Mind Full or Mindful: Assessing the Effectiveness of Different Short-term Mindfulness Meditation Methods on Emotion Regulation Skills

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Abstract

There is accumulative evidence that mindfulness meditation fosters emotion-regulation ability through the cultivation of attention and self-awareness, however the most beneficial short-term meditation method in terms of dosage and timing is yet unknown. Within this three-week experimental study, the effect of short-term mindfulness meditation as a response to emotional distress (AR, n = 9) was compared to weekly fixed schedule meditation (FS, n = 8) in terms of enhancing emotion relegation skills in a student sample. A total of 30 participants (mean age = 22, 50% female) of which 8 had prior meditation experience of six months (LME, n = 8), and 22 had no prior meditation experience were randomly allocated into groups (AR, FS, control), except for the LME group. Participants completed a self-report pre- and post-questionnaire at baseline and at three weeks, and continuous self-report documentation across three weeks. Repeated measures analysis revealed no significant increase in emotion regulation ability in either experimental condition over three weeks ($F(2, 19) = 1.4$, $p = .27$) Exploratory analysis was done because of the small sample size and indicated the highest improvement in emotion regulation skills in the AR-condition group. The comparison group with at least six months experience was found to have significantly better emotion regulation skills than either short-term intervention condition ($F(2, 21) = 7.44$, $p = .01$). Small sample size, homogeneity of sample, restricted time-resources, and reliance on self-report measurements call for caution in ascribing explanatory power or generalizability to the results. Short-term mindfulness meditation over three weeks might be considered as ineffective to noticeably increase emotions regulation skills. However, further research is necessary to extract the most beneficial while excluding ineffective mindfulness meditation methods in terms of emotion regulation.

Keywords: emotion regulation, mindfulness meditation, short-term meditation, meditation dosage

Contents

Introduction

It is for the extensive complexity of meditative practices, its various fields of utilization, and the many belief systems and philosophies in which it is integrated that ambiguous differences in definition exist. In turn, they generate ambiguity in perception and ultimately influence the interpretation of meditation and its practice. The interpretation and application of meditation in in the West was hence adapted to prevailing cultural needs and beliefs, resulting in a quite practical pursuit of self-knowledge and self-healing. Original meditation practices have been adapted to rather brief and simple instructions in Western use, stripping the concept off its surrounding religious or philosophical elements (Kowalski, 2008). For the purpose of this study, a transparent and elementary definition will therefore be considered in terms of the practice's most basic core elements to avoid misperception.

Meditation and Mindfulness

In its simplistic form, meditation can be viewed as an awareness and concentration exercise, aiming to actively maintain focus of the mind's attention on a single aspect for a period of time. Especially in the Western fast-paced and growth-oriented way of living, the mind is naturally filled with continuous thoughts, sensations, memories, and so forth. As human beings, we have a dispositional tendency to follow these streams of thoughts. This habit naturally develops over a lifespan if not otherwise altered through conscious awareness, leaving the habituated individual in a passive role of being pushed and pulled by the mind's content rather than in conscious control of which thoughts to actively follow (Kabat-Zinn, 2004).

Meditation practice teaches about this nature of the mind by gradually creating the understanding that all emotions, ideas, and thoughts are mental events that can be witnessed through turning attention inward. Its practice enables to detach from these events by acquiring an observer role and learning to consciously direct one's attention toward selected contents (Kabat-Zinn, 2004). Through this creation of awareness and attention, meditation practice cultivates the ability to fully engage in the present moment, thereby empowering an individual to become more self-directive.

At the very core of meditation practice lies the orientation of a mindful perspective. If meditation is conceptualized as a concentration exercise, mindfulness can be viewed as the

initiating means to perform it with. Jon Kabat-Zinn (2004), an important figure in the initiation of mindfulness and awareness meditation, defines mindfulness as „paying attention purposefully, in the present moment, non-judgmentally“. Within this definition there are two main characterizations to be made. One is the awareness of the here and now, the other is the acceptance of thoughts and emotions without evaluating them. It should therefore be highlighted that to be mindful does not mean to split off the mind and ignore its contents, but to position oneself in a different relationship to it.

In the Western context mindfulness is often paired with meditation as means to introduce and practice this mindful perspective in a more structured and gradual manner (Kabat-Zinn, 2004). This is mainly because the novelty of being present in the moment and taking on the observer role is easily overruled by the habit of being entangled in thoughts and emotions (Kowalski, 2008). Pairing mindfulness with meditation practice allows for a gradual approach to cultivate a mindful orientation. Accordingly, mindfulness meditation is the approach that is most widely understood and applied in the West (Kabat-Zinn, 2004). For the purpose of this paper, mindfulness meditation will be one of the central concepts, along with emotion regulation which will be introduced in the following sections.

Contemporary Research on Mindfulness Meditation

The motivation for people in the West to integrate mindfulness meditation practice into their lives derives from its high applicability to multiple contexts and fields. With progressive advances in research, its positive effect on inner psychological balance, as well as mental and physical health have been found widely (Kowalski, 2008). Next to integrating the practice in health care, psychotherapeutic, and educational fields, the number of individuals getting in touch with meditation as means to self-management in various areas has evolved simultaneously (Michaelson, 2013). The picture research findings have accomplished to paint of meditation is a method to upgrade the mind into a more resilient, higher functioning entity, thereby increasing people’s self-regulation.

The specific impacts of meditation on a practitioner’s life appear versatile, ranging from neurological to mental and behavioral aspects. Given the facet of attention in mindfulness meditation, there is a body of research that suggests increased efficiency of attention through the cultivation of mindfulness. Attention networks are comprised of

executive control functions that include shifting mental attention, monitoring and updating information, as well as response inhibition (Miyake et al. 2000). For example three months long meditation retreat study revealed a considerable decrease in the range of time where no new information is registered between two situations, and in turn increase one's attentional capacity (Slagter et al., 2007).

Especially in emotionally distressing events, where reactions tend to be automatic and habitual, a space for more conscious decisions is favorable. A review of six studies has concluded that enhanced self-control is highly promoted by having beneficial habits (Galla & Duckworth, 2015). In line with this, regular long term meditators do refer to a „spaciousness" after perceiving a stimulus that calls to action, by that meaning a calm state of mind that allows for consideration before responding, rather than an immediate response (Michaelson, 2013). During emotional distress meditation then appears to heighten the ability to self-regulate by enabling an individual to counteract habitual responses.

