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An experimental test of the maintenance and vulnerability hypothesis of depression in
consideration of the cognitive hierarchy

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Abstract

According to Beck's cognitive model of depression the activation of dysfunctional beliefs triggers negative automatic thoughts, which can be interpreted as the proximal "cause" for emotional, somatic, and motivational symptoms of depression. This top-down processes of beliefs causing thoughts and furthermore of thoughts causing symptoms can be called "cognitive hierarchy". Besides these processes there are bottom-up influences as well with dysfunctional beliefs being activated by external and internal events. A differentiation between top-down processes and bottom-up influences can be drawn with the first being seen as causing thoughts and emotions while the latter only activate existing beliefs. To test Beck's maintenance and the vulnerability hypothesis considering the cognitive hierarchy we suggest an experimental paradigm to experimentally manipulate beliefs, thoughts, and emotions separately and independent from each other. To test both hypotheses in an experimental paradigm depressed and nondepressed subjects are asked to concentrate on new beliefs, thoughts, or emotions during the imagination of personally stressful life events in two studies. Based on the top-down processes it was posited that concentration on new beliefs should lead to changes on all three levels of experience. Adding a new thought should cause changes on the levels of thoughts and emotions while new emotions should only change the level of emotions. The results confirm our hypotheses concerning beliefs and thoughts, but adding emotions changes the levels of thoughts as well as emotions. The results support the central role of beliefs in the development and maintenance of depressive symptoms.

Keywords: Depression; cognitive theory; maintenance hypothesis; vulnerability hypothesis; experimental paradigm

Introduction

Beck's cognitive model of depression (1976, 1987) postulates the existence of three levels of experience with bidirectional influences on each other: Beliefs, thoughts, and emotions.

Following Beck (1976, 1987) and Ellis (1991), beliefs are common basic attitudes about the self, other people, the world, and the own relationship to the world. Dysfunctional beliefs in particular are presumed by Beck (1976, 1987) to be crucial for the development and maintenance of depressive symptoms. Beliefs are categorized as dysfunctional if they expressed or implied dogmatic, rigid, illogical, global ideas about acceptance and competence. When dysfunctional beliefs are activated, an information processing bias can be observed, so that these beliefs guide the perception and interpretation of situations, leading to a better perception, memory, and recall of information congruent to them, while incongruent information is processed less efficiently.

Accordingly, activation of dysfunctional beliefs triggers so-called negative automatic thoughts. Automatic thoughts in general are understood as temporary, non-emotional mental events, which are subjective plausible in a certain situation (Beck 1976, 1987). These automatic thoughts can be interpreted as the proximal "cause" for the emotional as well as somatic and motivational symptoms of depression. This top-down processes of beliefs causing thoughts and furthermore of thoughts causing symptoms can be called *cognitive hierarchy*. A dysfunctional cognitive hierarchy in particular is defined to be triggered by dysfunctional beliefs.

Besides these top-down processes there are important bottom-up influences as well with dysfunctional beliefs being activated by external (e.g., stressful life events; Monroe & Simons, 1991) and internal events (e.g., thoughts or emotions). These bidirectional influences can lead to the impression of similar processes in both directions. Nevertheless, a differentiation can be drawn with top-down processes being seen as causing thoughts and emotions while bottom-up

influences activate existing beliefs (Ellis, 1962; Ingram, Miranda, & Segal, 1998; review for the mood-state hypothesis see Segal & Ingram, 1994).

For cognitively vulnerable subjects, activating events can precipitate a pattern of negatively biased, self-referring information processing through the activation of dysfunctional beliefs (Segal & Ingram, 1994). This process initiates the first cycle in a downward spiral of depression in those subjects (*vulnerability hypothesis*) and leads to the maintenance of the symptoms through the described information processing bias (*maintenance hypothesis*). In contrast, non-vulnerable subjects react with an appropriate level of distress (e.g., sadness) to activating events, but do not start a downward spiral into depression (Segal & Ingram, 1994; Segal, Shaw, Vella, & Katz, 1992).

