Mental health effects of mindfulness and applied relaxation training

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Abstract
The present study examines the effects of mindfulness training and applied relaxation training on psychological distress and psychological well-being. Participants ($N = 234$) were randomly allotted to each type of training and a control condition. Structural equation modeling analyses indicated that either 15 minutes of daily training in mindfulness or applied relaxation during one month equally increased experienced mindfulness compared to the control group. Changes in mindfulness were, in turn, connected with decreases in general psychological distress indicated by somatic symptoms, anxiety/insomnia, social dysfunction and depression, as well as increases in psychological well-being and satisfaction with life. Importantly, effects of training on psychological distress and well-being seem to be completely mediated by changes in experienced mindfulness. Taken together, the results seem to indicate that it is not mindfulness training per se that leads to changes in psychological distress or well-being, but instead the development of a more mindful perspective.

Keywords: Mindfulness, applied relaxation, well-being, anxiety, depression
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Introduction

Theory
During the last two decades the mindfulness construct has received considerable attention in psychological research as well as in clinical practice (e.g. Brown, Ryan & Creswell, 2007; Hofmann, Sawyer, Witt & Oh, 2010). Mindfulness is defined as the ability to be attentive to the present moment as it unfolds in a curious, nonjudgmental and accepting manner (Brown et al., 2007; Kabat-Zinn, 2003). One of the main reasons for this surge in interest is that mindfulness training (MT) may offer a way to treat and alleviate a broad spectrum of psychological and physiological symptoms (e.g. Baer, 2003; Brown et al., 2007). At the same time, there are specific similarities between MT and traditional relaxation techniques such as applied relaxation training (ART) that have been used since the 1930s. For example, both methods involve deliberatively practicing focused attention: By specifically observing attention in MT (Kabat-Zinn, 2003) and by using attention to alter physiological states in ART (Öst, 2006). The aims of the present study were (1) to compare MT and ART regarding their causal relation to psychological distress and psychological well-being, (2) to examine if mindfulness plays a mediating role in this relation and (3) to study if the amount of training in MT and ART, in addition to training per se, is correlated to increased mindfulness.

Mindfulness
Mindfulness is practiced through consciously focusing attention with the aim of observing without changing both internal and external experiences such as sensory stimuli, thoughts and feelings, while accepting reality as it is without flight or avoidance and instead allowing any experience to evolve, even if it means discomfort. Acceptance may by extension thereby reduce the impact of symptoms that individuals may need to learn to live with and thus lead to insights that can increase individual well-being (Brown et al., 2007). The development of MT in cognitive behavioral therapy, CBT, has in the beginning been driven by Kabat-Zinn and his colleagues (e.g. Williams, Teasdale, Segal & Kabat-Zinn, 2007) who adjusted traditional buddhistic meditation exercises for treating stress. The program is called mindfulness-based stress reduction, MBSR. Mindfulness based techniques are now an important component in treating a number of psychological problems, often in combination with more traditional CBT techniques. Today MT is used for, among other things, depression, generalized anxiety.
disorder, eating disorders, borderline disorder, and psychosis, as well as for symptom alleviation in cancer and pain patients (Baer, 2003; Brown et al., 2007; Hofmann et al., 2010). A number of empirical studies have shown that MT has beneficial effects. Brown et al. (2007) qualitatively summarized research that used randomized clinical trials. Among other things, they found empirical support for a causal relationship between MT and mental health and well-being as indicated by fewer depressive symptoms, less anxiety and stress, lower levels of negative affect, as well as higher levels of positive emotions, life satisfaction, vitality and self-realization. In a meta-analysis, Hofmann et al. (2010) examined 39 studies regarding the effects in patients with cancer, generalized anxiety disorder, depression, and other psychiatric or medical conditions. They found that therapy in mindfulness was moderately effective in reducing anxiety, and even more so for individuals who suffered from both anxiety and depression. Effect sizes were robust and not related to the year of each study or the number of training sessions. Carmody and Baer (2009) studied how long a MBSR program needs to be in a meta-analysis. They found no association between power and number of course hours, either for patients or for a normal population.

