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Impact of Automatic Thoughts and Psychological Flexibility on Depressive Symptoms and on Relapse of Remitted Depressed Persons

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Keywords
Major depression · Automatic thoughts · Psychological flexibility

Summary
Theoretical Background: Although positive and negative automatic thoughts (PAT, NAT) and psychological flexibility (PF) are strongly related to depressive symptoms, the role of these variables in a depressive relapse has not been examined yet. **Question:** The study examines the impact of an inpatient treatment on clinical variables like PAT, NAT, and PF. Furthermore, the course of PAT, NAT, and PF of individuals with early relapse after therapy is observed. Finally, the study focuses on the question, to what extent PAT, NAT, and PF predict a relapse in depression. **Method:** The variables were measured in 39 remitted depressed subjects and 45 healthy control persons. During the experimental phase, a sad mood was induced in both groups. The remitted depressed subjects went through a 16-month follow-up phase. **Results:** After the negative mood induction, remitted depressed showed less PAT in comparison to healthy persons. During the follow-up phase, individuals with early relapse showed restricted access to PAT and low PF. None of the variables (PAT, NAT, PF) could predict depressive relapse. **Conclusion:** Remitted depressive and early relapsed subjects show limited access to PAT. The weak production of PAT represents a risk factor for a depressive relapse.

Schlüsselwörter
Rezidivierende Depression · Automatische Gedanken · Psychologische Flexibilität

Zusammenfassung
Hintergrund: Obwohl positive und negative automatische Gedanken (PAG, NAG) sowie die psychologische Flexibilität (PF) einen engen Zusammenhang mit der depressiven Symptomatik aufweisen, wurde die Rolle dieser Variablen bei einem depressiven Rückfall bisher nicht erforscht. **Fragestellung:** In dieser Studie wird untersucht, wie sich eine stationäre Intervention auf klinische Variablen (PAG, NAG und PF) auswirkt. Zudem wird der Verlauf von PAG, NAG und PF von Frührückfälligen in der Katamnesephase erforscht. Dabei geht es darum, inwiefern PAG, NAG und PF einen Rückfall vorhersagen. **Methode:** Bei 39 remittierten Depressiven sowie 45 gesunden Kontrollpersonen wurden die oben genannten Variablen erhoben. In der experimentellen Phase wurde bei den Probanden beider Gruppen eine traurige Stimmung induziert. Die remittiert depressiven Probanden wurden über eine 16-monatige Katamnesephase nachuntersucht. **Ergebnisse:** Nach der negativen Stimmungsinduktion riefen remittiert Depressive im Vergleich zu Gesunden weniger PAG ab. Zudem zeigten Frührückfällige während der Katamnesephase einen eingeschränkten Zugang zu PAG und eine niedrige PF. Weder PAG, NAG noch PF erwiesen sich als bedeutsame Prädiktoren eines depressiven Rückfalls. **Schlussfolgerung:** Remittiert Depressive und Frührückfällige zeigen einen eingeschränkten Zugang zu PAG. Die schwache Produktion von PAG stellt einen Risikofaktor für einen depressiven Rückfall dar.

For reasons of readability, only male pronouns are used; however, in all cases, the meaning applies to both females and males.

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Background

Unipolar depressive episodes are among the most common and debilitating of mental disorders [Bromet et al., 2011]. In Germany, depressive disorders have a lifetime prevalence of 11–17% and a 12-month prevalence of 6–12% [Bush et al., 2013; Jacobi et al., 2004]. Those afflicted suffer an average of 3 to 4 depressive episodes in their lives [Keller and Boland, 1998]. The risk factors that are being discussed for the recurrence of depressive episodes include a large number of previous depressive phases, residual symptoms, cognitive reactivity (see definition in the section below on 'Cognitive Reactivity and Automatic Thoughts') and chronic stress factors [Burcusa and Iacono, 2007; Rojas et al., 2014; Schauenburg and Clarkin 2003; Segal et al., 2006].

