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Dysfunctional Attitudes Versus Metacognitive Beliefs as Within-Person Predictors of Depressive Symptoms Over Time

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Understanding within-person variation between theorized mechanisms of disorder and depressive symptoms can help identify targets for interventions. Cognitive models of depression hypothesize dysfunctional attitudes as underlying vulnerability factors, while the metacognitive model places emphasis on dysfunctional metacognitive beliefs. However, no previous study has tested the relative importance of change in dysfunctional attitudes and metacognitive beliefs as predictors of change in depressive symptoms within individuals. In a sample of 1,418 individuals measured at four time-points separated by 5-week intervals, a multilevel model approach was used to test the relative importance of change in dysfunctional attitudes and metacognitive beliefs as predictors of change in depressive symptoms. Change in dysfunctional attitudes and metacognitive beliefs predicted change in depressive symptoms over time. However, change in metacognitive beliefs and in particular negative metacognitive beliefs and judgements of cognitive confidence were significantly stronger predictors of change in depressive symptoms compared to dysfunctional attitudes. Furthermore, change in metacognitive beliefs predicted change in dysfunctional attitudes beyond change in depressive symptoms. These results suggest that metacognitive beliefs rather than dysfunctional attitudes might be more important for depressive symptoms over time within persons and that metacognitive change may also influence dysfunctional attitudes over time. Metacognitive beliefs are therefore a promising target for treatment and prevention aiming to reduce depressive symptoms, but replication of our results in clinical samples is warranted before more clear conclusions can be drawn.

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Depression is acknowledged as one of the main causes of disability in the world with extensive socio-economic costs (James et al., 2018). Paradoxically, even though treatments for depression

have improved over the last decades, the population prevalence of depression has not decreased (Ormel et al., 2022). One way to improve our understanding and interventions is to identify psychological factors underlying depression. Research concerned with the dynamics of intra-psychic processes and factors in relation to outcomes such as depression are often tested at the between-person level, which precludes inferences of effects at the within-person level. Testing within-person effects further offers some control for stable attributes at the individual level (e.g., intelligence, personality, individual baseline levels of predictors and outcome) and potential spontaneous fluctuations in symptoms, and thus provides more optimal empirical tests of theory-based hypotheses in psychology, which often postulates mechanisms at the within-person level (Curran et al., 2014). Predictors of within-person variation can further be directly relevant for clinical practice where clinicians want to target factors creating change in the individual over time.

According to Beck's schema theory (1972, 1976), which is the foundation for Cognitive therapy for depression, dysfunctional attitudes or beliefs (schemata) revolved around for instance perfectionistic standards and goals, self-control, and dependency such as "if I fail at my work, then I am a failure as a person" or "if others dislike you, you cannot be happy" are triggered in response to stressful life events and leads to negative automatic thoughts, biased interpretations, negative emotion and maladaptive coping, thus sustaining a depressive mood. For example, beliefs such as "If I fail at my work, then I am a failure as a person" or "If others dislike you, you cannot be happy" are triggered in response to stressful life events and lead to negative automatic thoughts, biased interpretations, negative emotion and maladaptive coping, thus sustaining a depressive mood. Research has shown dysfunctional attitudes to be associated with depression severity (de Graaf et al., 2009), prospective development of depressive symptoms at the between-person (e.g., Perez & Rohan, 2021) and the within-person level (e.g., Morris et al., 2014). Reduction in dysfunctional attitudes has further been found to mediate the reduction of depressive symptoms in participants receiving cognitive behavioral treatment (Quilty et al., 2008). However, the evidence is mixed, and a study by Burns and Spangler (2001) did not find support for a mediational effect of dysfunctional attitudes in relation to depression or anxiety in outpatients receiving CBT. In the early research stages, dysfunctional attitudes were found in large part to be state-dependent or to covary with depressive symptoms (Ingram et al., 1998), which could indicate that they are a symptom of depression rather than a driving mechanism. Nevertheless, they are considered central to the initiation and maintenance of depression at the within-person level according to cognitive theory and continue to be utilized in further developments of the cognitive model of depression and associated phenomena, such as the differential activation hypothesis (e.g., Lau et al., 2004; Williams et al., 2008).