**Applied relaxation**

Relaxation techniques have been popular for a long time, both among clinical professionals and among the public. ART involves daily training in muscular relaxation of a large number of muscle groups. Through guided exercises the aim is to be able to relax rapidly at need (e.g. Brantley & Jones, 1993). ART is considered to be effective in the treatment and management of a variety of psychological and psychosomatic problems such as anxiety disorders, sleep disorders, headaches, pain, hypertension and asthma (Bryant & Harvey, 2000).

**Comparing mindfulness and applied relaxation**

An important issue is whether MT has stronger psychological health benefits than ART. The empirical evidence comparing MT and ART shows a mixed picture, potentially, and at least partly, related to the actual design of the compared training exercises. Jain et al. (2007) conducted a randomized and controlled study in which both techniques showed significant reductions in distress and increases in positive mood. The mindfulness group also showed significant decreases in both rumination and distracting thoughts compared to the control group. Agee, Danoff-Burg and Grant (2009) compared mindfulness with applied relaxation in
a five-week-program. Even though the mindfulness group practiced significantly more, the
groups did not differ in measurements of relaxation, mindfulness or decreased psychological
problems. Chiesa and Serretti (2009) did a meta-analysis based on 10 studies. Their results
indicated that MBSR had a significant effect on stress reduction in comparison to an inactive
control condition. However, a direct comparison of MBSR to standard relaxation training
indicated that both techniques were equally effective in reducing stress. The authors
concluded that further research on the specific effects of MBSR is needed.

Apparently, both MT and ART seem to have similar beneficial effects in many cases. Even
if MT and ART seem dissimilar superficially, using attention deliberately is a central
component in both techniques. This might explain why they have similar effects in a number
of studies. Practicing deliberate attention, either through MT or ART, should increase the
capability to be mindful just by involving self-reflective and meta-cognitive processes.
Among other things, mindfulness has been associated with improved meta-cognitive skills,
e.g. in terms of better affective meta-cognition (Delgado et al., 2010), as well as in terms of
greater decentering (Feldman, Greeson & Senville, 2010). It seems then, that the development
of a more mindful perspective could play a critical role in bringing about beneficial health
effects of MT and ART, and potentially be of even greater importance than the actual types of
self-reflective exercises, i.e. here regardless of whether practicing MT or ART.

Aims
In the present study participants were randomly assigned to practice MT, ART or to a control
condition without intervention. Indicators of general psychological distress and of
psychological well-being were obtained before and after training. The first aim was to
examine the role of MT and ART in influencing distress and well-being. The question was
whether MT would outperform ART. This is an important issue, given that MT has been
proposed as a new method for alleviating a variety of psychological problems. The second
aim was to study to what extent any effects of MT and ART on distress and well-being are
mediated by and critically depend on changes in experienced mindfulness, rather than being
direct. Increased mindfulness seems to have a number of beneficial psychological effects.
Given that ART, like MT, involves using attention deliberately, and given that attention is a
central component in mindfulness, it seems plausible to hypothesize that increased mindful
awareness (below called experienced mindfulness), mediates the effects of both ART and MT.
on psychological distress and well-being. To be able to unambiguously study the influence of ART and MT, we made the actual training programs as similar as possible in their basic design, while at the same time preserving the core elements of respective training type. The third aim was to examine if the amount of training in MT and ART, in addition to training per se, is correlated with any relative increase in mindfulness.

Method

Participants

351 participants were recruited through posters and mailings to students in selected courses and programs asking if they would like to participate in a study aiming at evaluating possible effects of popular self-help techniques that are used within CBT. They were randomly allotted to the MT group (n = 115), ART group (n = 123) and Control group (n = 113). All participants who wanted to participate were allowed to do so after having given their informed consent. A number of participants failed to complete the study. The final sample consisted of 234 participants: 59 in the MT group, 67 in the ART group and 108 in the control group (51%, 54% and 96% of the individuals initially assigned to the respective group). The drop-out rate was thus higher in the MT and ART groups than in the control group.