Automatic Thoughts and Depression

The 'cognitive model of depression' is an influential explanatory approach to depressive relapse [Beck, 1967; Garrat et al., 2007; Thomsen, 2006; Winkeljohn Black and Pössel, 2015]. This model defines 4 different constructs [Beck, 1967; Disner et al., 2011]: Every person has 'cognitive schemata', which represent the first construct. These process and organize all incoming information and experiences. They include negative facts and beliefs, constituting so-called 'depressive schemata'. The schemata are reactivated in stressful situations, which can lead to 'cognitive biases' (the second construct). As a logical implication of the negatively changed processes, the 'negative cognitive triad' is formed (the third construct). It consists of negative attitudes towards the Self, the world, and the future. These attitudes are manifested as 'automatic thoughts' (AT; the fourth construct) [Hollon et al., 1996; Pössel and Knopf, 2008; Winkeljohn Black and Pössel, 2015]. AT are spontaneous, fleeting thoughts, which appear to be mostly self-evident. They can be either negatively or positively toned [Huffzinger et al., 2008]. The present work deals principally with AT as part of the cognitive model of depression.

The occurrence of 'negative automatic thoughts' (NAT) in depressive patients has been repeatedly confirmed [Crandell and Chambless, 1986; Dobson and Shaw, 1986; Dozois et al., 2009; Hjemdal et al., 2013; Oei and Sullivan, 1999]. It has been shown that improvement in depressive symptoms through psychotherapy is associated with a reduction in NAT [Furlong and Oei, 2002] and an increase in 'positive automatic thoughts' (PAT) [Dozois, 2007; Dozois et al., 2009; Shiraishi, 2005]. Therefore, an inverse relationship is assumed between PAT and depressive symptoms [Ingram et al., 1995; Missel and Sommer, 1983].

Whether it can then be supposed that AT have a moderating effect on depressive symptoms, or that vulnerability to depression is shown by AT, is a matter of dispute [Oei and Shuttlewood, 1996; Haaga et al., 1991]. For example, there is debate about whether AT mediate the influence of negative life events on the emergence of depressive symptoms, or whether they facilitate the adverse effect of dysfunctional attitudes on the depressive symptoms [Kwon and Oei, 1992; Szentagotai and Freeman, 2007].

Cognitive Reactivity and Automatic Thoughts

There is evidence to suggest that a negative or sad mood can intensify dysfunctional attitudes in remitted depressed subjects [Miranda and Persons, 1988; Miranda et al., 1998]. This phenomenon is referred to as 'cognitive reactivity' and is associated with an increased risk of depressive relapse [Lethbridge and Allen, 2008; Rojas et al., 2014; Segal et al., 1999, 2006]. Dysfunctional attitudes and AT are closely linked [Pössel and Knopf, 2008; Winkeljohn Black and Pössel, 2015]. Thus, negative mood induction might bring about altered access to PAT and NAT in remitted depressed subjects. This, in turn, could be associated with an increased risk of depressive relapse. This hypothesis has not so far been studied.

Psychological Flexibility and Depression

The construct of 'psychological flexibility' (PF), which originates in Acceptance and Commitment Therapy (ACT) [Hayes et al., 1999; Hayes, 2004], offers a complementary perspective on the emergence and maintenance of depressive symptoms. People with pronounced PF are intensely involved in the present moment, as well having greater acceptance of their feelings and thoughts. This enables them to adapt their behavior to their personal values and situations by flexibly changing or maintaining them [Hayes et al., 2006]. PF includes various aspects of ACT, such as developing a mindful attitude and acceptance, and reducing experiential avoidance as well as the formation of cognitive defusion [Hoyer and Gloster, 2013]. Cognitive defusion is defined as the easing of identification with verbal processes (especially thoughts) as a result of mindful awareness [Hayes, 2004].

PF is a construct that is regarded as an essential component of mental health [Kashdan and Rottenberg, 2010]. Measured by the Acceptance and Action Questionnaire II (AAQ II), PF is negatively correlated, as expected, with indicators of depression [Hoyer and Gloster, 2013]. The increase in PF is also assumed to mediate the impact of psychotherapeutic intervention on improvement of the depressive symptoms [Fledderus et al., 2013; Zettle et al., 2011].

Study Objectives

Although AT and PF, as described above, can moderate the course of depressive symptoms during a psychotherapeutic intervention, so far there has been no study of *remitted depressives* to determine whether their access to AT and the extent of their PF could affect a possible depressive relapse after treatment stops.

The study's first objective is to examine the *immediate effects* of a cognitive-behavioral (inpatient) program on the occurrence of PAT and NAT as well as the extent of PF in depressed persons.