Considerable research was conducted on discovering physiological changes in parts of the brain that regulate impulsive behavior resulting from anger or fear, for example. Findings suggest that meditation decreases the response-controlling impact of these brain structures of the Amygdala and those affected by it, and in turn allows for more considerate responses, self-control, emotion regulation, and self-awareness (Davidson & Begley, 2013; Michaelson, 2013). An effect of this was already seen after a few weeks of meditation practice, increasing with progressive practice. Meditation appears to reduce the impact of the impulse-generating, reactive mind that gives rise to emotionally charged body and mind states, thereby enhancing the ability to regulate reactions.

Emotion regulation is defined as a process to manage and alter if, when, and in which way an individual experiences emotions, and how they are expressed through behavior (Eisenberg, Hofer, & Vaughan, 2007). When there is a lack in emotion regulation capacity, also called emotional dysregulation, this can have a undermining effect. Emotional arousal has the ability to either enhance or impair effective functioning as an emotion is likely to manifest in a person's emotional response or behavior. Emotional dysregulation can not only be a result of a failure to notice a need for regulation, but also of the response being dysfunctional rather than functional. Dysfunctional responses, for example denial or suppression, are thought to be ways of escaping, rather than managing effectively. These

strategies can decrease emotional distress, however they rather delay the effect and possibly result in increased emotionally dysregulative behavior (Kolk, 2015).

The extent to which body states influence mental processes and emotional impact is characterized by the ability to register and interpret these bodily sensations correctly (Critchley, Eccles, & Garfinkel, 2013). Physical sensations then go hand in hand with emotional responses, as physical arousal is initiated upon the perception of affective cues. When those cues are perceived early during an emotion generating situation, a deliberate response is more likely. Mindfulness might heighten exactly this sensitivity to primary bodily cues and enable appropriate self-regulatory action instead of being directed by impulses.

In young adults especially, deficits in emotion regulation have a damaging property, as they are found to increase negative affect, substance abuse, or aggressive behavior (Thompson, 2008), potentially leading the individual into a downward spiral. Functional emotion regulation is therefore an essential quality that promotes an integrated self as it supports adaptive, self-managed and functional behavior. The capacity to regulate emotions is conceptualized to be enhanced through mindfulness training.

Theoretical Framework

Building upon research findings, Teper, Segal and Inzlicht (2013) propose a more integrated theoretical concept for how mindfulness enables individuals to exert emotion regulation (Figure 1). They suggest that mindfulness can be cultivated through present-moment awareness and nonjudgmental acceptance simultaneously. Awareness and acceptance are conceptualized to heighten the experience of, and attention towards affective states, as well as the registration of emotional impact.

More specifically, they suggest that mindfulness promotes early awareness of affective cues, thereby facilitating the ability to regulate these cues, as opposed to being regulated by them. The capacity to notice and attend to primary sensations is thought to counteract habitual responses such as rumination, suppression, or getting lost in experiencing those emotions. A space for a conscious response is created instead of responding automatically. Habitual reactions are counteracted by learning how to attend to affective physical states that manifests in the body.

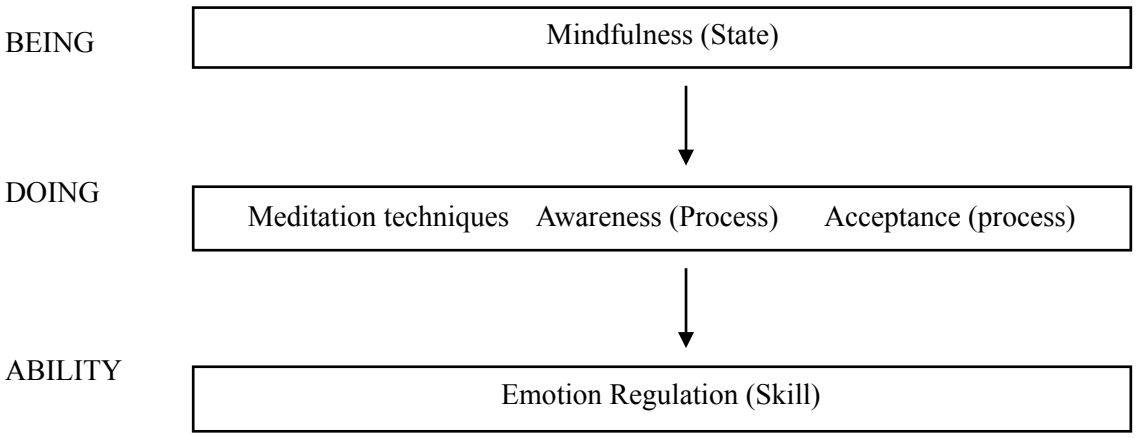

Figure 1. Acquisition of emotion regulation skills through cultivating mindfulness by practicing meditation, awareness and acceptance.

The model suggests that longterm practitioners especially are better able to regulate emotions through already having transformed their former habitual responses. Long-term practice does not enable an absence of affective cues per se, but enables the capacity to consciously register affective states and respond in a mindful way through acceptance of the situation and not attaching to the effect. Short-term practice is assumed to be less effective than long-term meditation, yet still reasonably effective through gradually teaching the practitioner to notice affective bodily cues. This capacity to notice these cues stems from an increased ability to become aware of one's bodily responses through mindfulness training.

In the beginning of practice it is of utmost importance to gradually learn to attend to affective cues through practice and cultivation of an open mind toward these. For the maintenance of an open mind, the cultivation of a mindfulness state that detects affective cues the moment they arise is required, comparable to an autopilot function (Teper et al., 2013). The model suggests that mindfulness techniques such as meditation and accompanying awareness and acceptance have to be applied to not only notice, but induce in the ability to regulate emotional responses. Mindfulness strategies have to be learned over time for them to be consistently and effectively applied to affective situations.

From the grounds of this literature review, there is a consensus about the fact *that* an effect occurs over time, as well as which mechanisms appear responsible for this effect. Yet, there is no consensus referring to the best method to induce this effect in terms of time and

dosage. As Michaelson (2013) points out that there is relatively little knowledge about *how* these processes can be induced, particularly referring to for which dosage it seems possible for meditation to have its positive impact. Although short-term effects have been found to enhance emotion regulation skills, it is still uncertain which specific method of mindfulness cultivation in terms of meditation dosage and timing of practice sessions is most beneficial for which context or individual.

The dosage of a practice per se can vary widely, from long-term regular meditation over years or decades, to short-term daily meditation over weeks or months, to meditation applied to a certain context or state. In a qualitative study that assessed participant's changes over time in an 8-week mindfulness program, indicating that especially in moments of distress they intensified their practice (Kerr, Josyula, & Littenberg, 2011). What they also found was increased positive affect and the emergence of an observing self, even in participants who characteristically experienced negative affect throughout the trial. An other qualitative study found a self-reported increase in emotion regulation skills during a weekly scheduled mindfulness meditation program over 6 weeks (Monshat et al., 2013). It appears that meditation reduces negative affective states over time, and that practitioners naturally their practice within contexts of perceived negative affect.