Many cross-sectional studies examining the correlation between beliefs and depression as well as thoughts and depression, provide support for the maintenance hypothesis (e.g., Garber, Weiss, & Shanley, 1993; Weisz, Sweeney, Proffitt, & Carr, 1993; for a review see Segal & Ingram, 1994). Although three important prospective behavioral high-risk studies examined the vulnerability hypothesis, it has not yet found conclusive support (Alloy et al., 1999; Alloy, Abramson, Whitehouse, Hogan, Panzarella, & Rose, 2006; Hankin, Abramson, Miller, & Haefel, 2004; Lewinsohn, Joiner, & Rohde, 2001).

In their 36-month prospective longitudinal analysis with 349 students, Alloy et al. (1999) found a greater likelihood to develop a major depression for high-risk students than for low-risk students (17% vs. 1%). Students in this study were assigned to the high-risk group by scoring high on dysfunctional beliefs and pessimistic attributional style (stability, globality, consequences and self dimensions; Abramson, Metalsky, & Alloy, 1989). As Alloy et al. (2006)

themselves imply, no definite conclusion can be drawn about the role of dysfunctional beliefs as vulnerability factors because of this mixture of beliefs and attributional style.

In their one-year prospective longitudinal analysis with 1507 adolescents (9th to 12^h grade) Lewinsohn et al. (2001) examined the effects of pessimistic attributional style and dysfunctional beliefs on depression separately. In interaction with stressful life events, both, pessimistic attributional style as well as dysfunctional beliefs, predicted the diagnosis of depression one year later. However, none of these interactions between stressful life events and dysfunctional beliefs or attributional style could be shown to be significant predictors for self-reported depressive symptoms (Lewinsohn et al., 2001).

Finally, Hankin et al. (2004) analyzed the influence of dysfunctional beliefs independent of pessimistic attributional style. In each of their three longitudinal studies with a total of 559 unselected undergraduate students a significant influence of the interaction between dysfunctional beliefs and life events on self-reported depressive symptoms as well as on depressive disorders became obvious.

Although the presented cross-sectional and prospective longitudinal studies support the maintenance as well as the vulnerability hypothesis, it can not be concluded that beliefs represent the sole maintenance and vulnerability factor within the cognitive hierarchy, because none of these studies controlled the influence of the two other levels of experience (thoughts and emotions) on self-reported depressive symptoms and diagnosis of depression, respectively. Therefore, we suggest an experimental paradigm to experimentally manipulate beliefs, thoughts, and emotions separately and independent from each other, in order to examine the existence of the proposed cognitive hierarchy as well as the influence of each level of experience on vulnerability and maintenance of depression.

For this experimental paradigm, the top-down processes and bottom-up influences between all three levels of experience have to be taken into account (Ellis, 1962; Ingram, Miranda, & Segal, 1998; review for the mood-state hypothesis see Segal & Ingram, 1994). As bottom-up influences are based on existing elements that are not activated at a particular moment, one way to control the bottom-up influences is to activate all existing elements on each of the three levels of experience before the experimental manipulation. A suitable method for this purpose is the imagination of a personally stressful life event (for a review see Westermann, Spies, & Hesse, 1996). As shown earlier, this procedure allows for separate manipulations of beliefs, thoughts, and emotions (Beck, 1976; Ellis, 1986, 1991). If our interpretation of the cognitive hierarchy is correct only top-down processes should be measurable during experimental manipulations on the separate levels of experience while bottom-up influences can be kept constant.

Based on these considerations, our first study tests the following hypothesis related to the maintenance hypothesis: If depressed subjects concentrate on new functional beliefs during the imagination of personally stressful life events, changes should occur on all three levels of experience. Adding positive thoughts should cause changes on the levels of thoughts and emotions while new positive emotions should only change the level of emotions.

Our second study tests the following hypothesis derived from the vulnerability hypothesis: If nondepressed subjects concentrate on new dysfunctional beliefs during the imagination of personally stressful life events, changes should occur on all three levels of experience. Adding negative thoughts should cause changes on the levels of thoughts and emotions while new negative emotions should only change the level of emotions.