A further question relates to the *long-term development of the variables (at 16-month follow-up) and their effects* on the depressive symptoms. Therefore, we have studied the trajectories of PAT, NAT, and PF, and whether a depressive relapse is associated with changes in these variables.

Furthermore, there is so far little evidence to show whether *remitted depressed subjects exhibit altered access to PAT and NAT compared to healthy controls* after *a negative mood induction (experiment).* So we pursue the question of whether altered access to

AT after a negative mood induction, as well as low PF at discharge, predict the time at which a depressive relapse will occur during the 16-month follow-up phase.

Method

Design

The present study succeeded a pre-post design with a follow-up history. Both remitted depressed and healthy subjects participated in the experiment on negative mood induction, but only remitted depressives were included in the 16-month follow-up phase. Organizational factors prevented follow-up with the healthy subjects.

Sample

A total of 84 persons participated in this study; of these, 39 were remitted depressives and 45 were subjects without current or past psychological disorders.

At the beginning of their stay at the Roseneck Hospital – Psychosomatics and Psychotherapy (Prien, Upper Bavaria, Germany), patients with a 'major depression' received a written invitation to an informational event. Those who were interested in participating in the study signed a consent form. To check the inclusion and exclusion criteria for participation, we administered the Structured Clinical Interview for DSM-IV (SCID I and II) [Wittchen et al., 1997], the Zahlen-Verbindungs-Test (ZVT) [Number-Connection Test] [Vernon, 1993], the Beck Depression Inventory II (BDI II) [Hautzinger et al., 2006], and the Quick Inventory of Depression Symptomatology – Clinician Rating 16 Items (QIDS-C-16) [Rush et al., 2003]. Persons, who were excluded, suffered from severe neurological or mental illnesses, such as psychotic syndrome, bipolar disorder, post-traumatic stress disorder, obsessive-compulsive disorder, addiction, eating disorder, or borderline personality disorder, as well as patients who were being treated with electroconvulsive therapy or were not proficient in the German language. The reason for the exclusion was that these variables could restrict cognitive processes and prevent correct responses on the questionnaires. During inpatient treatment with a behavioral therapeutic focus, the depressive symptoms of all interested patients were assessed every 14 days using the BDI II; but only those patients took part in the mood induction experiment who had met the criteria for complete remission of their depressive symptoms at least 4 weeks prior to the experiment. This was considered to be the case if the patients attained a score of ≤ 8 on the BDI II (self-evaluation) *and* ≤ 5 on the QIDS-C-16 (external evaluation). The experiment in negative mood induction was conducted with the remitted depressed patients during the week of discharge. There is more detailed information about the questionnaires used during negative mood induction in the section below on 'Conducting the Experiment'. Of the 114 depressive patients invited to participate in the study when they were admitted to the hospital, 62 agreed to do so. 23 of these subjects could not participate because they met at least 1 exclusion criterion (see above).

The *control group,* consisting of 45 healthy people, was recruited from a pool of subjects from the Department of Psychology at the University of Tübingen. After the control subjects were informed about the objective of the study and signed the consent form, the SCID I and II, the ZVT, the BDI II, and the QIDS-C-16 were administered to verify that there was no significant psychopathology. A second appointment was set for the actual study. The BDI II was re-administered before the experiment.

To ensure the comparability of the remitted depressive and healthy subjects, as well as to control for disruptive variables, the groups were matched by age, social class, education, and occupation. No differences were found between the groups (all chi-squared values > 0.10). The average age of the 39 men and 45 women in the group of remitted depressed subjects was 46 and in the control group 45. The remitted depressives had suffered from recurrent depression for about 10 years on average and had experienced an average of 3 depressive episodes. Regarding the intensity of the depressive symptoms (measured by the BDI II and QIDS-C-16), 31 persons (80%) were diagnosed with a moderate depressive episode and 8 (20%) with a severe one. At the time of the negative mood induction, 27 patients (69%) had been taking stable doses of antidepressants for at least 4 weeks. The rest of the patients received no medication. At that time, all participants were considered in remission.