Table 1

Consort table

<table>
<thead>
<tr>
<th>Randomized</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocated to Control</td>
<td>351</td>
</tr>
<tr>
<td>Received Control</td>
<td>113</td>
</tr>
<tr>
<td>Did not receive Control</td>
<td>5</td>
</tr>
<tr>
<td>Allocated to ART</td>
<td>123</td>
</tr>
<tr>
<td>Received ART</td>
<td>67</td>
</tr>
<tr>
<td>Did not receive ART</td>
<td>56</td>
</tr>
<tr>
<td>Allocated to MT</td>
<td>115</td>
</tr>
<tr>
<td>Received MT</td>
<td>59</td>
</tr>
<tr>
<td>Did not receive MT</td>
<td>56</td>
</tr>
</tbody>
</table>

Final groups did not differ in age, F (2, 231) = 1.59, p = 0.21, η² = 0.01 (MT, M = 28.73, SD = 8.74; ART, M = 27.24, SD = 7.35; control, M = 29.44, SD = 4.14) and not in female/male ratio, χ² (2) = 3.49, p = 0.18, ΦC = 0.12 (MT, 8.83; ART, 3.47; control, 4.14).

1 The ethical review guidelines for studies involving treatment were developed after this study was conducted and have therefore not been performed. All participants have given their informed consent prior to the study as well as the supervisor and the course instructor at the Psychological Department at Lund’s University, the only ethical requirement for publishing studies when this study was performed.
Table 2

Demography

<table>
<thead>
<tr>
<th></th>
<th>MT</th>
<th>ART</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>28.7</td>
<td>27.2</td>
<td>29.4</td>
</tr>
<tr>
<td>Women</td>
<td>53</td>
<td>52</td>
<td>87</td>
</tr>
<tr>
<td>Men</td>
<td>6</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Singles</td>
<td>20</td>
<td>22</td>
<td>41</td>
</tr>
<tr>
<td>In relationship</td>
<td>39</td>
<td>45</td>
<td>67</td>
</tr>
<tr>
<td>Studying</td>
<td>48</td>
<td>61</td>
<td>89</td>
</tr>
<tr>
<td>Working</td>
<td>6</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

Training materials

The groups were given prerecorded instructions and exercises to perform daily for up to 15 minutes for a maximum of 30 days, either focusing on observing attention deliberately and non-judgmentally in the present moment or on practicing relaxation techniques. The participants kept a log over number of training minutes and training days. The control group received no intervention. The training program in mindfulness was a significantly shortened version based on some of the original core exercises found in well-established training programs in mindfulness (Schenström, 2007; Williams et al., 2007). The training program in applied relaxation was inspired by a few of the core relaxation techniques that can be found in a manual developed by Öst (2006), supplemented with two well-known breathing exercises in traditional yoga and cognitive behavioral therapy in order to ensure similar types of exercises in both training programs. Both training programs were thus designed in a similar manner and were distributed in three audio files of approximately the same length. The selected exercises reflected the typical content and process of both techniques. In the first exercise participants were asked to lie down and either observe sensory stimuli in their body in the MT condition alternatively tensing and relaxing various muscle groups in the ART condition. The second type of exercise was a seated exercise that focused on different dimensions of breathing, again either observing the sense of breathing, feelings or thought passing by in the MT condition alternatively actively altering their breathing pattern in the ART condition. Finally, in the third audio file suggestions were offered on how the participants could use the techniques and
incorporate the exercises into their everyday life. See Table 1 for a detailed description of each type of exercise.

