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Effects of placebos vs. SMS reminders on homework compliance in cognitive-behavioral therapy for depression: a randomized trial

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Abstract

Background: Nonadherence to homework assignments is a frequent problem among patients with depression during cognitive-behavioral therapy (CBT). The present study investigated the effects of two additional treatment components of CBT: a placebo and SMS (short message service) reminders. These components aimed at improving homework compliance (the practicing of a daily relaxation exercise at home) during a four-week outpatient program.

Subjects and Methods: Eighty-six patients diagnosed with major depressive disorder were randomly assigned to one of three groups: 'Coping with Depression' course (treatment as usual; TAU group), 'Coping with Depression' course with additional daily placebo treatment (PLA group), or 'Coping with Depression' course with additional daily SMS reminders (SMS group). The placebo (sunflower oil) was introduced as a natural medicine to mobilize the body's natural healing powers. SMS messages were sent out once a day to remind the patients of their homework.

Results: The placebo group showed better homework compliance than the two other groups with improved quantity and quality of relaxation exercises. The SMS group practiced more often than TAU but did not differ in homework quality (relaxation level) from TAU. All groups showed a significant reduction of depression symptoms at the end of the course with the most pronounced reduction in the PLA group.

Conclusions: The results suggest that placebo treatment is more effective than SMS reminders to support relaxation training in patients with depression. Additionally, the placebo was associated with a larger reduction of depression symptoms.

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1. Introduction

Cognitive-behavioral therapy (CBT) refers to a class of interventions that effectively reduce symptoms of various mental health conditions (e.g., Albajes & Moix, 2021; Hoffman et al., 2012; Kazantis et al., 2018). Homework assignments are an integral component of CBT. Typically, CBT with outpatients involves regular in-office sessions (e.g., once a week), which are combined with instructions for therapeutic activities between the sessions (Kazantis et al., 2012). Research has shown that homework completion is associated with successful outcomes of psychotherapies (Burns & Spangler 2000; Detweiler & Whisman, 1999; Kazantzis & Lampropoulos, 2002; Kazantzis et al., 2016; Mausbach et al., 2010). A review by Mausbach et al. (2010) including 23 psychotherapy studies found evidence to suggest that patients who completed their homework showed greater symptom reduction than those who did not. This finding was replicated in a meta-analysis (Kazantzis et al., 2016), which identified that both the amount of homework completion ('homework quantity') and 'homework quality' (e.g., new skill acquisition) influenced the outcome of CBT. In the treatment of depression with CBT, homework compliance has been correlated with significant clinical improvement and decreases in both self-rated and clinician-rated depression scores (e.g., Coon et al., 2003; Cowan et al., 2008; Neimeyer et al., 2008; Rees et al., 2005; Simons et al., 2012; Strunk et al., 2012; Thase et al., 2006).

The therapeutic goals of homework assignments include psychoeducation (e.g., transfer of knowledge concerning disorder symptoms and treatment options) and self-assessment (e.g., symptom monitoring; Bunnell et al., 2021). Moreover, certain skills can be practiced as homework, such as exposure to disorder-relevant stimuli, or relaxation training (e.g., Tang & Krehdler, 2017). Relaxation training is a widely used CBT component in the treatment of depression (e.g., Beck 1996). All relaxation techniques (e.g., progressive muscle relaxation, autogenic training) elicit a somatic relaxation response, which is characterized by the reduction of muscle tension (Petermann & Vaitl, 2014). This somatic response is accompanied by a state of mental relaxation, such as increased calmness, and a reduced level of negative emotions (see meta-analysis by Manzoni et al. 2008). Because of these effects, relaxation exercises help to better cope with stressful situations, which is a central goal in the treatment of depression (Jorm et al., 2008, Lewinsohn et al., 1998). Even though relaxation exercises are beneficial for the treatment of depression, many patients struggle to complete their homework assignments. Reasons for lack of compliance often include motivational problems to initiate a behavior (e.g., relaxation training) when experiencing negative feelings and to show endurance with this

behavior. These deficits are directly linked to depression symptoms. Therefore, it is important to support homework compliance in patients with depression.