Variables and Instruments

Socio-demographic information was compiled in both groups for 'age', 'gender', 'family and educational status', and 'occupational status'. The subjects were also *asked about their physical health.* Possible mental disorders were assessed by means of the SCID I and II [Wittchen et al., 1997]. The ZVT [Vernon, 1993] was used to check for cognitive deficits by measuring processing speed and concentration.

The BDI II [Hautzinger et al., 2006] was conducted to assess the severity of the depressive episode, by self-assessment. The QIDS-C-16 [Rush et al., 2003] was used to determine the major symptom areas of depression and their severity (external evaluation). The 21 items of the 'Fragebogen positiver und negativer automatischer Gedanken' (FAG; Questionnaire on Positive and Negative Automatic Thoughts) were split, using the item-total correlation of the factor analysis from the work of Pössel et al. [2005], into 2 shortened and comparable scales with 11 items each, to prevent possible effects of repeated testing within a short period of time. The items were analyzed according to the strength of the factor loading. Items of each sub-scale of the FAG with similar factor loading were then allocated to the corresponding short version, so that each version contained the same number of items with similar loading. The resulting shortened versions, with 11 items each, were called FAG-11A and FAG-11B. The data for analysis of the short versions originated from a pilot study with a total of 204 persons (94 depressive and 110 healthy subjects), carried out by the lead investigator.

PF was measured by the German version of the Acceptance and Action Questionnaire II (AAQ II) [Hoyer and Gloster, 2013]. The 20 items of the 'Positive and Negative Affect Schedule' (PANAS) [Krohne et al., 1996] assess positive and negative feelings. The subjects themselves assess the intensity of their different feelings on a 5-point Likert Scale from 'very slightly' (1) to 'very much' (5). This questionnaire was used in the present study before and after the negative mood induction to verify the change of emotional state.

Procedure

Experiment

To standardize the procedure across all subjects (remitted depressed and healthy), the experimental study was performed at approximately the same time (between 14:00 and 17:00). Possible sources of disturbance were controlled. Before the start of the experiment, all subjects filled out the BDI II for assessment of depressive status, and the PANAS was used to capture the current emotional state. The subjects from both groups also completed the FAG-11B and the AAQ II. Then, a negative mood was induced by listening to the 10-min version of Suite No. 1, Op. 46, 'Åse's Death', from the Peer Gynt Suite by Edvard Grieg through headphones. Meanwhile, the subjects were asked to think of a sad event in their lives that occurred at least 2 years prior. After the negative mood induction, the FAG-11A and PANAS were administered. To offset the negative mood, subjects listened to the 7-min version of Suite No. 1, Op. 46, 'Morning Mood', also from the Peer Gynt Suite [see Rojas et al., 2014]. This approach to mood induction was similar to that of other working groups [Lethbridge and Allen, 2008; Segal et al., 1999, 2006]. The effectiveness of the musical piece in inducing a negative mood had been shown in an earlier study [Rojas et al., 2014].

Follow-Up

After the experiment, the 16-month follow-up phase began. The remitted depressed patients were interviewed by mail every 4 months to ascertain their AT (FAG-11A/B), PF (AAQ II), and depression status (BDI II). If the BDI II score was higher than 14 (mild depressive symptoms), the lead investigator contacted the subjects within 1 week by telephone, using the QIDS-C-16 to determine whether there had been a depressive relapse. If the QIDS-C-16 score was ≥ 7, a depressive relapse was diagnosed, and the patient received a telephone consultation.

Table 1. Descriptive statistics of the demographic and study variables from remitted depressed and healthy subjects at admission as well as before and after the negative mood induction