Table 3
Description of the exercises in the study

<table>
<thead>
<tr>
<th>Group MT</th>
<th>Group ART</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio file 1</td>
<td>Audio file 1</td>
</tr>
<tr>
<td>Lying exercise of 10 minutes called body scan, where the participant first is focusing on how breathing feels, then on observing various parts of the body in a specific sequence while avoiding any movements. Attention is alternated between breathing and various parts of the body. Finally the participant is asked to note how attention is drifting and to actively steer it back to the breathing.</td>
<td>Lying exercise of 9 minutes called progressive relaxation where the participant after a few relaxing deep breaths is focusing on tensing and relaxing various parts of the body in a suggested sequence. The level of relaxation is estimated before and after the exercise and the time it takes to become relaxed is noted. The aim is to become completely relaxed within 20-30 seconds. After several sessions, participants switch to only mentally going through the body to the command ‘relax’ without actually tensing and relaxing the muscles (conditioned relaxation).</td>
</tr>
<tr>
<td>Audio file 2</td>
<td>Audio file 2</td>
</tr>
<tr>
<td>Seated exercise of 5 minutes called the breathing anchor where the participant is aiming to maintain focus on breathing at a particular place where the sensation of breathing is the clearest, i.e. the anchor, and then keeping the attention there throughout the entire exercise. When distracted by thoughts, emotions or sensory stimuli, the participant should note their occurrence and content through labeling the experience, and thereafter return attention to the breathing.</td>
<td>Seated exercise of 6 minutes called the short version of progressive relaxation where the participant after a few relaxing deep breaths is focusing on breathing by holding the breath while relaxing the body, followed by breathing normally while tensing and relaxing different locations in the stomach and chest followed by tensing and relaxing various body parts, with the overall aim to get as deeply relaxed as possible.</td>
</tr>
<tr>
<td>Audio file 3</td>
<td>Audio file 3</td>
</tr>
<tr>
<td>Instructions on how to notice daily mental experiences through a curious discovery of internal states, sensory stimuli, thoughts and feelings. Furthermore, instructions on how to practice acceptance and non-attachment, explained metaphorically as sitting by the ocean or by a river and seeing intense thoughts and emotions as waves or leaves floating by. Finally, the participants are given 3 sequential steps to assist them in generalizing the exercises into their daily life: 1. focusing on noting and labeling sensory stimuli and/or thoughts, 2. noting how the breathing feels, 3. noting bodily sensations.</td>
<td>Instructions regarding how to ensure breathing with the stomach and how to apply relaxation techniques in daily life, labeled differential relaxation and applied relaxation. Finally, two brief breathing techniques are introduced aimed at achieving rapid relaxation in specific situations during the day.</td>
</tr>
</tbody>
</table>

Measurements
The measurements were chosen to give a wide perspective of different dimensions of well-being with the purpose to offer the possibility to catch a wide variety of different kinds of effects, from immediate physiological symptoms and affects to changed attitudes and perspectives of life.

Mindfulness. Each group completed the Mindful Attention Awareness Scale, MAAS, before and after training (Brown & Ryan, 2003).
General Psychological Distress. General distress was measured before and after training in each group through 6 indicators: Depression, anxiety/insomnia, somatic symptoms and social dysfunction by using the General Health Questionnaire (GHQ-28; Goldberg & Hillier, 1979), and positive and negative affect by using The Expanded Form of the Negative and Positive Affect Schedule (PANAS–X, Watson & Clark, 1994).

Psychological Well-being. Well-being was measured in each group before and after training with the indicators Satisfaction With Life Scales (SWLS; Diener, Emmons, Larsen & Griffin 1985) and Ryff’s Psychological Well Being Scales (RPWB; Ryff & Keyes, 1995).

Procedure
After filling out an online questionnaire with demographic variables as well as the scales presented above, the participants were randomly assigned to one of the three groups. Participants were anonymous and participated through a code generated by the online software used for administering the questionnaire. The participants in the training groups received the training programs. In order to minimize expectancy effects, the participants were not informed of the purpose of the exercises. The control group did not receive any intervention, but was offered to take part in the training programs after the trial period. The participants in the two training groups were instructed to exercise 15 minutes every day for a month. They were free to choose among the exercises and only to use the audio files when necessary in order to facilitate the integration of the training into their daily routines. This would also avoid feelings of compulsion and related adverse effects of training as well as lead to a variation in the amount of training. After a training period of one month all participants completed the same online questionnaire once again.

Data analysis
After reversing the appropriate items, the self-ratings from pre and post training were aggregated into separate scores for each scale. Each variable was then screened for univariate outliers, which were defined as values with a two-tailed probability lower than 0.01 in a normal distribution. Outliers were replaced with raw scores that correspond to 0.01/2 and 1 – 0.01/2; see Tabachnick and Fidell (2001). The variable that had the highest number of outliers had 4.70%.
Results

Amount of Training
Participants in the MT and ART groups reported the total amount of time they had spent
training mindfulness or applied relaxation. The average reported number of days was 20.08
($SD = 8.16$) in the MT group and 21.79 ($SD = 7.90$) in the ART group, $F (1, 124) = 1.42, p =
0.24$, $\eta^2 = 0.01$. The average reported number of minutes was 281.86 ($SD = 153.10$) in the
MT group and 301.69 ($SD = 159.06$) in the ART group, $F (1, 124) = 0.50, p = 0.48$, $\eta^2 = 0.00$.