STUDY 1

Material and Methods

Participants

Participants in Study 1 were 40 women with a current diagnosis of major depression or dysthymia based on DSM-IV criteria (Diagnostic and Statistical Manual of Mental Disorders; American Psychiatric Association, 1994). Their age ranged from 20 to 57 years with a mean of 30.55 years and a standard deviation of 10.87 years. The participants were recruited by local newspapers and received \$25 for participation. The sample was restricted to women to avoid gender as a confounding variable. The decision to focus on female participants is justified through the fact that women suffer from depressive episodes twice as often as men during the course of their lives following the DSM-IV (APA, 1994). An informed consent was obtained for all participants. To reduce social desirability and response biases we explained the aim of the study not until the end of the experiment.

Measures

Beck-Depression Inventory (BDI): The BDI (Beck & Steer, 1987) is a 21-item self-report instrument that assesses cognitive, affective, motivational, and physiological symptoms of depression. Scores on this instrument range from 0 to 63. The BDI was used as a screening instrument for the selection of probably depressed participants. With $\alpha = .83$ (Cronbachs Alpha) the internal consistency of the BDI in our samples is in the range of the internal consistencies reported in the German standardization study ($\alpha = .74$ to $.95$; Hautzinger, Bailer, Worall, & Keller, 1995).

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I): The SCID-I (First, Gibbon, Spitzer, & Williams, 1996) is a semi-standardized clinical interview, to assess diagnosis according to DSM-IV criteria (APA, 1994). Only women with a current diagnosis of major

depression or dysthymia and without any other psychopathological disorders were allowed to participate.

The SCID interviews were conducted by clinical psychologists, after passing a special SCID training program. The final psychiatric diagnoses were provided by consensus of two SCID interviewers according to Spitzer's procedure (Spitzer, 1983). The interrater reliability concerning affective disorders was 0.95 (kappa).

Exploration of emotions, thoughts, and beliefs: Exploration of individual emotions, thoughts, and beliefs based on A. T. Beck's approach (Beck, A. T. & Rush, 1985). The *three-column technique* was used to explore thoughts and emotions (A. T. Beck, 1976). With this technique, the interviewer supports the participants to distinguish their emotions and thoughts from an external event (e. g., description of surroundings and people involved, the behavior of the participant and others involved). For further analyses, the interviewer asked the participant about associations between each thought and particular emotions, and about associations between each emotion and particular thoughts, respectively.

In order to explore core beliefs, the *downward arrow technique* was utilized (Burns, 1999). Hence, based on the thoughts explored in the three-column technique, participants were asked: "What would it mean to you if [thought of the participant] matched reality?" The first answer was recorded and the same question was repeated with this answer. This procedure was continued until the participant described the same statement three times in a row with similar words. Following Burns (1999), this resulting statement represents an important *belief*. The described downward arrow technique was repeated for each thought named by the participant. This combination of triple column technique and downward arrow technique is common in research as well as in clinical use (Beck, J. S., 1995; Pössel, 2003; Pössel & Holzhay, 2006).

Finally, the participants estimated the intensity for each emotion, the degree of engagement for each thought, and the strength of conviction for each belief (*conviction values*). The questions read as follows:

“On a scale from 0 to 100%, how strong is this emotion compared to the maximum strength imaginable for this emotion?”

“On a scale from 0 to 100%, how strongly have you been preoccupied with this thought compared to the maximum strength imaginable?”

“On a scale from 0 to 100%, how strong is your conviction about this belief?”

All interviews were conducted by two clinical psychologists, who had passed a two day training by the first author. While the first interviewer conducted the interview with the participants, the assignment of the second interviewer was to control and ensure the adherence to the interview manual. Furthermore, the interview session was recorded by both interviewer and the final data were provided by consensus.