The metacognitive model of psychopathology (Wells, 2019; Wells & Matthews, 1994) challenges the role of schemas in psychological disorder. Recently, Wells (2019) outlined how a *metacognitive control system* monitors mental activity and influences mental regulation. According to this framework, depression is maintained by a cognitive style, termed the Cognitive Attentional Syndrome (CAS), which is activated in response to an initial trigger (i.e., thought) consisting of (1) perseverative negative thinking, (2) threat monitoring (e.g., inflexible and inward-focused attention towards symptoms or perceived external threat), and (3) unhelpful coping strategies. For a depressed patient the CAS can be recognized as brooding over negative self-relevant information such as past mistakes and negative feelings or worrying about the impact depression is having on one's life, monitoring for the presence or absence of joy or lack of energy, as well as being inactive or avoiding social situations. Thus, the CAS is a form of prolonged negative self-processing and maintains low mood. Further, the CAS is hypothesized to be linked to underlying biased metacognitive knowledge such as declarative beliefs about cognition (i.e., metacognitive beliefs). Metacognitive beliefs are further divided into positive beliefs that concern the usefulness of CAS strategies (e.g., "I need to worry in order to remain organized"), and the negative beliefs that concern the uncontrollability and dangers of cognition (e.g., "When I start to worry, I cannot stop"). In a recent systematic review and meta-analysis of the metacognitive model for depression (41 studies, $N = 10{,}607$), positive and negative metacognitive beliefs were found to be associated with the severity of depression cross-sectionally and longitudinally at the between-person level (Cano-López et al., 2022). In addition, one observational study reported that reductions in negative metacognitive beliefs were associated with greater improvement in depressive symptomatology longitudinally at the within-person level (Ebrahimi et al., 2022).

Even though both dysfunctional attitudes and metacognitive beliefs have been suggested as

mechanisms of depression, only a few studies have explored their relative importance. Cross-sectional studies indicate that both negative and positive metacognitive beliefs significantly explain variance on top of dysfunctional attitudes and that the metacognitive predictors were stronger than dysfunctional attitudes in predicting depressive symptoms (Huntley & Fisher, 2016; Leach et al., 2019; Yilmaz et al., 2015). Two studies have examined the relative role of metacognitive beliefs and dysfunctional attitudes in clinical samples. In the first study, Jelinek et al. (2017) showed that metacognitive beliefs concerning the need to control thoughts, and not dysfunctional attitudes, mediated treatment outcome for participants receiving metacognitive training for depression. Faissner et al. (2018) examined whether the treatment effect for participants in a randomized trial receiving either group-based metacognitive training or health training for depression was related to change in dysfunctional attitudes or metacognitive beliefs. Baseline scores of negative metacognitive beliefs and need to control thoughts, and their change over time, in addition to change in dysfunctional attitudes, predicted change in depressive symptoms over 3.5 years, and the authors concluded that dysfunctional attitudes was the strongest predictor.

To our knowledge, no study to date has tested the relative importance of change in dysfunctional attitudes and metacognitive beliefs for the variation of depressive symptoms over time within individuals, and this was therefore the goal in the current study. Consistent with cognitive theory (Beck, 1976), we expected change in dysfunctional attitudes to affect depressive symptoms. However, in line with metacognitive theory (Wells, 2019), we expected change in metacognitive beliefs to affect depressive symptoms, and that metacognition would be of greater importance for depressive symptoms when controlling the effects of dysfunctional attitudes. We also expected negative metacognitive beliefs to be of particular importance as this metacognitive belief domain, according to theory, has greater causal influence in psychopathology (Wells, 2019). In a secondary set of analyses, we set out to evaluate if the variation of dysfunctional attitudes within individuals over time may be influenced by change in metacognitive beliefs. Beck's schema theory does not describe or distinguish metacognitive beliefs, and the metacognitive model does not emphasize schemas as central to disorder. However, the metacognitive model suggests that negative schemas/dysfunctional attitudes can be an output of the CAS as the frequency of and belief in these may be influenced by thinking style (e.g., rumination), which is further linked to metacognitive beliefs (Wells, 2009). This is an interesting suggestion that, to the best of our knowledge, has not previously been empirically tested. In this test, we also controlled for the influence of change in depressive symptoms on change in dysfunctional attitudes in line with the observation that dysfunctional attitudes may be a symptom of depression (Ingram et al., 1998), and with means to evaluate if there was a unique contribution from metacognitions.

Material and Methods

PARTICIPANTS AND PROCEDURE

Participants were gathered at convenience to participate in an online survey administered 4 times with each time point separated by 5-week intervals. The only exclusion criteria were being under 18 years old and not being able to read Norwegian. The survey was advertised through various social media platforms (e.g., Facebook ads, targeting groups on Facebook for individuals struggling with depression, and Instagram). The participants were not compensated for participating but had the chance to win a lottery prize if participating across all four time points. Regarding our targeted sample size, the goal was to have enough participants to ensure statistical power for conducting MLM over the four time points with no upper limit (however the time-limit for the first round of data-collection was set to 2 weeks, so all participants answering in this time-window could participate). The study was approved by the Regional Committees for Medical and Health Research Ethics (Ref nr: 467342) and by the Norwegian Centre for Research data (Ref nr: 686857) but was not preregistered in any other way than being derived from prespecified hypotheses from cognitive and metacognitive theory. Informed consent was provided by all participants before taking part in the study.