Evaluation of Equivalence between Groups at Pre Training
The drop-out rate was higher in the MT and ART groups than in the control group. This could
have rendered experimental conditions non-equivalent on the dependent variables at pre
training even if participants were allotted randomly to groups; i.e. there was a risk of selective
subjective loss that could threaten the internal validity. As a precaution MT, ART and control
groups were compared on pre training measurements of mindfulness and each indicator
variable, i.e. depression, anxiety/insomnia, somatic symptoms, social dysfunction, positive
affect, negative affect, satisfaction with life and psychological well-being. None of the effects
were significant (all $Fs < 1.57$, all $ps > 0.21$).

Univariate Effects of Training
Analyses were conducted on change scores, indicated by the symbol $\Delta$, for experienced
mindfulness and each of the other outcome indicators$^2$. These were calculated by taking post-
training values minus pre-training values. Positive values in any change score thus indicated
an increase from before training to after training. Comparisons between MT, ART and control
groups are shown in Figure 1. Even if non-significant, the effects of training went in the
expected direction for many outcome indicators, with greater improvement in the MT and
ART groups than in the control group. The only difference that was statistically significant
was that both the MT and ART groups had stronger improvements in experienced
mindfulness than the control group. Post hoc tests for mindfulness showed that both the MT
group and the ART group were significantly different from the control group, but not
significantly different from each other (see the standard errors in Figure 1). Apparently
training in either mindfulness or applied relaxation led to an improvement of similar

$^2$ Before analysis, each difference score was inspected for normality. Histograms did not reveal any major
deviations.
magnitude in experienced mindfulness. The significant difference between groups with regard to Δ mindfulness is consistent with the hypothesis that training has a causal effect on Δ mindfulness. This path is postulated in the causal models tested below.

Figure 1. Group comparisons on mindfulness and outcome indicators. ART = Applied Relaxation Training, MT = Mindfulness Training. Error bars show the standard error.
Correlations between Changes in Mindfulness and Changes in General Psychological Distress and Well-Being

Correlations between change scores for each outcome indicator and Δ mindfulness are shown in Table 2. Note that Δ mindfulness is negatively correlated with Δ depression, Δ anxiety/insomnia, Δ social dysfunction and Δ negative affect, and that Δ mindfulness is positively correlated with Δ positive affect, Δ psychological well-being and satisfaction with life. This outcome is a necessary, but not sufficient, condition for claiming that Δ mindfulness causes changes in the outcome indicators. This hypothesis is examined in the following section.

Table 4
Correlations between continuous variables (outcome indicators and mindfulness)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ Mindfulness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ Depression</td>
<td>-0.17**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ Anxiety/Insomnia</td>
<td>-0.28**</td>
<td>0.48**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ Social Dysfunction</td>
<td>-0.26**</td>
<td>0.43**</td>
<td>0.46**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ Somatic Symptoms</td>
<td>-0.11ns</td>
<td>0.27**</td>
<td>0.42**</td>
<td>0.34**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ Negative Affect</td>
<td>-0.17*</td>
<td>0.40**</td>
<td>0.50**</td>
<td>0.32**</td>
<td>0.18**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ Positive Affect</td>
<td>0.18**</td>
<td>-0.35**</td>
<td>-0.35**</td>
<td>-0.49**</td>
<td>-0.30**</td>
<td>-0.18**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ Psychological Well-Being</td>
<td>0.30**</td>
<td>-0.23**</td>
<td>-0.25**</td>
<td>-0.13*</td>
<td>-0.12ns</td>
<td>-0.22**</td>
<td>0.26**</td>
<td></td>
</tr>
<tr>
<td>Δ Satisfaction with Life</td>
<td>0.15*</td>
<td>-0.29**</td>
<td>-0.20**</td>
<td>-0.18**</td>
<td>-0.17*</td>
<td>-0.21**</td>
<td>0.31**</td>
<td>0.41**</td>
</tr>
</tbody>
</table>

Note. ** < 0.01, *<0.05, ns corresponds to non-significant.

Structural Equation Models

The following analysis compared alternative causal models using Structural Equation Modeling (SEM) and was based on Δ-scores for the outcome indicators and Δ-scores for mindfulness. Factor loadings, path coefficients and errors were estimated with AMOS using Maximum Likelihood. As recommended by Anderson and Gerbing (1988) we proceeded by first evaluating a measurement model before evaluating complete alternative structural models.