What is striking is that not only are these studies on a rather qualitative basis, they also do not indicate clear statements about meditation dosage and time of application.
It is not clarified yet whether regular weekly meditation in general, or the accumulation of meditation practice in moments of increased distress are responsible for the regulation of negative affect.

Given the cultural context, many people in the West might favor a „quick fix" method over a longterm, continuous, and gradual one due to their fast paced, result oriented way of living. Those interested in meditation practice as a method to reduce stress as opposed to medical interventions for example might be inclined to try short-term interventions due to time management restraints. Whether it seems feasible to apply brief short-term meditation over less than a month to promote emotion regulation skills is yet unknown, especially whether there is a certain approach that exceeds others. Identifying or excluding certain approaches by exploring their effectiveness could therefore benefit the community of those with a fast-paced or stressful way of living and promote short-term health interventions.

Research Outline

The present study worked towards evaluating two distinct approaches to mindfulness through different meditation dosages in relation to the acquisition emotion regulation skills. More specifically, this research aims to answer the question in how far either a three week short-term mindfulness meditation routine applied at least four times a week is more or less beneficial than a three week short-term practice implemented as a coping response to emotional distress. As various studies have demonstrated that long-term practice benefits emotion regulation skills, this assumption was tested as well, by comparing a group of long-term meditators to beginners.

RQ1: To what extent is either a weekly fixed schedule approach to cultivating mindfulness through meditation, or meditation as a response to emotional distress more beneficial to enhance emotion regulation skills?

H*1*: Weekly fixed schedule short-term meditation intervention practice is more beneficial for emotion regulation than meditation as a response to emotional distress when compared to a control group.

RQ2: To what extent is long-term practice of at least six months more beneficial in terms of emotion regulation skills than short-term practice of three weeks?

*H*2: Long-term meditation practitioners of at least six months display better emotion regulation abilities than short-term meditation practitioners with three-weeks experience.

The evaluated approaches are (1) regular weekly meditation practice, and (2) meditation in moments of accumulating distress. It is assumed that the establishment of a mindfulness baseline-level through scheduled regular meditation of at least four days a week allows affective cues to be recognized earlier. An accepting awareness of the body's emotionally uncharged state is thought to be created through this approach. The cultivation of mindfulness through meditation is assumed to enable the individual to interfere with habitual responses to emotional affect as sensitivity for diverging physical states is heightened. Also, the

manifestation of an observing self appears reasonable to assume. Consequently, a space for a more conscious response might be created.

However, the novelty of the mindfulness meditation practice should be noted, as learning about one's natural non-aroused body state might not be recognizable yet. It could prove difficult to be able to notice subtle bodily changes that forego emotional behavior when only recently beginning to practice mindfulness meditation.

On the other hand, there are supportive arguments in favor of the cultivation of mindfulness through meditating as a response to emotional distress. For one, it provides individuals with an already functional response at hand that can be applied to such situations, highly decreasing the probability to engage in a dysfunctional response. Moreover, in such situations affective physical cues are most prevalent, raising attention towards the need for immediate regulation.

Although these aspects appear beneficial to transform habits into more functional ones, the novelty of coping strategy might place restraints on its application. It can provide difficult to engage from distressing situations immediately, given the habituated nature of the prior applied response. This might increase the difficulty to direct resources towards disengagement within the experience of emotional affect. Subsequently, the immediate emotional impact can place restraints on the ability to meditate as a response, especially when the individual is new to the practice. Lastly, time and place of emotional arousal cannot be foreseen, possibly placing restraints on utilizing mindfulness meditation as an immediate coping strategy.

Moreover, it is hypothesized that neither short-term practice intervention will be as beneficial as a regular long-term practice of at least six months. Arguments are centered around a consensus of longterm-study findings. The shift to a mindful perspective from a direct, active experience and regulation of emotions towards a non-attaching state appears to allow emotions to pass without being absorbed in their experience. Knowledge in how to interpret and attend to affective physical bodily cues, as well as a habituated functional mindfulness response to emotional distress is thought to be present.

What follows is a thorough description of the study's methodology, the evaluation of results and their relation to the main-, and secondary hypothesis, as well as a discussion of findings in relation to existing literature.

Methods

This study was approved by the BMS ethics committee of the University of Twente (no. 190364). All participants gave their written informed consent before their participation.

Design

This study is a randomized control trial conducted in The Netherlands. Eligible participants with none or at least six months of meditation experience were allocated into four groups. Participants with the eligibility requirement of no prior experience were randomly divided into three groups, (1) No meditation experience control group (NME), (2) meditation with a fixed schedule (FS), (3) meditation as response (AR). Both experimental groups received the same mindfulness meditation intervention differing in application. Participants with the qualification of (4) longterm experience (LME) were allocated into a comparison group and asked continuing their usual practice. LME participants were recruited through the official meditation group of the University of Twente. Neither the NME control or LME comparison group received the intervention.

A pre- and post measurement design, and continuous self-report measure were applied. The intervention lasted three weeks. Pre- and post- self-report questionnaires measured emotion regulation skills at baseline and after the intervention. Continuous self-report measures assessed reduction in emotion intensity and applied coping strategy across the intervention period.

Participants and Procedure

Of the 35 eligible participants, 30 participants completed the three week period of individual self-report. 5 participants terminated their participation due to time and effort required to invest in intervention and self-report measure documentation. Figure 2 shows participant flow and procedure of this study. In April 2019 participants with no prior meditation experience as eligibility criterion were recruited via the test subject pool SONA, an online university credit system of the University of Twente (n = 27). Prior experience was classified as any engagement in more than three meditation sessions in total, as those were viewed as curiosity but not commitment or consistency. After recruitment, participants were randomly assigned to groups.

The comparison group with longterm experience of six months as eligibility requirement was recruited via individual approaching through the official meditation group of the University of Twente (n = 8). Participants were not randomized due to limited availability of eligible participants. The six months were chosen as the target group consisted explicitly of students with limited experience possibility due to their age and occupation status as full-time enrolled students. Some studies report an increased accuracy to perceive bodily signals such as heartbeat pace and emotional awareness and plasticity changes in frontal cortex after six months already (Bornemann & Singer, 2016; Halsband, Mueller, Hinterberger, & Strickner, 2009). Inclusion criteria for all four groups was at least 18 years of age, as well as the possession of a smartphone.