A total of 1,418 individuals consented to and participated at time 1, of whom 669 (47.2%) were men, 728 (51.3%) women, 14 (1.0%) identified as nonbinary, and 4 (0.3%) answered that the aforementioned categories did not fit how they identified, and 3 (0.2%) did not answer. The sample had a mean age of 29.75 years (SD = 11.67, range = 18–79). Regarding civil status, 616 (43.4%) reported to be single, 285 (20.1%) in a romantic relationship, 468 (33.0%) were cohabitants or married, 43 (3.0%) reported to be separated or divorced, and 2 (0.1%) widowed, while 3 (0.3%) gave no information on their civil status. Regarding occupational status, 848 (59.8%)

reported they were students, 409 (28.8%) were working, 16 (1.1%) were searching for work, 26 (1.8%) were on sick-leave, 94 (6.6%) reported receiving a work assessment allowance or a disability pension, 23 (1.6%) were retired, and 2 (0.1%) individuals provided no information. In total, 639 (45.2%) had high-school or below as their highest completed education, and 774 (54.5%) reported having a university degree of 3 or more years. Five individuals (0.4%) did not report their highest level of completed education. Regarding mental health problems, 478 (33.7%) reported having received a diagnosis of a mental disorder at some point in their life. At time 2, 766 individuals participated, 651 at time 3, and 612 at time 4.

MEASURES

All measures utilized in the current study were provided in Norwegian using available versions already translated and validated for use.

The Patient Health Questionnaire 9 (PHQ-9; Kroenke et al., 2001) measures depressive symptoms based on the nine criteria for depression as specified in DSM-IV on a scale from 0 ("not at all") to 3 ("nearly every day") and was used as the primary outcome in the current study. It has been supported as a valid instrument for measuring depression in numerous studies (Kroenke et al., 2010) and has shown good internal consistency ($\alpha = .89$; Kroenke et al., 2001). The internal consistency in the current study ranged from .90 to .91 between the four time-points.

The Dysfunctional Attitude Scale (form A) Revised (DAS-A-17; de Graaf et al., 2009) is a revised version of the Dysfunctional Attitude Scale form A (DAS-A) by Weissman (1979), who divided the original DAS by Weissman and Beck (1978) into two forms (DAS-A and DAS-B). DAS-A is the most common version of the DAS utilized in research and has a two-factor solution consisting of dysfunctional attitudes concerning "dependency" and "perfectionism/performance evaluation." Seventeen items are scored on a 1 ("totally agree") to 7 ("totally disagree") scale. The internal consistency has been found to be excellent for the perfectionism/performance evaluation subscale ($\alpha = .90$), and good ($\alpha = .81$) for the dependency subscale (de Graaf et al., 2009). In the current study the internal consistency for the perfectionism/performance evaluation subscale ranged from .90 to .93, and the dependency subscale ranged from .84 to .87 between the four time-points.

The Metacognitions questionnaire 30 (MCQ-30; Wells & Cartwright-Hatton, 2004) consists of five categories of dysfunctional metacognitive beliefs: (1) positive metacognitive beliefs about worry, (2) negative beliefs about the uncontrollability and danger of worry, (3) cognitive confidence, (4) need to control thoughts, and (5) cognitive self-consciousness. The 30 items are rated from 1 ("do not agree") to 4 ("agree very much"). It has demonstrated good psychometric properties with internal consistency ranging from .72 to .93 for the subscales (Wells & Cartwright-Hatton, 2004). In the current study the internal consistency ranged from .84 to .90 for positive metacognitive beliefs, .88 to .90 for negative metacognitive beliefs, .89 to .93 for cognitive confidence, .76 to .80 for need to control thoughts, and .73 to .89 for cognitive self-consciousness between the four time-points.