The measurement model consisted of two latent variables and six indicators with the following relations: (1) The indicators Δ depression, Δ anxiety, Δ social dysfunction, Δ somatic symptoms were specified to load on the first latent variable termed general distress (i.e. the GHQ variables). (2) The indicators Δ psychological well-being and Δ satisfaction
with life were specified to load on the second latent variable, termed well-being (i.e. the RPBW and the SWLS). Path coefficients between the latent variables were left free to be estimated (and thus not forced to 0). The measurement model had a good fit: $\chi^2 (8) = 10.47, p = 0.23; \text{CFI} = 0.99; \text{RMSEA} = 0.04$ with $\text{PCLOSE} = 0.60; \text{SRMR} = 0.03$. The standardized factor loadings are shown in Table 3. Initially it was hypothesized that $\Delta$ positive affect and $\Delta$ negative affect would load on the latent variable general distress; however, such a measurement model did not fit the data very well: $\chi^2 (19) = 52.72, p < 0.01; \text{CFI} = 0.92; \text{RMSEA} = 0.09$ with $\text{PCLOSE} < 0.05; \text{SRMR} = 0.05$. The indicators $\Delta$ negative affect and $\Delta$ positive affect were thus not included in the following analyses.

Table 5

<table>
<thead>
<tr>
<th>Factor loadings for the measurement model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator</td>
</tr>
<tr>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>$\Delta$ Depression</td>
</tr>
<tr>
<td>$\Delta$ Anxiety/Insomnia</td>
</tr>
<tr>
<td>$\Delta$ Social Dysfunction</td>
</tr>
<tr>
<td>$\Delta$ Somatic Symptoms</td>
</tr>
<tr>
<td>$\Delta$ Psychological Well-Being</td>
</tr>
<tr>
<td>$\Delta$ Satisfaction with life</td>
</tr>
</tbody>
</table>

Note. * < 0.05, **<0.01. Standardized factor loadings. Loadings for the first indicator of each factor were forced to 1 (hence the absence of p – value for these indicators).

Two alternative structural models, A and B, where then fitted to the data; see Figures 2 and 3 (factor loadings from the previously tested measurement models were re-estimated). Type of training is in both models represented by two exogenous manifest variables: The first contrasts MT (coded as 1) with ART and control (both coded as 0); the second contrasts MT and ART (coded as 1) with control (coded as 0); $\Delta$ mindfulness is specified as an endogenous manifest variable dependent on the contrasts that represent type of training; $\Delta$ general distress and $\Delta$ well-being are latent endogenous variables having the indicators that are specified in the measurement model presented previously. In model A training is assumed to have both direct and indirect effects on $\Delta$ general distress and $\Delta$ well-being; the indirect effects being

3 Specifying $\Delta$ positive affect and $\Delta$ negative affect to load on the latent variable well-being, or to load on a dedicated third latent variable did not yield better fit either.
4 Categorical variables can be entered in SEM if they are dummy coded with dichotomous values.
mediated by Δ mindfulness (see Figure 2). Model A has an acceptable fit, but the path coefficients for the direct effects of training on Δ general distress and Δ well-being are small and non-significant; Δ general distress and Δ well-being are only influenced by Δ mindfulness. Setting all 4 direct effects of training on Δ general distress and Δ well-being in Model A to 0 did not result in a significant change in fit, χ² (4) = 1.70, p = 0.79.

Figure 2. Model A. Standardized coefficients are shown

Note. * < 0.05, ** < 0.01, ns means non-significant. No errors or disturbances were allowed to co-vary (errors and disturbances are not shown in the figure). The loading of each first indicator for each latent variable was fixed to 1. The dummy coding variables were allowed to correlate because they partially overlapped.

distress and Δ well-being is thus fully mediated by Δ mindfulness (i.e. the direct effects of training on Δ general distress and Δ well-being are specified to be 0). Model B has an acceptable fit, even if this model is more restrictive than model A. In sum, the SEM analyses show that the data is consistent with a model in which both MT and ART lead to an increase
in mindfulness, which, in turn, leads to a decrease in general psychological distress and an increase in psychological well-being.