Study variables	Remitted depressive (n = 39)	Healthy (n = 45)
Demographic data		
Age, years (M ± SD)	46 ± 9	45 ± 9
Gender, n (m/f)	18/21	21/24
Baccalaureate, n (%)	21 (54)	26 (58)
Occupation , n (%)	33 (85)	39 (87)
Depressive symptoms		
BDI II at admission (M ± SD)	23 ± 5	–
BDI II before experiment (M ± SD)	7 ± 2	5 ± 2
QIDS-C-16 at admission (M ± SD)	2,64 ± 1,31	–
QIDS-C-16 before experiment (M ± SD)	1.30 ± 0.50	1.0 ± 0.20
PF		
AAQ II at admission (M ± SD)	30 ± 7,40	–
AAQ II before experiment (M ± SD)	34 ± 9,50	44 ± 5,80
NAT		
FAG-11A admission (M ± SD)	1.90 ± 0.80	–
FAG-11B before experiment (M ± SD)	2.10 ± 0.70	1.40 ± 0.40
FAG-11A after experiment (M ± SD)	1.80 ± 0.80	1.30 ± 0.50
Index of NAT (M ± SD)	0.09 ± 1.10	–0.08 ± 0.90
PAT		
FAG-11A admission (M ± SD)	3.60 ± 0.90	–
FAG-11B before experiment (M ± SD)	3.34 ± 0.85	3.20 ± 0.84
FAG-11A after experiment (M ± SD)	3.94 ± 1.11	2.80 ± 0.95
Index of PAT (M ± SD)	–0.51 ± 0.90	0.44 ± 0.80
Emotional state		
PANAS – neg. affect before experiment (M ± SD)	1.30 ± 0.30	1.30 ± 0.30
PANAS – neg. affect after experiment (M ± SD)	1.80 ± 0.60	1.90 ± 0.40

M = mean; SD = standard deviation; PF = psychological flexibility; NAT = negative automatic thoughts; PAT = positive automatic thoughts; neg. = negative; BDI II = Beck Depression Inventory II; QIDS-C-16 = Quick Inventory of Depression Symptomatology – Clinician Rating 16 Items; FAG-11A/B = Fragebogen positiver und negativer automatischer Gedanken (Questionnaire on Positive and Negative Automatic Thoughts) (11A and 11B); AAQ II = Acceptance and Action Questionnaire II; PANAS = Positive and Negative Affect Schedule.

Statistical Analyses and Data Evaluation

The sample's characteristics were examined using a chi-square test. The depressive symptoms, AT, and PF of the remitted depressives at admission and discharge were compared using the paired t-test.

The severity of the depressive symptoms in the remitted depressed and healthy subjects shortly before the negative mood induction was calculated by an analysis of variance (ANOVA). An ANOVA was also used to verify whether the negative mood induction was equally effective for both groups. To do this, PANAS scores were included from before and after the negative mood induction for both groups. An analysis of variance (ANOVA) for repeated measurements was conducted to calculate the effect of mood induction on the PAT and NAT (pre-post). Here the partial eta-squared (η^2) was applied to determine the effect size.

The fluctuation of input values is a common problem in studies with a pre-post design, so we established *indices of automatic thoughts* [Brockmeyer et al., 2012; Segal et al., 2006]. Simple linear regression analyses were calculated with the scores from before the experiment (FAG-11B) as the predictor and the scores from after the experiment (FAG-11A) as the dependent variable. The resulting 'standardized residuals of the model' (Zres-FAG) represented unbiased measurements of the changes (pre-post) in these variables [Cohen et al., 2003]. The indices of the PAT and NAT were used to analyze the effect of negative mood induction. To investigate possible changes of AT in remitted depressed and healthy subjects, 'analyses of covariance' (ANCOVAs) were performed, with the BDI II at discharge as a covariate.

The differences between the relapsed and non-relapsed remitted depressives were calculated by means of t-tests for independent samples 16 months after discharge from inpatient care. After the 16-month follow-up, the survey results for AT and PF served as dependent variables.

We also investigated, using t-tests, whether the remitted depressed subjects who relapsed early in the follow-up phase differed from those who relapsed late or not at all, in terms of PF and AT. For this purpose, the remitted depressives were formed into 2 subgroups. The first subgroup (early relapse) consisted of the subjects who had already suffered a depressive relapse within the first 4 months. The second group (late relapse or no relapse) comprised subjects who had a depressive relapse later in the 16-month follow-up period, or no relapse at all.

To study the association of an altered access to PAT and NAT after the negative mood induction as well as PF before the experiment, with the probability of occurrence of a depressive relapse during the follow-up phase, we used binary logistic hierarchical regression models. To determine the effect size, f according to Cohen was calculated and applied.