STATISTICAL ANALYSES

A two-level multilevel model (MLM) for longitudinal data (Heck & Thomas, 2015; Raudenbush & Bryk, 2002; Singer et al., 2003) was used to analyze change in the outcome variables over time using all available data from all participants in three sets of analyses. Change in depressive symptoms was the outcome variable in the first set of analyses while the two subscales of the dysfunctional attitude scale concerning perfectionistic and dependence-related attitudes were the outcome variables in the second and third sets of analyses, respectively. The MLM accounts for correlations among repeated measurements nested within an individual when examining within-person changes and between-person difference and the relationship with other variables. We estimated two unconditional models: (1) *the unconditional means model* with no predictors at either level, and (2) the *unconditional growth model* with time as the only level-1 predictor and no substantive predictors at level 2 to examine whether there is systematic variation in the outcome variable over time and how much variation there is both within- and between-persons, respectively, thus providing a baseline model for evaluating the success of subsequent model building and the inclusion of predictors (Singer et al., 2003). The effects of time-varying covariates were fixed across people for model parsimony and person-mean-centering was used to capture the within-person part of their effects in all the models.

In the first set of analyses, the time-varying effects of relevant predictors implicated in depressive symptoms were included as predictors in the within-person model. Two sets of predictors were included: (a) *metacognitive belief domains* (i.e., negative metacognitive beliefs, positive metacogni-

tive beliefs, lack of cognitive confidence, need for control and cognitive self-consciousness), and (b) *cognitive domains of dysfunctional attitudes* (i.e., perfectionistic, and dependence-related attitudes). Next, we evaluated the predictive strengths of each predictor against the others to determine the most important predictors of within-person changes in depressive symptoms over time.

Changes in the dysfunctional attitude-domain variables were specified as outcome variables in separate analyses. Change in perfectionistic attitudes was the outcome variable in the second set of analyses, while changes in dependence-related attitudes, depressive symptoms, and metacognitive belief domains were included as predictors in the within-person model. Change in dependence-related attitudes was the outcome variable in the third set of analyses, while changes in perfectionistic attitudes, depressive symptoms, and metacognitive belief domains were included as predictors in the within-person model.

Results

ANALYSIS OF MISSING DATA PATTERNS

Incomplete data patterns can be represented as the proportion of data or coverage for each covariance of scores between two variables. At any time, the highest available data was 99% of the participants and the lowest coverage was 35%. Table S1 in the supplementary materials shows the pattern of data covariance coverage. Additional missing data analyses revealed that, except the levels of depressive symptoms which showed that across time points completers had a small but significant systematic higher self-reported score on depressive symptoms, there were no differences between completers and noncompleters at T2–T4 with respect to their T1 scores (supplementary material, Table S2). We also used logistic regression to estimate the extent to which variables in previous times (i.e., T1–T3) predict attrition from subsequent times (T2–T4). If variables in the analysis model are related to attrition, it is unlikely that dropout occurred completely at random (i.e., resulting in data that are missing completely at random, MCAR). The results mainly indicated that the logistic regression models were not significant in the extent to which variables in previous times predict attrition from subsequent ones (supplementary material, Table S3).

Finally, the MCAR test was performed to identify patterns of missing values, testing the null hypothesis that missingness is completely at random. For all the outcome variables, the result did not reject the null hypothesis: depressive symptoms ($\chi^2 = 26.10$, $df = 17$, $p = .073$), perfectionistic attitudes ($\chi^2 = 12.39$, $df = 18$, $p = .827$), and dependency attitudes ($\chi^2 = 26.82$, $df = 18$, $p = .082$). These results from the systematic analyses of missing data patterns support random missingness in the data, and the plausibility of full information maximum likelihood (FIML). FIML is regarded as a state-of-the-art missing data technique because it improves the accuracy and the power of the analyses relative to other missing data handling methods (Schafer & Graham, 2002).

PRELIMINARY RESULTS

Table 1 presents the means, standard deviations, and correlations across time for all outcome variables. Figure S1 in the supplementary material is a display of observed individual trajectory for a random subsample ($n = 50$) of the participants for depressive symptoms, perfectionistic, and dependence-related attitudes. The patterns across the outcome variables show similarity across all outcome variables in the extent of variability around the intercepts and rate of change.

MULTILEVEL MODEL OF DEPRESSIVE SYMPTOMS

Model A of Table 2 presents the results of fitting the unconditional means model to depressive symptoms, indicating significant within-person and between-person variability with an intraclass correlation of ICC = .82. Model B presents the results of fitting the unconditional growth model, which showed significant variability in the within-person model as well as in the intercept and slope. Model C presents the results of fitting the conditional growth model, which was a significantly improved model compared to the unconditional growth model in Model B, $-2\Delta LL$ (7) = 316.09, $p < .001$. Although there was no significant linear change on average, there were significant individual differences in both the intercept (i.e., initial status) and slope (i.e., linear rate of change). To describe the random intercept and slope variances, 95% random effects Confidence Intervals were computed as *CI = fixed effect ± 1.96*SQRT [random effect variance]*. Thus, the model predicted that 95% of the population will have their individual intercepts for depressive symptoms between 1.89 and 16.53, and their individual linear change between −1.45 and 1.57. So, while on average there was no change in depressive symptoms, some individuals had elevated symptoms while others showed decline, and others were stable over time. The within-person effects of metacognitive belief domains (except positive beliefs) were generally stronger predictors of