Correlations between Training Time and Changes in Mindfulness

Our final analysis concerned relations between amount of training and Δ mindfulness in the MT and ART groups. The MT and ART groups had larger changes in mindfulness than the control group, but would the amount of time that the MT and ART participants spent on training matter? Neither the number of days nor or the number of minutes that participants reportedly trained correlated with Δ mindfulness, $r (124) = 0.00, p = 0.96,$ and $r (124) = 0.13,$
fitting quadratic and cubic functions to the relation between days and minutes of training, and Δ mindfulness, also did not produce significant relations (all ps > 0.09). Apparently, what seems to matter is that participants engage in MT or ART at all, regardless of the amount of training.

**Discussion**

Firstly, this study found that either practicing mindfulness or applied relaxation equally increased experienced mindfulness compared to a control group. Consistent with some prior research, the effects of either training method were statistically equal in magnitude. Secondly, structural equation modeling indicated that mindfulness mediated the decreases in general psychological distress measured by somatic symptoms, anxiety/insomnia, social dysfunction and depression as well as the increases in psychological well-being and satisfaction with life. Hence, the present study adds to the literature by showing that it is the changes in perspective and not the training per se that might be the main active component in both mindfulness and relaxation training and hence the factor to focus on. Neither the training per se in any of the techniques had any direct effects on general psychological distress or psychological well-being. Instead, the effects seemed to be completely mediated by changes in experienced mindfulness. Thirdly, consistent with most prior research, the study did not find a connection between the amount of training and relative increase in experienced mindfulness. These findings have clinical implications since many programs today suggest extensive daily training based on the assumption that the amount of training is critical for achieving a positive outcome. Continuous training can of course be of importance in maintaining the increased experienced mindfulness, but even less extensive training targeting deliberate attention seems to render positive effects. Also, it is possible that a more thorough understanding of the rationale behind the training could lead to even larger and possibly different training effects between the two techniques, but this still remains to be supported by research. This study also implies that any training method that leads to an increase in experienced mindfulness could be equally effective in generating positive mental health effects. In summary, this study supports the conclusion that it is worthwhile to engage in any kind of training that increases the level of experienced mindfulness and that this training does not need to be extensive to result in health benefits. Even modest training can result in positive health effects.

Despite the intention in this study to honor important methodological requirements including randomization, inclusion of a control group, controlled training programs and large
samples, the study has some limitations. A limitation is that both mindfulness as described in Schenström (2007) as well as Williams et al. (2007) and applied relaxation as described in Öst (2006) were shortened and only specific exercises were used to fit the design of the study. Hence, neither mindfulness nor applied relaxation have been performed according to their standard manuals. However, the actual exercises are thought to be the vital components, of either method, but this has not been verified in this study. Another limitation is that all dependent variables were measured with self-report techniques. Other types of instruments, such as psychophysiological measures, could have been included. Even so, the main aim was to measure changes in general psychological distress and well-being, in which the subjective experiences that are captured by self-reports play a critical role. Another limitation is having predominantly Caucasian individuals as participants. Future research on more diverse samples is needed to verify that the results of the study can be generalized to other cultural groups. Also, an important limitation could be the statistical methods used. There are different perspectives within the research community on how to perform mediation analyses (Baron & Kenny, 1986). In mediation analysis, repeated cross-sectional designs are often used. There are circumstances under which and to varying degree this design to estimate mediation can be biased and potentially misleading, even under ideal conditions where mediation is complete, longitudinal parameter estimates are stable, and the sample sizes are large (Maxwell & Cole, 2007). Hence, further research, possibly including newly developed models to measure mediation specifically needs to be performed to verify the results in this study, for example by including multiple waves of data in designs and analyses.

This study points to the importance of comparing methods in order to identify overlaps and active components. More research seems to be needed comparing the effectiveness of mindfulness and applied relaxation in specific problems; the two forms are probably not necessarily the most powerful methods in all situations. Identifying active components of mindfulness and applied relaxation is probably one of the keys in understanding why the techniques are effective and for whom they are effective. Finally, the present study points to the need to examine whether longer programs in mindfulness, which include more extensive training, really have any additional benefits compared to shorter programs.

To conclude, changes in experienced mindfulness seem to play a critical role in decreasing general psychological distress and in increasing psychological well-being. Practicing MT or ART seemed to be beneficial if and only if it increased the experienced mindfulness.
References