Procedure

In order to select participants suitable for the experiment, a two-level selection process was completed. In the first step, potential participants were chosen with the BDI. In this study, only participants with a BDI score of 16 and above were assigned preliminarily to the study, all other participants were excluded. In the second step of the selection, SCID-I was conducted to identify and exclude all participants (a) without a major depression or dysthymia diagnosis, (b) with other psychological disorders, that may lead to major depression or dysthymia (psychotic disorders, substance-related disorders, agoraphobia, social phobia, PTSD, generalized anxiety syndrome, & eating disorders).

Afterwards, all participating women had to report a personally stressful life event to explore beliefs, thoughts, and emotions following Beck (1976) and Burns (1999) as described above. Personally stressful life events were used to activate latent dysfunctional beliefs. In study 1 the depressed participants were explicitly asked about situations in which they had felt depressive as described in SCID-I.

Approximately one week after the selection, in accordance with Beck's imaginative approach, (1976) each participant was asked to imagine the reported situation four times in detail (one baseline condition and three treatment conditions). The conditions were separated by one hour breaks, where participants were allowed to relax, eat their lunch and/or read magazines in the lab. To control the effects of order and habituation, the four conditions (approximately half an hour each) were balanced between the participants. Within the baseline condition the depressed participants were only asked to imagine their stressful life event, while under treatment conditions they had to add new more functional beliefs or positive thoughts respectively emotions to this imagination. A similar procedure is often used in cognitive psychotherapy (Beck, 1976; Ellis, 1986, 1991), especially with Axis II patients (Beck, J. S., 1995). In an empirical study with patients Ellis (1986) could show that this procedure is highly effective and able to change beliefs in a short time.

The added elements (beliefs, thoughts, or emotions) were specified through cooperation between the experimenter and the participant immediately previous to each treatment condition. Therefore, the experimenter asked for a belief (a thought and emotion, respectively, in the other treatment conditions) that could have been helpful for the participant within the chosen situation. This procedure leads to a high rate of participant's acceptance. To avoid false interpretations of

the results neither activated beliefs, nor already existing thoughts and emotions within the personally stressful life events were added during of the treatment conditions.

In order to add new positive elements in study 1, the participants were asked to repeatedly concentrate on the specified positive elements (e. g. a positive belief like “I am loveable!”) during the treatment imaginations. This technique differs significantly from normal cognitive-behavioral therapy strategies. However, this strategy seems beneficial to influence beliefs, thoughts, and emotions separately and independent from each other.

Immediately after each imagination, the participants were asked to estimated the strength of conviction for each belief, the degree of engagement for each thought, and the intensity for each emotion during the imagination.

Data Analysis

Categorization of emotions, thoughts, and beliefs: Emotions, thoughts, and beliefs were subsequently subdivided into positive and negative. For this, the same procedure was used as in preceding research (Kuiper & Derry, 1982; Pössel, 2003; Pössel & Holzhey, 2006; Schwartz & Garamoni, 1986), following Russel and Mehrabian (1977). Thereby, emotions were assigned to the categories *positive* or *negative* according to their emotional valence. Based on the association given by the participant, affiliated thoughts were assigned to the same category as the emotions.

Based on A. T. Beck and Rush (1985) beliefs were classified as dysfunctional or functional. They were categorized as dysfunctional if they expressed or implied dogmatic, rigid, illogical, global ideas about acceptance and competence. All other beliefs were classified as functional.

Calculation of power values: To integrate positive and negative values on each level in one figure and to reduce the number of statistical analyses, data were integrated by calculating so-called *power values*. For this integration the conviction values were summarized separately for

positive and negative emotions. These values of power were used to calculate a *states-of-emotion* called *ratio for emotions* by the formula of Schwartz (Schwartz, 1997).¹ This procedure was repeated for thoughts (*states-of-thought*) as well as beliefs (*states-of-belief*). Based on Schwartz et al's model (1997) lower values represent a more negative ratio that is connected with increasingly severe depression (mild: .42 to .58; moderate: .34 to .41; severe: .10 to .33; profound: .00 to .09). Higher values represent a more positive ratio that is usually correlated with more positive features (range: .59 to .90) or in the case of an extreme positive ratio with unrealistic optimism and mania (range: .91 to 1.00).