Table 1
Table of Means, Standard Deviations, and Correlations Across Time for Outcome Variables

	Mean	SD	PHQ_T1	PHQ_T2	PHQ_T3	PHQ_T4	DAS_PT1	DAS_PT2	DAS_PT3	DAS_PT4	DAS_DT1	DAS_DT2	DAS_DT3	DAS_DT4
PHQ_T1	9.27	6.407	–											
PHQ_T2	9.65	6.468	.85**	–										
PHQ_T3	9.75	6.573	.82**	.86**	–									
PHQ_T4	9.33	6.651	.78**	.83**	.82**	–								
DAS_PT1	35.14	13.838	.57**	.56**	.52**	.57**	–							
DAS_PT2	35.79	14.349	.56**	.59**	.56**	.59**	.86**	–						
DAS_PT3	35.25	14.203	.51**	.55**	.54**	.55**	.85**	.89**	–					
DAS_PT4	34.86	15.191	.57**	.57**	.55**	.58**	.86**	.89**	.90**	–				
DAS_DT1	23.29	7.636	.45**	.44**	.44**	.48**	.64**	.59**	.59**	.59**	–			
DAS_DT2	23.19	7.626	.46**	.48**	.47**	.52**	.61**	.66**	.63**	.63**	.81**	–		
DAS_DT3	23.20	7.742	.43**	.45**	.45**	.48**	.61**	.63**	.68**	.64**	.79**	.86**	–	
DAS_DT4	22.79	7.837	.47**	.45**	.44**	.47**	.60**	.62**	.63**	.66**	.79**	.84**	.86**	–

Note. T = time of measurement, PHQ = Depressive symptoms; DAS_P = Perfectionistic attitudes; DAS_D = Dependence-related attitudes.

depressive symptoms than the cognitive domains of dysfunctional attitude.

Significant differences in the predictive strengths of all significant predictors of depressive symptoms were computed. Negative metacognitive beliefs emerged as the stronger predictor of depressive symptoms over dependence-attitudes (β = .27, $p < .001$), perfectionistic attitudes (β = .26, $p < .001$), need for control (β = .21, $p < .001$), cognitive self-consciousness (β = .21, $p < .001$), and cognitive confidence (β = .15, $p < .001$). Other significant differences included the greater predictive strengths of cognitive confidence over perfectionistic attitudes (β = 27, $p < .001$) and dependence-related attitudes (β = 27, $p < .001$). All other pairwise comparisons were not significant.

MULTILEVEL MODEL OF PERFECTIONISTIC ATTITUDES

Model A of Table 3 presents the results of fitting the unconditional means model to perfectionistic attitudes, indicating significant within-person and between-person variability with an intra-class correlation of (ICC = .87). Model B presents the results of fitting the unconditional growth model, which showed significant variability in the within-person model as well as in the intercept and slope. Model C presents the results of fitting the conditional growth model, which improved the model fit compared to the unconditional growth model in Model B, $-2\Delta LL$ (7) = 393.27, $p < .001$. The model predicted that 95% of the population will have their individual intercepts for perfectionistic attitudes between 9.61 and 60.71, and their individual linear change between −2.16 and 2.01, indicating that some individuals showed increasing change in perfectionistic attitudes while others showed decreasing change, and others were stable over time.

The results show that within-person effects of metacognitive beliefs about cognitive confidence significantly predicted perfectionistic beliefs above and beyond depressive symptoms and dependence-related attitudes. However, the strongest relationship was between the dysfunctional attitude domains.

MULTILEVEL MODEL OF DEPENDENCE-RELATED ATTITUDES

Model A of Table 4 presents the results of fitting the unconditional means model to dependence-related attitudes, indicating significant within-person and between-person variability with an intra-class correlation of ICC = .82. Model B presents the results of fitting the unconditional growth model, which showed significant variability in the

Table 2
Results of Fitting a Taxonomy of Multilevel Models for Change in Depressive Symptoms