One innovative way to improve adherence to relaxation training has been placebo treatment (Höfler et al., 2020; Jurinec & Schienle, 2020; Schienle & Jurinec, 2021; Schienle & Unger, 2021). In a study by Höfler et al. (2020), healthy female participants were provided with a ‘natural medicine to mobilize the body’s natural healing powers’ (sunflower oil provided in a small bottle with the label ‘golden root oil’) to improve adherence to progressive muscle relaxation (PMR) training. The women were randomly assigned to a standard group, which was instructed to practice PMR every day at home for two weeks, or a PMR group, which received additional daily placebo treatment (which had to be taken orally directly before the exercise). The placebo group practiced more often than the standard group. Patients diagnosed with major depressive disorder who received the same placebo (‘golden root oil’) showed a higher quantity and quality of their relaxation homework than a group without a placebo (Jurinec & Schienle, 2020). The placebo group practiced more often and experienced greater relaxation effects. Similar effects (higher practice frequency of relaxation training) were achieved using an open-label placebo which was administered without deception (Schienle & Unger, 2021).

Placebo effects are generally conceptualized as psychobiological phenomena that can be traced back to different mechanisms, including the expectation of clinical improvement and Pavlovian conditioning (Benedetti et al., 2005; Fernandez-Lopez et al., 2022). It has been suggested that positive expectations elicited via placebos are associated with ‘meaning attribution’ (Moerman, 2002). The process of receiving a placebo is connected with a special meaning: the patients are assured that they get an effective treatment, which will lead to improvements in somatic and/or mental health (‘healing’). This type of treatment reflects the caring of the placebo provider and thus is an important aspect of the patient-practitioner relationship. However, in the case of placebo-improved homework compliance (Höfler et al., 2020; Jurinec & Schienle, 2020), it is also possible that the placebo oil ‘only’ had a reminder function. The patients saw the little bottle with the oil and this visual cue reminded them to practice. To follow up on this hypothesis, we conducted a study where patients diagnosed with major depressive disorder were randomly assigned to one of three groups: ‘Coping with Depression’ course (treatment as usual; TAU), ‘Coping with Depression’ course with additional daily placebo treatment, or ‘Coping with Depression’ course with additional daily mobile phone short-text message reminders. We used SMS (short message service) to remind the patients of their daily relaxation practice (e.g., ‘This is just to remind you to take your 15 minutes to relax’). The implementation of such reminders in the healthcare system has demonstrated positive effects on the achievement of daily behavioral goals (for reviews see Pirolli et al., 2017, and Schwebel & Larimer, 2018).

1.1 Hypotheses for the present study

In the present study, we tested whether the two additional CBT components (placebo vs. SMS reminders) would have different incremental effects on the quantity and quality of relaxation training as well as on depression symptoms compared to the standard therapy. We hypothesized that the participants of the placebo group would show improved homework compliance (increased frequency of completed relaxation exercises; improved relaxation effects due to the exercises) and a greater reduction of depression symptoms compared to the SMS and TAU groups.

2. Methods and Materials

2.1. Participants

A total of 86 patients (85% female; mean age: $M = 46.1$ years, $SD = 10.5$) with a diagnosis of major depressive disorder (moderate or severe symptoms) participated in this study. The majority of participants had completed an upper secondary level of education (≥ 12 years; 87%) and worked in white-collar jobs (66%). Exclusion criteria for the study were severe psychiatric comorbidity (e.g., psychotic disorder, substance dependence), acute suicide risk, severe somatic illness (e.g., cancer), and current psychotherapy. Antidepressant medication was accepted if the dose had been stable for at least 12 weeks before study enrolment.

