consent.

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