After group allocation, participants individually received an oral explanation of the group-specific procedure. Participants gave their written informed consent thereafter. Of 35 participants in total, all 35 completed the baseline questionnaire. After baseline, participants each received continuous measure self-report sheets to document reduced emotion intensity and applied coping strategy to distressing events (see *Measures* for more details). They were instructed to collect individual data over the next three weeks. Participants gave their email addresses to the researcher to receive a summary of the procedure of the group they were in, as well as the post-questionnaire at the end of the three-week period (Figure 2).

After three weeks of individual data collection and intervention period, participants of all groups received an email with the post-questionnaire to measure their emotion regulation skills after the three weeks. All log sheets were collected at that time, and participants were thanked for their participation. There was room for questions and comments during the ongoing study and after via email. Participants that successfully completed the study received their Sona credits.

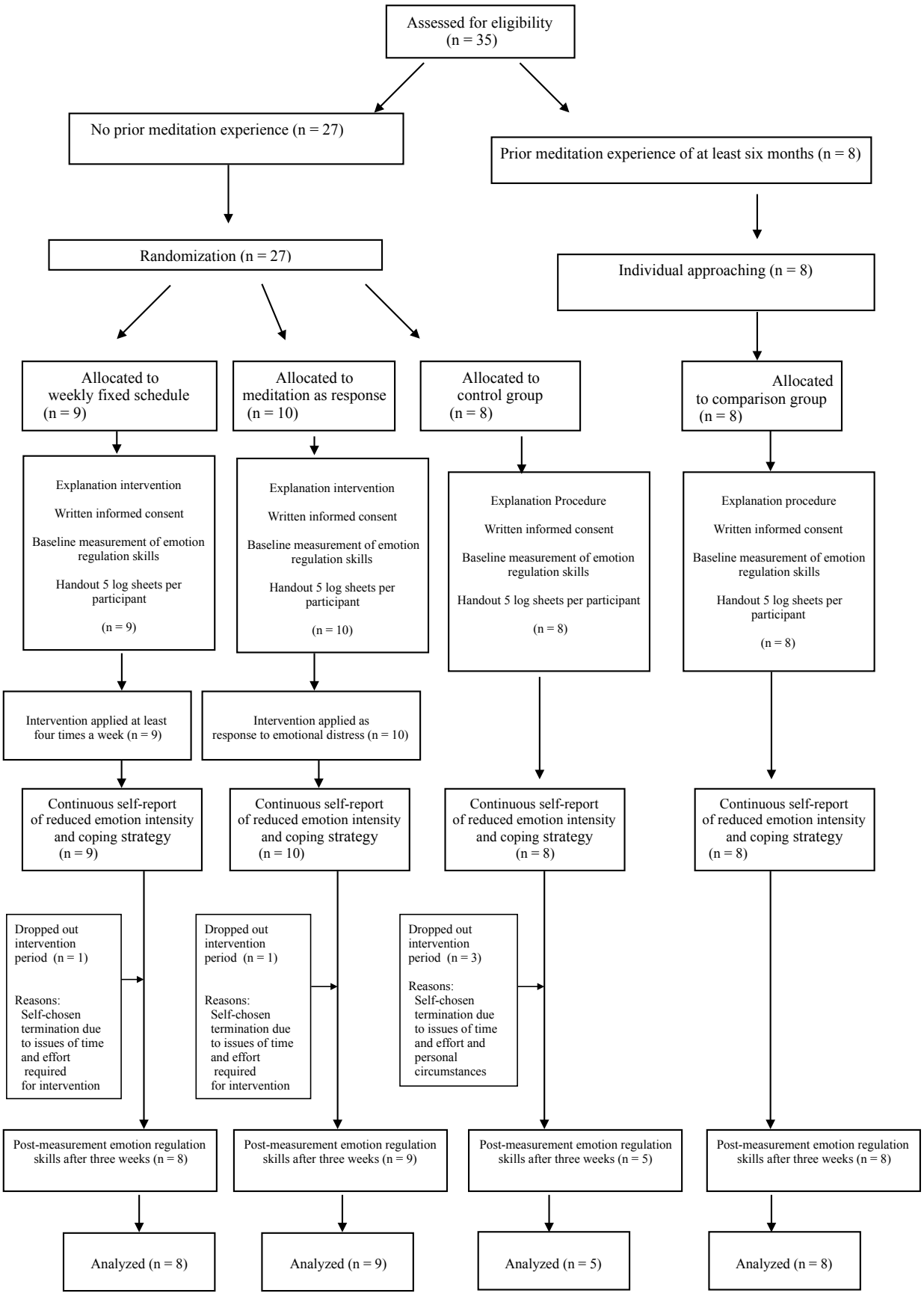

Figure 2. Flow-chart of participants and procedure in the study.

Interventions

Fixed Schedule Experimental Group (FS). The experimental condition meditating four times weekly on a fixed schedule (FS) was asked to meditate at least 4 days a week at a self-chosen time. Participants downloaded the meditation app „Insight Timer“ on their mobile phone. App choice is reflected in simplicity of utilization and activity track possibility to verify compliance with the assigned fixed meditation schedule. This data was not used for analysis. Within this app, they were given three similar guided mindfulness meditations to choose from (see Table 1 for summary of meditation content). The basic content of these mindfulness meditations was the same, each was applicable for beginner level. Meditations varied slightly in length, being between 10 and 16 minutes, as well meditation teacher style, being either straightforward or slightly spiritually nuanced, and male or female voice to offer options to participants. All three hold mindfulness as a central aspect, highlighting and guiding through one-pointed attention and focus on different objects of the mind, as well as nonjudgmental acceptance and presence, all central to mindfulness practice.

As Response Experimental Group (AR). The experimental condition meditating as a response to emotional distress (AR) was asked to apply the intervention as a coping strategy to emotional distress. Identical to the FS experimental group, they downloaded „Insight Timer“ on their smartphone to access and utilize the same three guided mindfulness meditations (Table 1).

No Meditation Experience Control Group (NME). The control group with no prior meditation experiences did not receive the intervention. Over the three week intervention period they were instructed to continue their usual daily routine.

Long-term Meditation Experience Comparison Group (LME). Participants of the comparison group with long term meditation experience (LME) did not receive the intervention. Participants were instructed to continue their meditation practice as usual during these three weeks.

Table 1

Description of the guided meditations applied as the intervention for this study.