2.2 Design

This study had an additive design: two components (placebo, SMS reminders) were added to standard CBT (the brief version of the ‘Coping with Depression’ course by Lewinsohn et al., 1984; Cuijpers et al., 2009). The ‘Coping with Depression’ course consisted of four sessions (90 minutes, weekly, over four weeks) and focused on psychoeducation about depression, training of cognitive skills, pleasant activities, and relaxation training. The course was conducted in a group setting with six patients. The teaching was combined with daily homework assignments. The patients were asked to conduct a 15-minute relaxation exercise at home every day (practicing period = 21 days). The relaxation instructions were delivered via a guided audio recording.

The patients were randomly assigned (random number table) to one of three groups (see Figure 1 with CONSORT diagram): the standard version of the ‘Coping with Depression’ course (treatment as usual: TAU), the course with additional daily placebo (PLA) treatment, or the course with additional short-message reminders (SMS). The three groups did not differ in mean age, gender ratio, educational status, marital status, and medication (see Table 1). All courses (TAU, PLA, SMS) were conducted by the same therapist in a randomized sequence. The

participants of the different courses (TAU, PLA, SMS) had no contact with each other within the scope of this study and were not aware of the different treatment components.

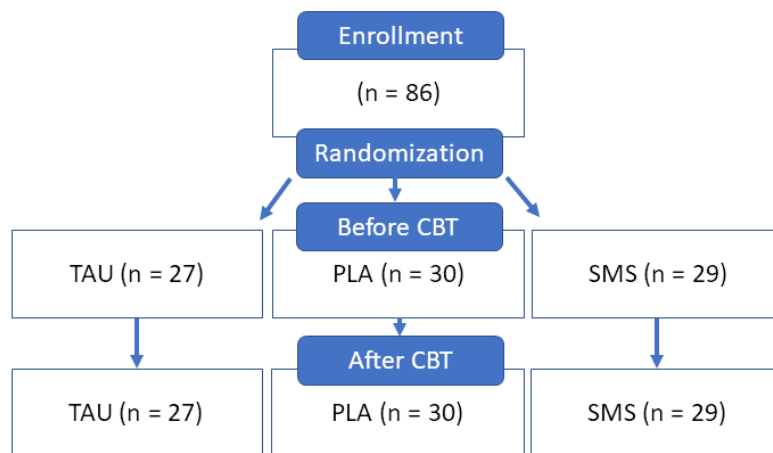


Figure 1. CONSORT diagram (TAU: treatment as usual, SMS: short-text reminders, PLA: placebo treatment; CBT: cognitive-behavioral therapy)

2.3 Additive therapy components

a) Placebo: The participants of the PLA group received a blue glass bottle with a dropper (height: 103 mm) from the therapist. The bottle was filled with 30 ml of sunflower oil for self-administration at home. The bottle was labeled ‘golden root oil’ (*Rhodiola Rosea*). It was explained that the oil is a natural medicine that helps the patients to focus on their inner strengths and to mobilize their bodies’ natural healing powers. The participants were instructed to take three drops of the oil orally before the daily relaxation exercise, which was conducted as therapeutic homework. At the end of the study, the patients returned the bottles to check their placebo adherence (All participants had used the oil).

b) SMS reminders: The SMS participants received a daily SMS reminder on their mobile phone (randomly between 9 a.m. and 7 p.m.; e.g., “Hello Mrs. X. This is just to remind you to take your 15 minutes to relax”, “Hello Mr. X, don’t forget to do your relaxation exercise”, “Have you already relaxed today, Mrs. X?”, “Relaxation will help you cope with your depression”). A total of 21 different messages were sent to each patient.

Both additive therapy components were comparable in terms of duration of application (it takes a few seconds to apply three drops of the placebo oil/ read an SMS), frequency (once per day), and context (outside of therapy session; at home).