Calculation of reliability: The classification in emotions, thoughts and beliefs as well as positive/negative and functional/dysfunctional, respectively, was revised by two psychologists with a minimum of two years of clinical (therapy) experience. These raters reassessed separately and independently from each other as well as blind to the exploration condition (baseline vs. addition of beliefs vs. addition of thoughts vs. addition of emotions). The interrater reliability for emotions and thoughts was both $\kappa = 1.00$, and the interrater reliability of the beliefs reached $\kappa = .85$, which indicates close to perfect agreement (Landis & Koch, 1977). Furthermore, the interrater reliability for the classification as positive vs. negative and functional vs. dysfunctional elements was $\kappa = .92$.

Statistical analyses: The statistical analysis was based on the ratios described above. For beliefs, thoughts, and emotions separate analyses of variance for repeated measures with the following conditions were calculated for the depressed participants: Baseline, addition of beliefs, addition of thoughts, and addition of emotions. The reported significance levels were corrected

¹ States-of-mind = $P/(P+N)$; P = number of positive/functional power value; N = number of negative/dysfunctional power value.

by degrees of freedom according to Greenhouse and Geisser (1959). The values of significance of the post-hoc tests were adjusted with the Bonferroni correction (Diehl & Arbing, 1993). Since we only generated hypotheses for three of six possible t-tests within each analysis of variance, only these t-tests were conducted. The levels of significance for the pairwise comparisons have been adjusted accordingly, allowing significance only if $p \leq .016$ ($\alpha = 5\%$).

Results

The descriptive data of the depressed participants' ratios and the results of the analyses of variance which were all significant are presented in Table 1.

In the adjusted post-hoc tests significant differences are revealed between the conditions *addition of beliefs* and baseline in the states-of-belief ($t(39) = - 8.16, p < .001$), the states-of-thought ($t(37) = - 2.71, p = .010$), and the states-of-emotion ($t(37) = - 3.82, p < .001$). For the condition *addition of thoughts*, no significant difference to the baseline condition can be shown for the states-of-belief ($t(39) = - 1.53, p = .133$), but for the states-of-thought ($t(37) = - 7.62, p < .001$) and the states-of-emotion ($t(39) = - 4.37, p < .001$). The conditions *addition of emotions* and baseline differ not significantly for the states-of-belief ($t(39) = - 2.35, p = .024$), but for the states-of-thought ($t(37) = - 2.68, p = .011$) and the states-of-emotion ($t(37) = - 8.36, p < .001$). All results but the significant difference between the conditions addition of emotions and baseline for the states-of-thought are according to the hypothesis.

Discussion

After activating existing beliefs, thoughts, and emotions connected to a specific personally stressful life event, the addition of new beliefs affected all three levels of experience (beliefs,

thoughts, and emotions) while experimental manipulations of thoughts and emotions showed no effects on beliefs. Therefore, the results of the experimental manipulation of beliefs and thoughts are in accordance with the cognitive hierarchy and with the maintenance hypothesis. However, the addition of emotions induced an unpredicted effect on the level of thoughts, referring to the cognitive hierarchy. Given these intriguing results, Study 2 tests the vulnerability hypothesis considering the cognitive hierarchy in subjects without current or lifetime depression or dysthymia.

STUDY 2

Material and Methods

Participants

Participants for Study 2 were 48 women without any current or lifetime diagnosis following DSM-IV (APA, 1994). The age of these subjects reach from 20 to 49 years with a mean of 25.50 and a standard deviation of 7.97. Previous research concerned with intended changes support the notion that it is more complicated to influence a person in a negative than in a positive direction (e.g. McCabe, Gotlib, & Martin, 2000; for a review see Westermann et al., 1996). As nondepressed participants were supposed to be influenced in a negative direction, a greater sample size was used than in the first study in order to balance the presumably lower effect sizes. The participants were recruited by local newspapers and were paid \$25 for participation. Informed consent was obtained by participants. To reduce social desirability and response biases we explained the aim of the study not until the end of the experiment.

Measures

The measures for study 2 were identical to those in study 1 (see above).