		Parameter	Model A	Model B	Model C
Fixed effects					
Initial status		γ_{00}	9.25***	9.30***	9.21***
Rate of change		γ_{10}		−0.05	0.06
NEG		γ_{20}			0.31***
POS		γ_{30}			0.01
CC		γ_{40}			0.16***
NFC		γ_{50}			0.11*
CSC		γ_{60}			0.11**
DAS_P		γ_{70}			0.04**
DAS_D		γ_{80}			0.06**
Variance components					
Level 1	Within-person	σ^2_{ε}	7.53***	6.38***	5.75***
Level 2	Initial status	σ^2_0	33.33***	34.88***	13.94***
	Rate of change	σ^2_1		0.68***	0.59***
	Covariance	σ_{01}		−0.94**	−0.76**
Goodness fit					
	LL		−9997.607	−9977.775	−9819.731
	AIC		20001.214	19967.551	19665.462
	BIC		20019.642	20004.406	19745.286

Note. NEG = negative metacognitive beliefs about uncontrollability and danger of worry, POS = positive metacognitive beliefs, CC = cognitive confidence, NFC = need for control, CSC = cognitive self-consciousness, DAS_P = Perfectionistic attitudes; DAS_D = Dependence-related attitudes.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

within-person model as well as in the intercept and slope. Model C presents the results of fitting the conditional growth model, which showed a significant improvement in model fit over the unconditional growth model in Model B, $-2\Delta LL\ (7) = 385.76$, $p < .001$. The model predicted that 95% of the population will have their individual intercepts for dependence-related attitudes between 9.48 and 37.05, and their individual linear change between −1.70 and 1.55, indicating that some individuals showed increasing change while others showed decreasing change, and others were stable over time. The within-person effects of negative metacognitive beliefs and beliefs about the need to control thoughts significantly predicted dependence-related beliefs above depressive symptoms and perfectionistic attitudes. However, the strongest relationship was between the dysfunctional attitude domains.

Discussion

The primary aim of the current study was to test the relative importance of change in dysfunctional attitudes and metacognitive beliefs predicting change in depressive symptoms within individuals. Change in dysfunctional attitude domains as well as all metacognitive belief domains (except positive metacognitive beliefs) predicted change in depressive symptoms while controlling for the overlap between the predictors. When evaluating the relative strength of the individual predictors, negative metacognitive beliefs were found to be significantly stronger than both domains of dysfunctional attitudes, as well as all other significantly contributing metacognitive belief domains. Further, cognitive confidence emerged as a significantly stronger predictor of depressive symptoms compared to both dysfunctional attitude-domains. All other pairwise significance tests between predictors were not significant when depressive symptoms were used as the outcome. In secondary analyses, we tested, as suggested by the metacognitive model, that dysfunctional attitudes may be an effect of metacognitive beliefs within individuals and found support for this notion. Change in judgments of confidence in memory predicted the within-person change in perfectionistic attitudes, while negative metacognitive beliefs and beliefs about the need to control thoughts emerged as significant predictors of dependence-related attitudes above and beyond depressive symptoms and the individual attitude-domains. This indicates that metacognitive beliefs might also contribute to the development and per-

Table 3
Results of Fitting a Taxonomy of Multilevel Models for Change in Perfectionistic Attitudes

		Parameter	Model A	Model B	Model C
Fixed effects					
Initial status		γ_{00}	35.10***	35.25***	35.16***
Rate of change		γ_{10}		−0.18	−0.07
NEG		γ_{20}			0.06
POS		γ_{30}			0.09
CC		γ_{40}			0.21***
NFC		γ_{50}			−0.02
CSC		γ_{60}			0.08
PHQ		γ_{70}			0.14**
DAS_D		γ_{80}			0.54***
Variance components					
Level 1	Within-person	σ^2_ε	26.63***	23.89***	20.70***
Level 2	Initial status	σ^2_0	171.68***	166.75***	169.94***
	Rate of change	σ^2_1		1.65**	1.13**
	Covariance	σ_{01}		2.60*	2.07*
Goodness fit					
	LL		−12419.637	−12400.830	−12204.193
	AIC		24845.275	24813.659	24434.387
	BIC		24863.706	24850.520	24514.211

Note. NEG = negative metacognitive beliefs about uncontrollability and danger of worry, POS = positive metacognitive beliefs, CC = cognitive confidence, NFC = need for control, CSC = cognitive self-consciousness, PHQ = depressive symptoms, DAS_P = Dependence-related attitudes.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 4
Results of Fitting a Taxonomy of Multilevel Models for Change in Dependence-Attitudes