2.4 Procedure

The patients were diagnosed with major depression by a psychiatrist (according to ICD-10) and transferred to a community health center where the course was conducted. The course has been implemented by the National Institute of Public Health (NIJZ) of Slovenia.

During the first session of the course, the patients answered the Beck Depression Inventory-II (BDI-II; Beck et al., 1996). The BDI consists of 21 items rated on 4-point scales from 0 to 3, with higher scores indicating more severe depression symptoms (severity categories: 0–13: minimal depression, 14–19: mild depression, 20–28: moderate depression, 29–63: severe depression). Cronbach's α of the BDI-II in this study was .79 (first assessment) and .82 (second assessment). Furthermore, the patients received instructions on how to conduct a 15-minute relaxation exercise at home, an audio recording for the relaxation exercise, and a homework booklet. They were asked to write down the day of practice and the level of relaxation before and after the exercise on a Likert scale that ranged from 1 ("not relaxed at all") to 10 ("totally relaxed"). In the last session of the course, the booklet was returned to the therapist and the BDI-II was completed again. Additionally, the therapist assessed patients' changes due to the therapy on a Likert scale that ranged from 1 to 7 (1: strong increase in depression symptoms/worsening; 4: no change; 7: strong decrease of depression symptoms/improvement).

The study was approved by the ethics committee of the University and conformed to the Declaration of Helsinki 1995 (as revised in Edinburgh 2000). All participants provided written informed consent. At the end of the study, all participants were fully debriefed on the study design and use of the placebo.

2.5 Statistical analysis

We computed four analyses of variance (ANOVAs). The first ANOVA tested the effects of GROUP (TAU, PLA, SMS) on homework quantity (number of days with a completed relaxation exercise). The second ANOVA investigated the effects of GROUP and TIME (before/after relaxation exercise) on homework quality (changes in relaxation level). The third/fourth ANOVAs tested the effects of GROUP and TIME (before/after the course) on depression symptoms (self-rating: BDI-II scores, therapist ratings). We report effect sizes as η^2 (partial eta squared). For post hoc t-tests, we applied the Bonferroni-Holm correction and report Cohen's d as an effect size measure. To assess the clinical relevance of changes in BDI-II scores due to the treatment, changes in severity categories of depression were compared between the groups (i.e., the percentage of patients in a group who were in a lower category after the course). This was done with a χ^2 test. All statistical analyses were performed using IBM SPSS Statistics, version 21.

We computed a power analysis via G*Power (3.1.9.7; Faul et al., 2007) based on a previous study (Jurinec & Schienle, 2020) that found differences in practicing frequency of relaxation training between a placebo and a no-placebo group with a very large effect size (Cohen's $d = 1.6$). Because of the inclusion of the SMS group, we assumed a moderate effect (Cohen's $f = .35$). A total sample size of 84 participants is sufficient to detect this effect with a probability of $1-\beta = .80$ ($\alpha = .05$).

3. Results

3.1 Homework quantity (number of days with a completed relaxation exercise)

The ANOVA revealed a significant effect of GROUP on homework quantity ($p < .001$; $\eta^2 = .27$). The PLA group reported a higher number of completed relaxation exercises than the SMS group ($t(37.52) = 2.75$, $p = .009$, $d = .72$), which in turn practiced more often than the TAU group ($t(49.75) = 2.33$; $p = .024$, $d = .62$; see Table 1).

Table 1: Group characteristics (TAU = treatment as usual; PLA = placebo; SMS = short message reminder; M = mean; SD = standard deviation; n = number of participants; BDI: Beck Depression Inventory-II; a: baseline b: after course/exercise)