Procedure

In both studies identical procedures were used. Differences only occur firstly in the selection criteria of the participants: To select nondepressed participants only women with a BDI score of ten and below and no current or lifetime DSM-IV (APA, 1994) diagnosis in SCID-I were allowed to take part in the experiment. Secondly, there are differences in the added elements (beliefs, thoughts, and emotions): While the depressed participants in study 1 were asked to add positive elements, the nondepressed participants in this study were asked to add new negative and dysfunctional elements, respectively, by repeatedly concentrating on them during the treatment imaginations. Similar to study 1, the added elements (belief, thought, or emotion) were specified through cooperation between the experimenter and the participant immediately before each treatment condition. That is, the experimenter asked for a belief (a thought and an emotion, respectively, in the other treatment conditions) that would be negative for the participant within the chosen situation. Negative and dysfunctional elements, respectively, as stated by the subjects in study 1 were used as examples.

The interrater reliability concerning affective disorders in study 2 was 0.95 (kappa).

Data Analysis

The classification in emotions, thoughts and beliefs as well as positive/negative and functional/dysfunctional, respectively, was revised by the same rater than in study 1. The statistical analyses for study 2 were identical to those for study 1 (see above).

The interrater reliability for emotions and thoughts was both $\kappa = 1.00$, and the interrater reliability of the beliefs reached $\kappa = .84$, which indicates close to perfect agreement (Landis & Koch, 1977). Furthermore, the interrater reliability for the classification as positive vs. negative and functional vs. dysfunctional elements was $\kappa = .91$.

Results

The descriptive data of the depressed participants' ratios and the results of the analyses of variance which were all significant are presented in Table I.

In the adjusted post-hoc tests a significant difference between the conditions *addition of beliefs* and baseline is revealed for the states-of-belief ($t(47) = 7.50, p < .001$), the states-of-thought ($t(47) = 2.57, p = .013$), and the states-of-emotion ($t(47) = 5.94, p < .001$). Furthermore, while the comparison between the conditions *addition of thoughts* and baseline is not significant for the states-of-belief ($t(47) = 1.63, p = .109$), the comparisons show significant differences for the states-of-thought ($t(47) = 4.48, p < .001$) and the states-of-emotion ($t(47) = 3.30, p = .002$). Finally, the comparison between the conditions *addition of emotions* and baseline show no significant difference for the states-of-belief ($t(47) = 2.23, p = .030$), while the differences are significant for the states-of-thought ($t(47) = 2.49, p = .016$) and the states-of-emotion ($t(47) = 5.66, p < .001$). All results beside the significant difference between the conditions addition of emotions and baseline for the states-of-thought are according to the hypothesis.

Discussion

In accordance with the cognitive hierarchy and vulnerability hypothesis the addition of negative beliefs affected all three levels of experience (beliefs, thoughts, and emotions), while experimental manipulations of thoughts and emotions showed no effects on beliefs. But contrary to the ideas of the cognitive hierarchy the addition of negative emotions induced an unpredicted effect on the level of thoughts.

General Discussion

Due to the cognitive model of Beck (1976, 1987), dysfunctional beliefs are central for the development (vulnerability hypothesis) and maintenance (maintenance hypothesis) of depressive symptoms. Following the hypothesis regarding the cognitive hierarchy, activated dysfunctional beliefs lead to depressive symptoms due to their influence on the information processing and automatic thoughts. Although many cross-sectional and prospective longitudinal studies give support to the maintenance and vulnerability hypothesis, it can not be concluded that beliefs represent the only maintenance and vulnerability factors within the cognitive hierarchy, because these studies did not control the influence of thoughts and emotions. To test the influence of beliefs, thoughts, and emotions separately an experimental paradigm was used. In this experimental paradigm, existing negative elements of the participants on all levels of experience (beliefs, thoughts, and emotions) were activated by the imagination of a past personally stressful life event to control the impact of bottom-up influences. Concerning the maintenance hypothesis it was predicted that if depressed subjects concentrate on new functional beliefs during the imagination of personally stressful life events, changes should occur on all three levels of experience. Adding positive thoughts should cause changes on the levels of thoughts and emotions while new positive emotions should only change the level of emotions. Concerning the vulnerability hypotheses, it was expected that if nondepressed subjects concentrate on new dysfunctional beliefs during the imagination of personally stressful life events, changes should occur on all three levels of experience. Adding negative thoughts should cause changes on the levels of thoughts and emotions while new negative emotions should only change the level of emotions.