	Characteristics and Content	Example passage
Breathing Meditation (Jack Kornfield, n.d)	- Introduces nature of the mind and what it means to be present - Focus on body and tension release - Emphasis on rhythm of breath - Guidance to redirect attention - Use of bells	*„The mind will* wander. As *soon as you notice, gently let go and return back to feel the next breath when you can. No judgement, no evaluation. It's like training a puppy, stay, you put your on the breath, and in a few breaths, like the puppy, the* mind will wander away.“
Breath & Awareness (Sacha Stewart, n.d)	- Main emphasis on guided breathing and presence - Body scan and active tension release - Focus on other sense (sound, touch) - Mindful observation and release of emotions	*„Each breath bringing you here. For the next while you can leave the world of doing and simply being in this moment, being with the body breathing and settling into stillness, settling into presence.“*
Surrender to The Silence Within (Davidji, n.d)	- Teachings about spirituality and nature of the mind - Deep breathing and body relaxation - Period of silent meditation - Offers chanting at end	*„60.000 to 80.000 thoughts run through your mind each day, all of our conversations* of the past and potential *interactions distracting and overwhelming us. The mind swirls in every moment and there is only one way to settle it down and that is by accessing the space between our thoughts, breaths, and words, connecting to stillness*

Measures

Emotion Regulation Skills. Trait emotion regulation skills were measured with the self-report 36-item Difficulties in Emotion Regulation Scale (DERS), of which all 6 subscales were used as a combined measure (Appendix A; Gratz & Roemer, 2004). Items were rated on a 5-point scale from 1 (almost never) to 5 (almost always) and a sum score obtained by adding all item-ratings. Participant sum scores were analyzed in terms of very high (167 to 180 points), high (133 to166 points), medium (85 to 132 points), low (51 to 84 points), or

very low (36 to 50 points) mean scores (Gratz & Roemer, 2004). High scores suggest greater difficulty to regulate emotions.

The first sub scale, NONACCEPT, assesses a possible deficit in the ability to accept emotional responses, with items such as *When I am upset, I become angry at myself for feeling that way*. The sub scale GOALS assesses a potential lack in capacity to engage in goal-directed behavior and is made up of items like *When I am upset, I have difficulty controlling my behaviors*. The sub scale IMPULSE includes items representing deficits in impulse control skills, an example being *I experience my emotions as overwhelming and out of control*. Next, items like „I have no idea how I am feeling“ represent the AWARE sub scale that aims to identify a possible absence of emotional awareness. The sub scale STRATEGIES identifies a potential inability to access emotion regulation strategies with items such as *When I am upset, I believe there is nothing I can do to make myself feel better*. Lastly, the CLARITY sub scale aims to identify the potential absence of emotional clarity, represented by items like *I have difficulty making sense out of my feelings*.

There is sufficient support for an adequate fit for undergraduate student populations (Perez et al., 2012). Psychometric properties of the DERS show sufficient results. Findings suggest good test-retest reliability (α=0.88), excellent internal consistency (α=0.9), as well as adequate construct and predictive validity (Gratz & Roemer, 2004; Hallion, Steinman, Tolin, & Diefenbach,2018).

Self-Reported Reduction in Emotion Intensity. Besides the questionnaire, the ability to regulate emotions within distressing situations was assessed by self-reported reduction in emotion intensity (SRREI) using the administered log sheet (Appendix B & C). The TICES log sheet was used as a template (Shapiro, 2001). The log sheet was utilized as a documentation device for any noticeably distressing emotions that require regulation. Situations that are classified as requiring regulation were self identified by participants. Emotion intensity was measured within two columns of the log sheet, one for the *intensity before* the emotion was regulated, and *intensity after*. Intensity was rated on a scale from 0 (*absence of distressing emotion*) to 10 (*highest intensity of distressing emotion*).

The reported level of emotion *intensity before* to emotion *intensity after* was combined into a difference score per documented situation. The difference score of these two variables

was used as an indication for change in emotion intensity. Classification of self-reported reduction in emotion intensity was rated from 0 (*no reduction*) to 10 (*most effective reduction*). As all cases of this study either showed no change or a reduction, this obtained value was labelled as self-reported *reduction* in emotion intensity. Per participant, self-reported reduction in emotion intensity was computed as mean score across documented situations.

Coping Strategy. Coping strategies were assessed in a column of the log sheet to assess the dominantly applied coping strategy within groups. For each documented situation, participants qualitatively described their way of coping with the emotion. Qualitative analysis found four categories of dealing with emotions across the sample: dysfunctional coping strategies (1), and functional coping strategies which were further divided into three subcategories, searching for external support (2), relying on internal support (3), and mindfulness strategies (4). To obtain the dominant coping strategy per participant, the applied strategy per situation was classified with a representative value for that strategy, ranging from 1 to 4 (1 = dysfunctional, 2 = searching for external support, 3 = relying on internal support, 4 = mindfulness strategies). Frequency analysis obtained the most dominant coping strategy per participant across documented situations.

Dysfunctional coping strategies were classified as those avoiding emotional affect, rather than managing it, for example *withdrawing from the situation*. Dysfunctional responses to emotional distress oppose the perception of effective regulation, as they appear to effectively reduce emotional impact when in fact they suppress or delay it (Kolk, 2015). Functional Coping strategies were characterized as those directed towards regulating the emotional distress by dealing with it in a productive way. Searching for external support was the reliance on others to resolve emotional distress, for example *I called my boyfriend and asked him help me calm down*. Internal support was classified as strategies applied by the self without external help that aimed at dealing with the situation, for example *I reflected about the situation in my journal*. Lastly, mindfulness strategies were those with acceptance of and attention to the emotion aiming to hold it in nonjudgemental awareness, for example *I engaged in walking meditation*, or *I accepted the situation because I know I cannot change it*.

Data Analysis

For statistical analysis, the statistical program SPSS, version 24, was utilized. The primary hypothesis was tested with ANOVA and repeated measures analysis. To control for similar baseline level and homogeneity of variance, DERS pre-test measures between as-response condition (AR), fixed-schedule condition (FS), and control group (NME) were compared in a one way ANOVA with Levene's test statistic ($\alpha \leq .05$). Exploratory analysis of emotion regulation skills over time was done by plotting group scores and calculating descriptives. Repeated measure analysis tested for the effect of time, group, and interaction effect (time x group) for intervention effectiveness across groups. As the DERS measured the difficulty to regulate emotions, the group with a significantly larger decrease ($\alpha \leq .05$) in the DERS score was characterized to have the larger intervention effect.