	TAU (N = 27)	PLA (N = 30)	SMS (N = 29)	Group differences
Mean age in years (<i>SD</i>)	44.2 (11.6)	48.0 (10.0)	45.8 (9.9)	$F(2,83) = .97, p = .38$
Female, % (<i>n</i>)	78 (21)	83 (25)	93 (27)	$\chi^2(2) = 2.65, p = .27$
Education (≥ 12 years), % (<i>n</i>)	85 (23)	83 (25)	93 (27)	$\chi^2(10) = 5.92, p = .82$
Employed, % (<i>n</i>)	59 (16)	73 (22)	65 (19)	$\chi^2(8) = 5.42, p = .71$
In relationship, % (<i>N</i>)	77.8 (21)	50.0 (15)	62.1 (18)	$\chi^2(4) = 6.46, p = .17$
Children, % (<i>n</i>)	66.7 (18)	83.3 (25)	82.8 (24)	$\chi^2(2) = 2.89, p = .24$
Antidepressants, % (<i>n</i>)	81.5 (22)	80.0 (24)	89.7 (26)	$\chi^2(2) = 1.15, p = .56$
Mean number of completed relaxation exercises (<i>SD</i>)	10.56 (4.54)	17.73 (2.82)	14.07 (6.63)	$F(2,83) = 15.25, p < .001$
Mean relaxation level ^a (<i>SD</i>)	3.86 (0.83)	4.35 (0.80)	4.05 (0.88)	$F(2,83) = 2.51, p = .090$
Mean relaxation level ^b (<i>SD</i>)	6.44 (0.94)	7.79 (0.78)	6.45 (0.70)	$F(2,83) = 27.05, p < .001$
Mean BDI-II score ^a (<i>SD</i>)	26.70 (6.27)	28.23 (7.74)	29.72 (8.60)	$F(2,83) = 1.10, p = .340$
Mean BDI-II score ^b (<i>SD</i>)	20.93 (6.94)	16.53 (7.76)	21.24 (7.14)	$F(2,83) = 3.91, p = .024$

3.2 Homework quality (relaxation level)

For changes in relaxation level (homework quality), the ANOVA revealed a significant effect for TIME ($F(1,83) = 1315.44$; $p < .001$; $\eta^2 = .94$). The participants reported a higher relaxation

level after the exercise ($M = 6.92$, $SD = 1.03$) than before the exercise ($M = 4.09$, $SD = 0.85$, $t(85) = 30.85$, $p < .001$, $d = 3.00$; see Table 1).

The interaction $GROUP \times TIME$ also reached statistical significance ($F(2,83) = 17.90$; $p < .001$; $\eta^2 = .30$). The three groups did not differ before the exercise ($p = .09$, $\eta^2 = .06$) but afterwards ($p < .001$; $\eta^2 = .40$; see Table 1). Directly after the exercise, the PLA group reported a higher relaxation level than the SMS group ($t(57) = 6.98$, $p < .001$, $d = 1.81$) and the TAU group ($t(55) = 5.92$, $p < .001$, $d = 1.56$). There was no difference between SMS and TAU ($p = .99$). The increase in relaxation level due to exercising was higher in the PLA group ($M = 3.44$, $SD = .80$) compared to the SMS group ($M = 2.47$, $SD = .55$; $t(51.29) = 5.46$, $p < .001$, $d = 1.41$) and the TAU group ($M = 2.58$, $SD = .71$; $t(55) = 4.28$, $p < .001$, $d = 1.14$). Changes in relaxation level did not differ between SMS and TAU ($p = .51$; see Figure 2a).

3.3 Depression symptoms (self-report)

For the depression scores, the ANOVA indicated significant effects for $TIME$ ($F(1,83) = 222.58$; $p < .001$; $\eta^2 = .73$) and the interaction $GROUP \times TIME$ ($F(2,83) = 8.79$; $p < .001$; $\eta^2 = .18$). The effect for Group was not statistically significant ($F(2,83) = 1.51$; $p = .23$; $\eta^2 = .04$). The BDI-II scores were significantly lower after the course ($M = 19.53$, $SD = 7.55$) than before the course ($M = 28.26$, $SD = 7.64$, $t(85) = 13.89$; $p < .001$, $d = 1.15$).