Results

As expected, there was a significant reduction of depressive symptoms among remitted depressives. This was demonstrated with high effect sizes for the scores of the BDI II ($t(39) = 13.83$; $p = 0.02$; $d = 2.48$) and of the QIDS-C-16 ($t(39) = 11.29$; $p = 0.001$; $d = 2.20$). But neither for the NAT ($t(38) = -1.54$; $p = 0.13$) nor for the

Table 2. Results of the t-test to compare relapsed and non-relapsed remitted depressive subjects after the 16-month follow-up for the study variables captured during the follow-up

Variable	Depressive relapse	n	M ± SD	95 % CI	d
NAT (FAG-11)	yes	17	2.91 ± 0.93	–1.91, –0.65	–1.26**
	no	21	1.94 ± 0.61		
PAT (FAG-11)	yes	17	1.98 ± 0.81	0.33, 1.68	1.05*
	no	21	2.84 ± 0.89		
PF (AAQ II)	yes	17	26.60 ± 10.00	0.56, 1.96	1.48**
	no	21	37.50 ± 7.38		

Data is missing from one relapsed participant, so n = 17. M = mean; SD = standard deviation; PF = psychological flexibility; NAT = negative automatic thoughts; PAT = positive automatic thoughts; 95% CI = 95% confidence interval; d = effect size according to Cohen, with an indication of the significance level (*p < 0.01; **p < 0.001); FAG-11A/B = Fragebogen positiver und negativer automatischer Gedanken (Questionnaire on Positive and Negative Automatic Thoughts) (11A and 11B); AAQ II = Acceptance and Action Questionnaire II.

PAT (t (38) = –1.63; p = 0.11) a difference could be found between the scores at the admission and discharge dates. The PF (AAQ II), however, increased significantly between these 2 dates, with medium effect size (t (39) = 3.60; p = 0.001; d = 0.47) (table 1).

Despite a clear improvement in mental health, the patient group showed a significantly higher level of depressive symptoms compared to the healthy subjects (F (1, 84) = 8.24; p = 0.005; $\eta^2 = 0.10$). The BDI II score at discharge was therefore considered as the covariate in the further analyses.

Negative Mood Induction in Remitted Depressed and Healthy Subjects

First using an ANOVA, we checked whether the negative mood induction was equally effective for both groups. It showed a time effect (F (1, 82) = 109.31; p ≤ 0.0001; $\eta^2 = 0.57$), but no interaction effect (time × group). Thus the negative mood induction was the same for both groups.

To investigate possible different levels of PAT and NAT before and after the mood induction, indices of AT were calculated and used for analysis. By using an ANCOVA with BDI II at discharge, the scores of which were used as a covariate, we established that there was a significant increase of PAT in the healthy control subjects (M = 0.44 ± 0.81) and a clear decrease of this score for the remitted depressives (M = –0.51 ± 0.95), with a large effect (F (2, 84) = 12.77; p = 0.001; $\eta^2 = 0.24$). With regard to the NAT, there was no difference between the two groups (remitted depressives: M = 0.09 ± 1.1; control group: M = –0.08 ± 0.88) (F (2, 82) = 0.31; p = 0.73).

Long-Term Effects

Comparison between relapsed and non-relapsed remitted depressives after 16-month follow-up

18 subjects (46%) suffered a depressive relapse during the follow-up phase. Of these, 12 were female and 6 male. Using the t-test for independent samples, we examined whether there were differences in the AT and PF between all the relapsed and non-relapsed subjects after the 16-month follow-up. At this time of measurement, the remitted depressives without a relapse (n = 21) showed greater PF and greater access to PAT than those who had a relapse. These results are significant, with large effect sizes. By contrast, those who relapsed had a significantly higher access to NAT than those who had no relapse (table 2).

Comparison between early relapsed and late relapsed or non-relapsed remitted depressives

Two subgroups were formed within the group of remitted depressives to gain a better understanding of the impact of the study variables on early depressive relapse (Group 1: early relapsed subjects, who suffered a relapse within 4 months; Group 2: late relapsed or non-relapsed subjects). The highest incidence of relapse was within the first 4 months (early relapsed subjects, n = 12). In the next 12 months, 6 more people suffered a relapse (late relapsed).