Self-reported reduction in emotion intensity (SRREI) was analyzed by calculating the mean SRREI per participant and per group. Significant group differences ($\alpha \leq .05$) were analyzed with an ANOVA. Larger SRREI measures between groups indicated a better ability to reduce emotion intensity, and thus suggested better emotion regulation skills. To verify SRREI measures, frequency of applied coping strategies were analyzed for functionality vs. dysfunctionality. Frequencies of coping strategy per group were evaluated with chi-square analysis.

To test the second hypothesis, both experimental conditions were combined (FS+AR) as both engaged in short-term meditation. Two independent samples t-test with post-measure DERS outcomes, and SRREI outcomes were conducted with the long-term experience comparison group (LME) and FS+AR. Significantly ($\alpha \leq .05$) smaller DERS scores indicated better emotion regulation ability. In addition, repeated measures analysis was conducted to indicate the short-term mediation intervention effect over time in relation to the comparison group. Significantly larger SRREI outcome ($\alpha \leq .05$) between groups indicate better ability to reduce intensity of emotions and suggest higher emotion regulation skills. Coping strategies were inferred and assessed in the same manner as for the first hypothesis.

Results

Table 2 shows the descriptive statistics in terms of age and gender distribution of each group. The total sample of this study consisted of 30 university students. There were no significant differences in age or gender distribution between and within groups. Participants were all enrolled in a university program. All participants in all groups had German nationality.

Table 2

Descriptive statistics per group and total study sample with test for significant differences in age and gender distribution (N = 30).

	Fixed schedule (n = 8)	As response (n = 9)	No experience (n = 5)	Longterm experience (n = 8)	Total (n = 30)	p*
Age, M (SD)	22 (1.1)	22 (1.2)	23 (2.6)	23 (1.5)	22 (1.5)	0.45
Gender, n (%)						
female	5 (63)	4 (44)	2 (40)	3 (38)	15 (50)	0.73
male	3 (37)	5 (56)	3 (60)	5 (62)	15 (50)	

*Differences between groups were tested with ANOVA for age and Chi-square test for gender.

Similar baseline level and homogeneity of variance of the experimental condition meditating on a fixed schedule (FS), the experimental condition meditating as a response to emotional distress (AR) and the control group with no meditation experience (NME) was confirmed, F= 3.52, p = .35.

Table 3 displays the baseline and post-measurement of emotion regulation skills (DERS) three weeks after baseline assessment, and the continuous measure of self-reported reduction of emotion intensity across three weeks. As the DERS assessed difficulties in regulating emotions, lower scores indicate lower difficulty and thus better emotion regulation skills.

The following exploratory findings are all non-significant, but will yet be reported due to the small sample size. At face value, both experimental groups declined in difficulty to regulate emotions from baseline to post-measure, the AR group to a greater extent (Figure 3),

and the NME group retained their level of emotion regulation skills. Also at face value, the range of scores in the AR experimental group decreased in minimum and maximum value to a greater extent than the FS experimental group.

The FS- and AR-condition groups began with a baseline emotion regulation difficulty classified as medium, and obtained a level classified as low at the end of the intervention (Gratz & Roemer, 2004). The NME control group shows low difficulty to regulate emotions at both baseline and post-intervention. Analysis of variance of SRREI between the three groups (FS, AR, NME) indicated that intensity difference scores of groups did not differ significantly across groups, F=0.27, p =.77. All groups displayed the same self-reported reduction in emotion intensity.

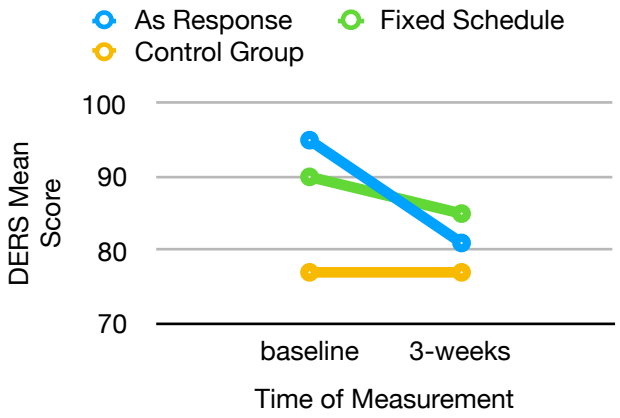

Figure 3. Group mean scores of repeated measures diagram of emotion regulation skills (DERS) across baseline to post-test measurement of FS, AR, and NME groups. A decline in score indicates less difficulty to regulate emotions.

Repeated measures analysis of emotion regulation skills (DERS) of FS, AR and NME (Table 3) indicates no statistically significant interaction effect, F(2, 19) = 1.40, p = .27, indicating that neither FS- or AR-experimental condition improved their emotion regulation skills compared to the control group. Taken the results if the statistical analysis together, they do not support the hypothesis.

Table 3

*Means and standard deviations for (difficulties in) emotion regulation skills measures of FS, AR, NME, and LME** groups at baseline and post-intervention with repeated measures analysis for interaction effect (time x group) of of FS, AR, and NME of the (difficulties in) emotion regulation skills measure.*

	FS (n = 8) *M(SD)*	AR (n = 9) *M(SD)*	NME (n = 5) *M(SD)*	LME (n = 8) *M(SD)*	FS+AR (n = 17) *M(SD)*	F* *FS,AR & NME* *FS + AR & LME*	p* *FS, AR & NME* *FS + AR & LME*
(Difficulties in) Emotion Regulation Skills (DERS)							
baseline	90 (20.0)	95.5 (18.2)	77 (10.6)	70.8 (17.8)	93 (18.6)		
3 weeks (post-intervention)	85 (23.1)	81 (16.8)	77.8 (10.7)	7 (14.3)	83 (19.5)	1.40 0.77	0.27 0.39
SRREI*	3.5 (1.6)	3.0 (1.6)	3.2 (0.5)	3.5 (1.3)	3.2 (1.6)		

*(1) Repeated measures analysis of (difficulties in) emotion regulation skills of FS, AR, and NME groups at baseline and post intervention indicated no significant effect of time ($F = 2.63$, $p = 0.12$), and no significant effect of group ($F = 0.88$, $p = 0.43$)
(2) Repeated measures analysis of (difficulties in) emotion regulation skills of FS + AR, and LME groups at baseline and post intervention indicated no significant effect of time ($F = 3.3$, $p = 0.08$), and a significant effect of group ($F = 7.44$, $p = 0.01$)

**FS = Fixed Schedule, AR = As Response, NME = No meditation experience (control), LME = Long-term meditation experience (comparison)

Implemented coping strategies were checked for actual emotion regulation strategies, as opposed to emotion dysregulation such as suppression, distraction or denial within groups. Person Chi-Square statistic was significant ($p < .001$), indicating that the type of intervention had a significant effect on group-dominant coping strategy. Table 4 displays the dominant coping strategy per participant within the respective group. Dysfunctional coping strategies and mindfulness coping strategies were applied as the group-dominant strategies on an equal basis in the FS-condition. AR-condition participants consistently applied the mindfulness meditation intervention to cope with emotional distress. The coping strategies most frequently applied in the NME control group were dysfunctional ones. When comparing coping strategies to the mean scores of the post-DERS, the AR-group with the greatest reduction in mean score implemented mindfulness strategies consistently.