The three groups did not differ before the course ($p = .34$; $\eta^2 = .03$; see Table 1). After the course, PLA had lower BDI-II scores than SMS ($t(57) = -2.48$; $p = .016$, $d = .65$) and TAU ($t(55) = -2.24$, $p = .029$, $d = .60$). There was no difference between SMS and TAU ($p = .83$). The reduction of BDI-II scores differed between PLA and TAU (PLA: $M = -11.70$, $SD = 5.45$; TAU: $M = -5.78$, $SD = 3.18$, $t(47.51) = -5.07$, $p < .001$, $d = 1.33$) and PLA and SMS (SMS: $M = -8.38$, $SD = 6.69$, $t(57) = -2.09$, $p = .041$, $d = .54$; see Figure 2). The difference between SMS and TAU was not statistically significant ($p = .068$).

After the course, 87% of the PLA participants were in a lower severity category (compared to pre-therapy), 67% in the TAU group, and 69% in the SMS group ($\text{Chi}(2)^2 = 3.67$, $p = .160$). We then compared the percentage of patients who showed a reduced depression severity of more than one category. This was the case for 37% of the PLA participants, compared to 11% of the TAU participants, and 14% of the SMS participants ($\text{Chi}(2)^2 = 6.69$; $p = .031$).

3.4 Depression symptoms (therapist rating)

The effect of $GROUP$ was statistically significant ($F(2,83) = 10.67$, $p < .001$; $\eta^2 = .20$). The therapist reported a higher change score for the PLA group ($M = 6.63$, $SD = .67$) than for the

SMS group ($M = 5.86$, $SD = 1.13$, $t(45.29) = 3.19$, $p = .003$, $d = .83$), and the TAU group ($M = 5.48$, $SD = 1.05$; $t(43.24) = 4.87$, $p < .001$, $d = 1.31$). The difference between SMS and TAU was not statistically significant ($p = .20$). The therapist rating was substantially correlated with the BDI-II difference score (post minus pre-therapy; $r = .72$, $p < .001$).