In both studies the addition of new beliefs affected all three levels of experience (beliefs, thoughts, and emotions), while experimental manipulations of thoughts and emotions showed no effects on beliefs. Therefore, the results of the experimental manipulation of beliefs and thoughts are in accordance with the maintenance and vulnerability hypothesis. However, the addition of emotions induced an unpredicted effect on the level of thoughts.

One possible explanation might be a carry-over effect between the addition of thoughts and emotions. If this was true, there should be a carry-over effect between these two conditions and the addition of beliefs as well. However, the addition of beliefs shows a different pattern than the addition of the two other elements which contradicts the carry-over effect as explanation. Furthermore, carry-over effects should be controlled by the balance of the order of all conditions. However, a design allocating subjects randomly to baseline and one treatment condition would be an alternative and probably more effective to study the cognitive hierarchy.

A theoretically based explanation for a carry-over effect on the levels of thoughts and emotions might be that rumination was measured by asking the participants how preoccupied they are with their thoughts. Given the strong relationship between rumination and negative emotion (Nolen-Hoeksema, 2004), this could explain why the experimental manipulation of emotions also leads to changes on the level of thoughts. When integrated in Beck's model and the cognitive hierarchy this would mean that, at least some thoughts and emotions, are located on one level of experience. This idea would support the strong interdependence of both levels as postulated by Ellis (1962), as well as by the mood-state hypothesis (Ingram et al., 1998).

Another possible explanation for the influence of the addition of emotions on thoughts might be that some subjects have limited abilities to imagine personally stressful life event. In subjects with lower imagination abilities bottom-up influences might not be controlled in a sufficient

manner, which can lead to an activation of existing thoughts by adding of a new emotion.

Inconsistent with this explanation an activation of existing beliefs would be expected as well, if bottom-up influences are not controlled adequately.

The different effects of the experimental manipulation of beliefs on the one hand and thoughts and emotions on the other hand give strong support for a successful attempt to influence the levels of experience separately and corroborates the experimental paradigm as effective to study the interdependencies within the cognitive hierarchy.

It has to be noted that the ratios of beliefs, thoughts, and emotions at baseline are relatively low compared with earlier studies (review see Schwartz, 1997). This difference between the study presented here and earlier studies might base on a negative valence of the personally stressful life events, described by the ratios. This is in line with some earlier studies which report these ratios to be dependent on the valence of situations involved in the studies (e.g., Fichten, Amsel, Robillard, & Tagalakis, 1991; Michelson, Schwartz, & Marchione, 1991; Treadwell & Kendall, 1996).

The presented studies have to acknowledge several limitations: They refer to (a) the exclusive use of self-report data, (b) missing control of the ability to imagine the personally stressful life event, (c) the lack of examination of depressive symptoms, and (c) the exclusive participation of female subjects with comorbid diagnoses.

The exclusive use of self-reports can lead to doubts, whether the participants have the ability to differentiate between beliefs and thoughts by introspection. If participants are not able to differentiate, manipulations on both levels should show the same effect. However, in both studies different findings for beliefs and thoughts were revealed, which argues against this objection. Nevertheless, the exclusive use of self-reports can lead to demand effects, so that