All groups displayed similar ability to reduce emotion intensity as measured by self-reported intensity reduction of distressing emotion (Table 3). The applied coping strategies FS-condition appear to reflect emotion regulation skills in about half of the group. Mindfulness strategies explicitly reflect self-reported reduced intensity in the AR-group. For the NME group, this reduced intensity does not appear to reflect actual emotion regulation.

Table 4

Dominant coping strategy collected throughout the intervention period (log sheet) per group (N = 30).

	FS* n, (%)	AR* n, (%)	NME* n, (%)	LME* n, (%)	(FS+AR*) n, (%)
Dysfunctional	**3, (37.5)**	0, (-)	**3, (60)**	0, (-)	3, (17.5)
Functional (total)	5, (62.5)	9, (100)	2, (40)	8, (100)	14, (82.5)
External Support	0, (-)	0, (-)	2, (40)	0, (-)	0, (-)
Internal Support	2, (25)	0, (-)	0, (-)	0, (-)	2, 12.5
Mindfulness	**3, (37.5)**	**9, (100)**	0, (-)	**8, (100)**	**12, (70)**
Total	8, (100)	9, (100)	5, (100)	8, (100)	17, (100)

*FS = Fixed Schedule, AR = As Response, NME = No meditation experience (control), LME = Long-term meditation experience (comparison), FS + AR = Combination of Fixed Schedule and As Response

The second hypothesis assumed that the long-term experience comparison group (LME) would display significantly better emotion regulation skills than the experimental groups

engaging in short-term meditation (FS+AR). Table 3 shows that the LME group displays less difficulties in emotion regulation than the FS+AR group (Gratz & Roemer, 2004). At face value, the ability of the FS+AR group to regulate emotions appear to approach the LME group over time, while the LME group maintained their level of emotion regulation skills (Figure 4), though these findings are non-significant.

Independent samples *t*-test indicated that post-test scores of the LME comparison group are significantly lower than those of the FS+AR experimental group $t(23) = 2.04$, $p = .05$. These results indicate that long-term meditation practice does enable better emotion regulation skills when compared to short-term meditation practitioners in a statistically meaningful way within this sample. A second independent samples *t*-test shows that self-reported reduction of emotion intensity does not differ significantly $t(23) = 0.34$, $p = .74$. Long-term meditation of six months does not seem to enable a greater ability to reduce emotion intensity, as reflected by self-reported reduction in emotion intensity measure.

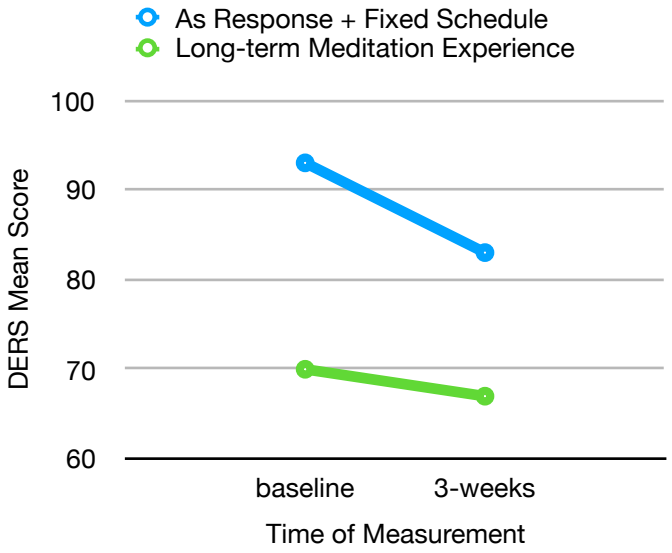

Figure 4. Group mean scores of repeated measures diagram of emotion regulation skills (DERS) across baseline to post-test measurement of FS+AR and LME groups. A decline in score indicates less difficulty to regulate emotions.

Repeated measures analysis of emotion regulation skills (DERS) of FS+AR and LME (Table 3) shows no changes of emotion regulation skills in either group across time, $F(2, 21) = 0.77$, $p = 0.39$, indicating no significant intervention effect. There was a significant difference between groups in emotion regulation skills, in line with results above, $F(2, 21) = 7.44$, $p = .01$. Taken the results of the statistical analysis together, they do appear to be in line with the second hypothesis.

Table 4 demonstrates that participants in the LME comparison group consistently employed mindfulness strategies as the dominant coping strategy. The most dominantly applied coping strategy in the FS+AR group were mindfulness strategies as well. For both groups the self-reported reduction in emotion intensity can be assigned to mindfulness strategies.

Discussion

The acquisition of mindfulness through meditation practice was conceptualized to promote emotion regulation skills through increasing the perception of affective physical states that accompany distressing emotions (Teper, Segal, & Inzlicht, 2013). Previous research suggested a decrease in negative affect and increase in emotion regulation skills over time

when meditating regularly, and found a self-induced increase in meditation practice across periods of distress (Kerr, Josyula, & Littenberg, 2011; Monshat et al., 2013). However, regular practice per se is too broad to draw direct inferences about exact meditation practice timing and dosage across time. Research has not yet shown whether weekly applied regular meditation independent of context, or a practice applied especially in situations of distress prevails as a method to regulate emotional distress. This study aimed to approach this objective by evaluating two different short term meditation application methods by applying a mindfulness meditation intervention, either as a response (AR) to emotional distress or with a fixed schedule of at least four days a week (FS) across an intervention period of three weeks.

Experimental groups were compared to a control group with no mediation experience and to a comparison group with longterm meditation experience (LME). The following results should be read and interpreted with caution as the sample size of the study was not sufficiently representative (n = 30). This study rather holds as an experimental exploratory research.

The primary hypothesis stated that the FS-condition would obtain better emotion regulation skills than the AR-condition when compared to a control group without meditation experience (NME). Results of this three week pre-/post-measurement with additional continuous self-report showed that neither short-term meditation group significantly increased emotion regulation skills over the intervention period, nor was there a meaningful difference in ability to regulate emotions when compared to the control group (DERS, self-reported reduction of emotion intensity, coping strategy). In addition, neither experimental condition was able to display greater self-reported reduction in emotion intensity. Results suggest that meditating with a fixed schedule is not more or less beneficial than meditating as a response to emotion distress.