		Parameter	Model A	Model B	Model C
Fixed effects					
Initial status		γ_{00}	23.19***	23.33***	23.27***
Rate of change		γ_{10}		−0.15*	−0.07
NEG		γ_{20}			0.10*
POS		γ_{30}			−0.01
CC		γ_{40}			−0.06
NFC		γ_{50}			0.14**
CSC		γ_{60}			−0.01
PHQ		γ_{70}			0.08**
DAS_P		γ_{80}			0.22***
Variance components					
Level 1	Within-person	σ^2_ε	10.68***	9.27***	7.95***
Level 2	Initial status	σ^2_0	48.44***	48.40***	49.45***
	Rate of change	σ^2_1		0.83***	0.69***
	Covariance	σ_{01}		−0.10	−0.22
Goodness fit					
	LL		−10626.125	−10605.636	−10412.755
	AIC		21258.250	21223.272	20851.510
	BIC		21276.681	21260.134	20931.334

Note. NEG = negative metacognitive beliefs about uncontrollability and danger of worry, POS = positive metacognitive beliefs, CC = cognitive confidence, NFC = need for control, CSC = cognitive self-consciousness, PHQ = depressive symptoms, DAS_P = Perfectionistic attitudes.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

severance of dysfunctional attitudes within individuals over time.

The finding that change in dysfunctional attitudes predicts change in depressive symptoms within individuals is in line with previous research (e.g., Morris et al., 2014) and provides support for cognitive theory and treatment that emphasizes and attempts to modify them (Beck, 1976; Hofmann et al., 2012). Further, changes in 4 out of 5 metacognitive belief domains predicted change in depressive symptoms and provide support for the metacognitive model (Wells, 2019; Wells & Matthews, 1994), which places metacognitive beliefs as central in the development and maintenance of depressive symptoms within individuals over time. Change in both negative metacognitive beliefs and judgments of (lower) memory confidence were found to be significantly stronger predictors of change in depressive symptoms compared to both domains of dysfunctional attitudes, with negative metacognitive beliefs also being significantly stronger than the other contributing metacognitive belief domains. The finding that negative metacognitive beliefs were the most central domain is consistent with the S-REF model asserting them as key for disorder-maintenance; this has been supported by previous research implicating them as fundamental across diverse psychological disorder presentations, including major depressive disorder (Cano-López et al., 2022; Sun et al., 2017; Wells, 2019). The superior contribution from metacognitive beliefs over dysfunctional attitudes further aligns with four previous studies which found metacognitive beliefs to be stronger predictors of depressive symptomatology compared to dysfunctional attitudes at the between-person level (Huntley & Fisher, 2016; Jelinek et al., 2017; Leach et al., 2019; Yilmaz et al., 2015). Faissner et al. (2018) concluded that dysfunctional attitudes were of more importance than metacognitive beliefs for change in depressive symptoms at the between-person level. However, this was only the case for clinician-assessed depression when controlling for all other factors. For self-reported depressive symptoms, change in negative metacognitive beliefs was the stronger predictor and change in need for control also contributed significantly as an individual predictor. Nonetheless, our study adds to the previous literature as it addresses *within-person relationships,* which are more relevant for theories of psychopathology and clinical practice (Curran et al., 2014). At this level, it appears that metacognitive beliefs have a more central role compared to dysfunctional attitudes for the variation in depressive symptoms over time. Our findings are also consistent with other studies that have reported that metacognitive beliefs predict various anxiety and depressive symptoms at the within-person level. Ebrahimi et al. (2022) found that reductions in negative metacognitive beliefs were predictive of reduction in depressive symptoms at the within-person level; however, this study did not compare the relative effect of metacognitions and dysfunctional attitudes as in the current study. Hoffart et al. (2023) found negative metacognitive beliefs to predict variability in a composite emotional distress measure. Hoffart et al. (2018) showed that changes in positive metacognitive beliefs predicted changes in symptoms of anxiety for patients receiving metacognitive therapy or CBT. Sunde et al. (2021) further demonstrated that metacognitive beliefs concerning the need to control thoughts in patients with OCD prospectively predicted change in OCD symptoms.

In addition, we found that change in metacognitive beliefs about memory (cognitive confidence) contributed significantly to change in perfectionistic attitudes within individuals, while negative metacognitive beliefs and beliefs about the need to control thoughts were found to be significant predictors of dependence-related beliefs above and beyond the individual attitude-domains and depressive symptoms. The metacognitive model (Wells, 2009) suggests that negative cognitions may be the output of the CAS, which is directed by underlying metacognitive beliefs. For example, distrust of one's memory may facilitate overcompensation when under pressure to perform (i.e., CAS strategies; e.g., worrying and exaggerated planning), accompanied by endorsement of perfectionistic attitudes. Negative metacognitive beliefs and beliefs about the need to control thoughts may prohibit disengagement from the CAS which activate dependence-related attitudes and create negative appraisals of one's ability to cope. Overall, these findings implicate metacognitions as relevant for the variation in endorsement of dysfunctional attitudes within the individual over time above depressive symptoms and other dysfunctional attitude-domains. This finding aligns with a recent study by Nordahl et al. (2022), which reported that metacognitive beliefs at the between-person level prospectively predicted negative social self-beliefs, even when controlling for the effect of social anxiety. Schemas such as dysfunctional attitudes may be more strongly endorsed when emotional distress symptoms are pronounced, as they are both products of the

CAS, which is further directed by the metacognitive control system containing dysfunctional metacognitive beliefs (Wells, 2019).