participants who were asked to concentrate on a dysfunctional belief might be more likely to endorse dysfunctional beliefs or even negative thoughts and emotions later. If this was true, the concentration on one element (belief, thought, or emotion) should lead to a change on the affected level of experience but not on one of the other levels of experience. The results of both studies concerning the addition of beliefs and thoughts are contradictory to this idea. However, the use of more experimental methods to measure the three levels of experience should be preferred in further research. One alternative could be the application of the self-reference encoding task-paradigm (SRET; Kuiper & Derry, 1982) that focuses on differential information processing characteristics between depressed and nondepressed subjects. In this paradigm, participants are asked to decide, whether certain adjectives are descriptive for themselves. Afterwards the power of recollection for adjectives with different valences is determined. In previous research it was shown, that depressed subjects remember more negative self-descriptive adjectives than nondepressed subjects (e.g., McCabe et al., 2000). Another possibility could be a writing speed task to measure psychomotor retardation which correlates positively with negative emotions. During this task subjects are asked to write down as many numbers from 100 in descending order as possible in a certain time (Gotlib, Ranganath, & Rosenfeld, 1998). But writing speed shows only correlations with emotions, but does not measure emotions itself, so it can not be used as a mean to examine all three levels of experience.

As mentioned above, it can not be ruled out that some subjects have only limited abilities to imagine personally stressful life events which might be a reason for the unexpected influence of emotions on thoughts. Therefore, in future studies this ability should be measured (e.g., with the Questionnaire upon Mental Imagery; Sheehan, 1967), and statistically controlled.

Another limitation of the study is the restriction to depressed women without comorbid disorders. Although the decision to prefer female participants is justified through the higher incidence rate for depression in women, and previous research did not find gender differences in dysfunctional beliefs (Lewinsohn, Seeley, & Gotlib, 1997), this constriction leads to limitations concerning the generalizability of the presented results. Therefore, future research should focus on both genders. As comorbidity is more the rule than an exception in depressive disorders, the restriction on participants without comorbid disorders clearly limits the external validity. Hence, future research should consider the inclusion of participants with different comorbid disorders.

Finally, it can be seen as limitation that each subject participated in all three treatment conditions (addition of beliefs, thoughts, emotions), as carry-over effects can not be completely ruled out. We controlled such a possible bias by balancing the order of all conditions, and no indications for any carry-over effect became obvious in both studies. Nevertheless, a design allocating subjects randomly to baseline and one treatment condition would be a considerable alternative.

In summarizing, the results support the central role of beliefs in the development and maintenance of depressive symptoms based on the cognitive hierarchy of Beck's cognitive model of depression. Contrary to the expectations there seem to be bidirectional influences of thoughts and emotions. Therefore, it can be assumed that thoughts and emotions are on one level of experience, supporting the strong interdependence postulated by Ellis (1962), as well as by the mood-state hypothesis (Ingram et al., 1998).

The different effects of the experimental manipulation of beliefs on the one hand and thoughts and emotions on the other hand give strong support for a successful attempt to influence the levels of experience separately. Furthermore, the different result patterns on the levels of beliefs

and thoughts show that the participants were able to differentiate between beliefs and thoughts by introspection. This indicates that the used dependent variables and the experimental manipulation are reliable variables and procedures, respectively, to study the cognitive hierarchy. Nevertheless, further experiments are necessary to replicate the results.

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Table 1:

Descriptive data and results of the variance analyses for repeated measures for both studies.²

	baseline	addition of beliefs	addition of thoughts	addition of emotions	F-value	df	p
	Mean/SD	Mean/SD	Mean/SD	Mean/SD			
Study 1							
states-of-belief	.17/.16	.40/.18	.21/.20	.24/.22	26.55	1.77/68.97	.001**
states-of-thought	.18/.15	.30/.25	.36/.13	.27/.24	11.16	1.73/63.87	.001**
states-of-emotion	.22/.18	.37/.23	.36/.24	.49/.18	17.67	2.43/89.86	.001**
Study 2							
states-of-belief	.48/.27	.35/.24	.46/.29	.45/.28	21.05	1.61/75.73	.001**
states-of-thought	.34/.20	.26/.18	.28/.20	.27/.17	3.53	1.69/79.47	.048*
states-of-emotion	.29/.19	.16/.14	.21/.16	.15/.12	22.71	1.95/91.42	.001**

Footnote: * $p < .05$; ** $p < .01$

² Data of power values for separate positive and negative elements are available from the authors.