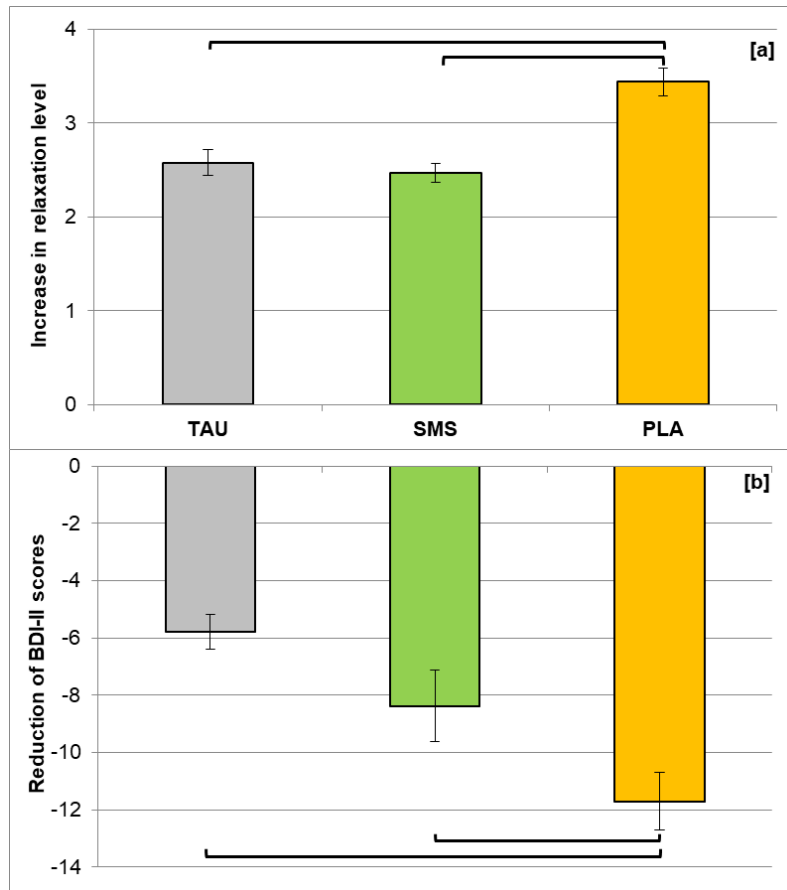


Figure 2. [a] Group comparisons for increases in relaxation level before vs. after the exercise and [b] reductions of Beck Depression Inventory-II scores (means, standard errors) before vs. after the course) Treatment as usual (TAU), additional short-text reminders (SMS), additional placebo treatment (PLA); bars indicate statistically significant differences ($p < .05$).

4. Discussion

This study on homework compliance during CBT used an additive design. Two therapy components (placebo, SMS reminders) were added to standard CBT to test whether the new components would cause an increment in the degree of change generated by the standard therapy. We thereby followed the recommendations for studying placebo effects in psychotherapy (e.g., Borkovec & Sibrava, 2005; Enck et al., 2019; Gaab et al., 2018).

It was shown that placebo treatment increased both homework quantity and quality. The placebo group (PLA) completed more relaxation exercises than the two other groups (TAU, SMS) and perceived the exercises as more effective in terms of a greater increase in relaxation

level. Compared to the standard therapy, the group with SMS reminders also showed a superior performance concerning homework frequency (higher number of relaxation exercises). These results are in line with findings that short text messages can be an effective tool to improve treatment compliance (e.g., Schwebel & Larimer, 2018). However, homework quality did not differ between the SMS and TAU groups.

The present results demonstrate that placebo treatment can effectively support relaxation homework in depressed patients. In the current study, the placebo had been introduced as a means to activate the body's natural healing powers and was self-administered directly before the daily relaxation exercise. This procedure could have produced an immediate placebo response (i.e., a higher relaxation level in the placebo group directly after taking the oil). The data showed that the placebo did not have this immediate calming effect because the groups (TAU, PLA, SMS) did not differ in their baseline relaxation levels. However, the placebo motivated the recipients to practice more, which in turn positively affected the relaxation level. This interpretation was also supported by the verbal feedback of some of the patients in the PLA group. They mentioned that they felt motivated to practice because they had received a 'little gift', something that was given to them to support them (Geers et al., 2005). They not only had to give, and show their commitment to the therapy but they received something in return for their efforts. Typically, psychotherapy only involves communicative exchange. The placebo treatment expanded this exchange process with a physical entity (the bottle with the 'natural medicine') that activated a specific meaning schema (Moerman, 2002). Different authors have suggested that placebo administration signals that the therapist 'takes care' of the patient, who feels 'I am being cared for' (e.g., Wager & Atlas, 2015). In this sense, the placebo effect is a psychological/ biological response to an act of caring (Blease et al., 2011, Miller et al., 2009).

SMS reminders may also activate the meaning schema 'the therapist is interested in my progress'. However, it is also possible that the perceived meaning of SMS reminders is 'I am being checked by the therapist whether the homework was completed or not'. Other patients may regard psychotherapeutic homework as a test of their abilities, similar to the school setting (Beck et al., 1979). Reminders to complete a homework assignment might activate negative memories of teachers, or parents who pressured us to complete our homework. Eckert et al. (2018) used a program with daily SMS reminders to overcome procrastination. The participants reported feelings of guilt when they had not engaged in the scheduled training. This negative aspect however did not apply to the present investigation because the patients did not show resistance to conducting the relaxation training but increased the practicing frequency compared to the

standard therapy. However, the ‘reminder effect’ was only small and did not influence relaxation quality.