The within-person effects identified in the current study have both theoretical and clinical implications given that within-person effects are more in line with what is predicted by the theoretical models, as well as having a potential to inform clinical work aimed at creating change at the individual level. While the within-person changes over time were small in the current sample, clinical implications cannot to the same extent be drawn based on evidence at the between-person level. We warrant caution in drawing firm conclusions from our study given the observational design and the small within-person changes in the variables over time. However, the results indicate that dysfunctional attitudes could be important targets at the within-person level to reduce depressive symptoms. This is also supported by CBT interventions overall showing a moderate to large effect on depression (Hedges's $g = .79$: Cuijpers et al., 2023a) with CBT trials conferring to Beck's manual, where dysfunctional attitudes play a prominent role showing a large pooled effect size of $g = .95$ (Cuijpers et al., 2023b). However, our results also indicate that rather than focusing on dysfunctional attitudes, treatment could aim to reduce metacognitive beliefs in treatment of depression since beliefs at the metacognitive level were found to be significantly stronger predictors of the development of depressive symptoms compared to dysfunctional attitudes at the within-person level and were also shown to significantly predict change in both dysfunctional attitude-domains. This suggests that creating metacognitive change may also be an effective route to change dysfunctional attitudes at the cognitive level, which, according to the metacognitive model, is more likely an output of higher-order metacognitive processes. In support of this, metacognitive therapy (MCT; Wells, 2009), which specifically aims to achieve metacognitive change at the within-person level, has been found to be a highly effective treatment for depression (Normann & Morina, 2018). Further, in a randomized clinical trial comparing MCT and CBT for major depressive disorder by Callesen et al. (2020), MCT demonstrated superior treatment effects. Further, in this study the MCT condition, in addition to symptoms of depression, achieved significantly better results also in the reduction of dysfunctional attitudes both at posttreatment and follow-up, which supports the findings from the current study and further questions the importance of schemas in depression.

There are several limitations that should be considered when interpreting the findings in the current study. First, the sample was gathered at convenience, and it is therefore not clear whether these results will replicate in a sample of clinically depressed individuals or when utilizing other measurement methods such as clinician-administered measures of depressive symptoms. This is relevant for the clinical meaningfulness of the findings since the prevalence of depression tends to vary when using the PHQ compared to in example clinical interviews (Levis et al., 2020). Second, the rate of individual linear change across time points was relatively small, which should be considered when interpreting the clinical meaningfulness of the findings. Based on this, caution is warranted in generalizing the results to clinical settings. Third, there was considerable attrition across the four time points; however, we employed appropriate tests to evaluate the pattern of missingness and used state-of-the-art procedures for handling missing data to achieve the best utilization of the data. Fourth, there was further a small but significant systematic difference between completers and non-completers such that completers on average reported higher levels of depressive symptoms across time-points. This could indicate that participants experiencing more depressive symptoms were more motivated to provide information about their experiences and participate in the study. Finally, the time lag between time-points could affect the results obtained since they can have implications for when effects are significant or nonsignificant (Anyan et al., 2020). For instance, in similar statistical frameworks, cross-lagged effects have been shown to emerge at different lag schedules than fixed lag schedules (Selig & Little, 2012). A strength in the current study was the disaggregation of the data to isolate and test within-person effects in a large sample, thus adding to the previous research. Future research should investigate the within-person effects of metacognitive beliefs on symptoms of depression in clinical treatment and potential mediational effects.

Conclusion

The current study tested the relative contribution of change in dysfunctional attitudes and change in metacognitive beliefs for change in depressive symptoms within individuals in a large nonclinical population. The results suggest that treatment and prevention efforts for depressive symptoms could target both dysfunctional attitudes and metacognitive beliefs. However, targeting metacognitions could lead to better outcomes as they seem to be

more important to change in depressive symptoms within individuals and at the same time provide change in endorsement of dysfunctional attitudes. In sum, these results suggest that interventions for depressive symptoms might be best aimed at targeting change at the metacognitive rather than the cognitive level. However, further studies within clinical samples are warranted before more clear conclusions can be made.

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