With respect to the PAT (FAG-11A/B), the two groups differed significantly, with a large effect size (t (37) = 2.25; p = 0.03; d = 0.78), whereby the early relapsed subjects displayed distinctly lower PAT (M = 1.7 ± 0.5) than those with a late relapse or no relapse (M = 2.7 ± 0.6). There was *no difference* between the two groups regarding NAT. For PF (AAQ II), the early relapsed subjects likewise showed (M = 27.6 ± 7), in comparison with those with a late relapse or no relapse (M = 36.6 ± 9.3), significantly lower scores (t (37) = 3.0; p = 0.005; d = 1.04). Since a large number of prior depressive episodes is considered a risk factor for depressive relapse, we then examined the correlation of these variables with an early relapse. The two groups (early relapse: M = 4.2 ± 2.6; late or no relapse: M = 2.0 ± 1.1), as expected, differed significantly in the number of prior depressive episodes (t (36) = –3.71; p = 0.001; d = 1.30; 95% confidence interval = –2.03, –0.55).

Prediction of a depressive relapse in remitted depressed subjects

We postulated that remitted depressed subjects with an altered access to NAT and PAT resulting from the negative mood induction and with low PF before the experiment would suffer a depressive relapse. Binary logistic regression analyses were used to study the probability of a depressive relapse.

The first step was verification of the influence of demographic and clinical variables (gender, number of depressive episodes, and BDI II at discharge) on the likelihood of relapse 16 months after

Table 3. Logistic regression analysis of depressive relapse as a function of demographic, clinical, and cognitive variables

Variable	Block	B	Wald	eβ	χ2 (block)	R2	f
Analysis 1 (simultaneous entry)					5.63*	0.18	0.47
Gender	1	–	n.s.	–			
Number of depressive episodes	1	0.44	4.53*	1.55			
BDI II at discharge	1	–	n.s.	–			
Analysis 2 (stepwise entry)							
Indices of positive and negative automatic thoughts (FAG-11A/B)	2	–	n.s.	–	–	–	–
Analysis 3 (stepwise entry)							
Psychological flexibility before experiment (AAQ II)	2	–	n.s.	–	–	–	–

*p < 0.05; n.s. = not significant.
β = beta; Wald = Wald criterion; e^{β} = exponentiation of the β coefficient; χ^2 = chi-square; R2 = Nagelkerke correlation value; f = effect size according to Cohen; BDI II = Beck Depression Inventory II; FAG-11A/B = Fragebogen positiver und negativer automatischer Gedanken (Questionnaire on Positive and Negative Automatic Thoughts) (11A and 11B); AAQ II = Acceptance and Action Questionnaire II.

the end of the intervention. The overall model is significant and accounts for 18.4% of the variance (χ^2 (4, N = 38) = 5.63; p = 0.02; R^2 = 0.18; f = 0.47). But taking into account the Wald criterion only the variable 'number of depressive episodes' has forecasting power (χ^2 (1, N = 38) = 4.53; p = 0.033; e^{β} = 1.55).

In further individual analyses, the indices of the PAT and NAT were also considered (based on the FAG-11A/B), as was the PF before the experiment (based on the AAQ II). The introduction of these variables into the regression model, however, achieved no increase in forecasting power, so that the number of depressive episodes remained the only significant predictor in the model (table 3).

Discussion

Our results show a notable improvement in the PF of depressive persons who were in remission after inpatient behavioral treatment of their depressive symptoms. Contrary to our expectation, however, there were no significant changes in the PAT and NAT. The state character of the AT can be used to explain this result [Beck et al., 1994; Kelava and Schermelleh-Engel, 2012], in comparison to the fixed trait of the dysfunctional attitudes [Beck et al., 1994; Rojas et al., 2014; Segal et al., 1999, 2006]. Thus, the level of the AT reflects mainly the actual state at discharge. At this time, the emotional situation of remitted depressed subjects is described as ambivalent, because while they feel joy and optimism about the imminent return home, there is also uncertainty regarding new tasks and decisions. As previously mentioned in the context of the cognitive model of depressive disorders, AT have a close connection to dysfunctional attitudes [Pössel and Knopf, 2008; Winkeljohn Black and Pössel, 2015]. It is assumed that reactivation of dysfunctional attitudes (traits), triggered by stress or strain, also alters access to the AT (state).