The group assignment (PLA, SMS, TAU) also had differential effects on depression symptoms. The PLA group showed larger reductions in self-rated and clinician-rated depression scores compared to the two other groups (also see Kirsch, 2019; Rutherford et al., 2017). Regarding depression severity categories, a subgroup of PLA recipients showed the most pronounced therapeutic changes. Of the PLA participants, 37% reported a reduced depression severity of more than one category after the CBT course. This result replicates the findings of a previous study on placebo effects on homework compliance in patients with depression (Jurinca & Schienle, 2020). In this study, the ‘golden root oil’ significantly reduced average BDI-II scores and depression severity categories compared to the standard treatment without a placebo.

In the present study, the patients felt more relaxed and less depressed because of the added placebo component to CBT. Some researchers have suggested that such changes are due to the generation of hope as a coping resource (Kaptchuck, 2018). The explicit positive suggestions in the context of placebo treatment instill hope for improvement, which goes beyond the concept of ‘positive expectations’ (Kaptchuck, 2018). The placebo suggestion used in the current investigation referred to the presence of self-healing powers in the patients that only needed to be activated. Thus, the placebo helped the patients to believe in their potential to change their situation. The mental state of hope functioned as a motivator to complete the therapeutic homework, which in turn induced feelings of mastery. This interpretation was supported by the verbal feedback of the patients after the debriefing. Many of them were positively surprised about their unexpected self-management potential and proud of their improvement, which was not due to the ‘medicine’ but due to their achievement.

5. Limitations

We also have to acknowledge the following limitations of the present research. We investigated the short-term effects of two additional CBT components for depression. To investigate the durability of the observed effects, follow-up assessments should be introduced in a future investigation. Moreover, changes in the timing and frequency of reminder messages might improve outcomes (Schwebel & Larimer, 2018). The therapist was not blinded concerning the group assignment. Thus, the expectations of the placebo provider could have influenced the outcome of the experiment. Finally, deceptive placebo treatment was used. As studies with non-deceptive placebos have produced promising results for several disorders (for a review see Charlesworth et al. 2017), a future study should use an open-label placebo approach. Future

studies should also include qualitative data assessment to gather more information on patients' understanding of placebo functions and mechanisms. Placebos evoke 'meaning responses' (Moermann & Jonas, 2002) but the meaning is unique for each patient. We need to explicitly ask the patients what type of concepts (e.g., hope) they associate with the placebo treatment. In particular, the patients could be asked via a questionnaire how they think the placebo supported their relaxation training. Did the placebo help them initiate the daily relaxation exercise? Did it help to complete the exercise or did the patients feel more competent to do the exercise? These questions could provide information about the specific effects of placebos in promoting motivation, endurance, and/ or a sense of self-efficacy in the patients. Finally, possible moderators of the placebo effect (e.g., emotional intelligence; Tolsa & Malas, 2022) should be investigated.

6. Conclusion

The present study investigated the effects of two additional treatment components of cognitive-behavioral therapy (CBT) for depression. The participants received a placebo ('natural medicine to mobilize the body's natural healing powers') or SMS (short message service) reminders once a day. These components aimed at improving homework compliance (the practicing of a daily relaxation exercise at home) during a four-week outpatient program. The study replicated findings on the beneficial effects of SMS reminders on compliance. The SMS group practiced more often than the TAU (treatment as usual) group, but homework quality (reported relaxation level) did not differ between the two groups. Placebo treatment proved to be the most effective strategy to improve compliance by increasing both the frequency and quality of the therapeutic homework. In addition, all groups showed a significant reduction of depression symptoms at the end of the course with the most pronounced reduction in the placebo group. In conclusion, this study demonstrated that placebo treatment can be used to leverage the effects of CBT in patients with depression.

Ethical approval: The study was approved by the ethics committee of the University (GZ 39/53/63 ex 2021/22)

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available on request from the corresponding author.

Conflict of interest statement: The authors have no conflict of interest.

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Author Contributions: Both authors were involved in designing the study, statistical analyses, interpretation of data, and manuscript writing.

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