We carried out a negative mood induction with remitted depressives and compared these patients to healthy subjects. Contrary to expectation, there was no difference in regard to the NAT. In the case of the PAT, however, there was a significant difference in favor of the healthy subjects. This suggests that the experience of a sad mood caused a similar activation of NAT in all subjects. The healthy subjects showed a significant increase of PAT given the sad mood, which can be interpreted as a coping strategy. But remitted depressives find it difficult to summon up positive and mood-brightening thoughts when experiencing a sad mood. Brockmeyer et al. [2012] studied the same relationship by the use of positively and negatively toned emotion words after a negative mood induction. They observed that remitted depressives used less positively toned emotion words than healthy control subjects.

Another objective of this work was to investigate the progression of clinical variables in remitted depressives during follow-up. 16 months after the end of intervention, those who had no relapse showed stronger access to PAT and a lower level of NAT compared to those with relapses. Thus, our findings confirm the results of previous studies [Dozois, 2007; Dozois et al., 2009; Furlong and Oei, 2002; Shiraishi, 2005]. Those without relapses also had much higher PF. That suggests that PF has a protective function against a depressive relapse.

Comparison of those with early relapses and those with late or no relapses showed that the former reported more frequent depressive episodes in their prior history. They also had less access to PAT and low PF. Here, however, we found no difference between the groups with regard to NAT. This result is consistent with our previous finding that access to PAT among remitted depressives is limited compared to that among healthy subjects.

The findings suggest that it is more the reduced access to PAT than the increase of NAT that is associated with depression symptoms (residual symptoms at the end of the hospital stay or depressive relapse in the follow-up period). A possible interpretation of this result is that, with an increasing number of depressive episodes, there is a gradual reduction of access to helpful cognitions or that each successive depressive episode intensifies dysfunctional attitudes [Lewinsohn et al., 1999; Nolen-Hoeksema et al., 1992].

On the other hand, PAT (e.g., optimistic thoughts about the Self) serve as a buffer against threats of reduced self-esteem in stressful situations [cf. Bosson et al., 2003]. An implication for behavioral therapeutic practice is that therapists should work with patients to develop helpful and especially realistic thoughts. Clinical experience shows that a few patients are aware of their patterns of thought; therefore, they need to learn to construct a conscious and attentive attitude toward the content of their thoughts and thought processes, using metacognitive and/or mindfulness-based interventions. The development of strategies for managing NAT and dysfunctional cognitions as well as for establishing mood-enhancing activities and thoughts thus plays an important role. These strategies, e.g., the activation of PAT in burdensome or stressful situations, should be practiced in everyday life through behavioral experiments. It is striking that the PF of those without relapses is higher than those with them. Therefore, it is advisable to encourage PF by using the methods of ACT [Hayes, 2004].

We also looked at whether the altered access to AT after a negative mood induction and the PF at discharge proved to be predictors of depressive relapse during the 16-month follow-up phase. Contrary to our expectations, we found no evidence for this hypothesis. Only the number of depressive episodes in the patient's prior history turned out to be a significant predictor. This result could be attributed to the state character of the AT and complements the results of earlier studies. In these studies, the activation of irrational attitudes (traits) after a negative mood induction proved to be a significant predictor of early depressive relapse [Rojas et al., 2014; Scher et al., 2005; Segal et al., 1999, 2006].

There are, however, some limitations to consider when interpreting the results. Under the naturalistic-clinical conditions, we could not choose a randomized study design. The relatively short time span between the remission of depressive symptoms and the implementation of the experiment (4 weeks) could also be seen as a limitation. The sample was relatively small, especially that of the remitted depressed subjects. The results at the follow-up phase for early relapsed and late relapsed or non-relapsed subjects should at this point be considered exploratory and hypothesis-generating.

To validate the findings, we recommend that former depressives with a short remission period be compared with subjects who are considered to have recovered from the depressive phase. For clinical practice, it would be relevant to examine whether classical cognitive behavioral therapy for depression could be improved by additional modules to promote PF and PAT, for example, by metacognitive strategies. Correlations between dysfunctional attitudes and AT should be validated experimentally. This should shed further light on the internal and connectivity structure of the constructs presented here and could have important implications for diagnosis and treatment of depressive disorders.

Ethics Committee Approval

The study protocol along with the explanatory information and consent forms were examined and approved by the Ethics Committee of the University Hospital of Tübingen. All participants received oral and written information about the study. A written consent form was signed at the beginning of the study.

Disclosure Statement

The authors hereby declare that they have no conflicts of interest with regard to the present manuscript.

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