These results are not in line with previous work by Teper, Segal and Inzlicht (2013), who theorized that mindfulness would increase perception of physical affective cues through meditation and thereby promote effective emotion regulation. This in turn was suggested to benefit emotion regulation through a capacity to witness and consciously decide for a functional response to distress. Results are not in line with these propositions, as short-term condition participants appear to not have cultivated mindfulness to the extent that it reinforced better regulation of emotions.

From an exploratory perspective, an alternative interpretation of results appears to indicate that emotion regulation skills were enhanced across the intervention period in both mindfulness meditation methods (FS, AR). The method of applying emotion regulation skills as a response appears to have generated the greatest increase in ability to regulate emotions. Relating these findings to applied coping strategies, the difference between both experimental groups appears to be that the group meditating as a response to emotional distress explicitly applied mindfulness strategies, while the group meditating with a fixed schedule utilized mindfulness and dysfunctional strategies equally. Careful inferences could be made between the greater increase in ability to regulate emotions and applied coping strategies to emotionally distressing situations. It appears that the intervention method that applied meditation as the only coping strategy was the group with the greatest increase in emotion regulation ability.

From this perspective, exploratory results appear to fit with the model of Teper et al. (2013), which suggests that mindfulness enables better emotion regulation capacities by counteracting habitual responses and enhancing more conscious and functional ones. Likewise, Critchley, Eccles, and Garfinkel (2013) found, emotion regulation is more likely when a capacity to notice an interpret in a functional way is developed. The pairing of meditation with emotional distress could benefit habit formation, as the tendency to interpret affective cues and mental states with a mindful attitude might be enhanced.

Nonetheless, considering that the intervention only lasted for a period of three weeks, it might have not been enough time to consistently apply mindfulness for it to become a habit. Study's have placed an average timeframe for automaticity and habit to develop to around 10 weeks (Gardner, Lally, & Wardle, 2012). Before a habitual response of mindfulness behavior is formed, it might be less likely for it to have a beneficial effect on emotion regulation skills, possibly reflected in the non-significance of the findings. Yet, no integrative statement can be made given the small sample size and non-significance of findings, but a possible direction to invest future research efforts in might be inferred.

The secondary hypothesis held that long term meditators display better emotion regulation strategies than short-term meditators. Results do suggest that a trend was found that individuals with long-term meditation experience of at least six months display better emotion

regulation skills than individuals with short-term experience. Although the reduction in emotion intensity when experiencing emotional distress did not differ significantly between the two groups, overall ability to regulate emotions was higher in the group with long-term experience.

Moreover, both groups' most dominant coping strategy were related to mindfulness. An interesting finding here was that although the long-term meditation group did not receive the intervention, each participant's predominant coping strategy was related to mindfulness, for example meditation or acceptance and letting go. These findings are reflected in the model by Teper et al. (2013), suggesting that the route taken by long-term meditators is to notice the emotional impact and accepting it without attachment. They appear to have moved from an automatic response towards emotional distress to a more conscious one, allowing them to chose a more functional coping strategy. The model also suggests, that a mindful response of those with long-term meditation experience has become habitual. The analysis of the coping strategies seems to reflect this.

Implications

While previous research has focused on discovering the ways in which short-term meditation influences mind, behavior and body, in relation to emotion management, this research compared different methods of mindfulness meditation dosage. Results appear to implicate that neither 3-week approach of short-term meditation either as a response to emotional distress, or on a weekly fixed schedule is beneficial to increase emotion regulation skills. Teper et al. (2013) proposed that short term meditation would already have an effect on mindfulness acquisition, and thus on emotion regulation skills. Findings seem to challenge their theory. Although from an exploratory perspective a trend could be inferred in favor of short term meditation when applied as a response to emotional distress, no clear statements can be made without further exploration. The study might have assisted further research to exclude three week short-term meditation interventions applied as a response to emotional distress or with a weekly schedule. Findings might hold as exploratory ground to direct future research efforts.

This knowledge might be important for those looking for a „quick-fix" to emotional overwhelm or dysregulation. For people with a limited time frame in fast-paced life contexts,

engaging only three weeks in either meditation practice does not seem feasible in order to transform old habits into new mindfulness habits. As this study comprised only a sample of university students, results must be seen in light of that target group. Adjacent to this, having a functional response at hand, although it has not yet become automated might be of value for those with dysfunctional or no coping strategies at all. It is not clear whether this strategy would transform into a habitual response over time, although analysis of coping strategies of the long-term meditation group might suggest this vaguely.

Limitations

First, the generalizability and reliability of these results is limited by the small sample size of each group. Factors that might have contributed to limited participation and cooperation were centered around period of recruitment and time and effort required for participation. Recruitment fell on a time period where study load of students accumulated, while the intervention required continuous data collection and therefore engagement over three weeks. The sharing of personal information concerning emotional distress with the researcher might have been an additional contributor to the inhibition of participant flow and therefore reliability.

Second, a possible limitation of the sample is the homogeneity of German nationality and consistent occupation as full-time student within higher eduction institutions. To draw more general inferences about the application of different meditation approaches varying in dosage, other occupational statuses and nationality might be favorable to research.

A third limitation concerns the period defined as „short-term“ within this study. Various studies about short-term meditation practices have utilized a different definition, or have found results after a time period exceeding three weeks, as was used in this study. For example, studies on attention in relation to meditation have found improvements in ability to shift attention after three months (Slagter et al., 2007). This difference in definition could have caused results not to be in line with the theoretical framework of Teper et al. (2013).

Fourth, this study relied on self-reported emotion regulation skills, possibly placing restraints on validity. People may not be able to accurately report their ability to regulate emotions, as differences in actual and perceived state might exists. Although efforts were taken to include multiple measures, the data is limited by this. Some participants were

individually known by the primary researcher, possibly leading to either more favorable or less disclosing reports of data.

Lastly, delivering the guided meditation intervention with means of the meditation app might not have provided the needed guidance, given the novelty of the practice. A more interactive approach with personally delivered guided meditations could have offered room for practice-related questions and further guidance. The present study might therefore have placed restrains on validity in terms of how the intervention was delivered and participants were taught.

Future Research and Recommendations

Future research should consider a different approach to participant recruitment to obtain a more representative and larger sample to study. This might be done by placing an advert for those willing to contribute time and effort. Participant recruitment should also include a broader target group to draw more realistic and broader implications. Especially an increase in sample size and diversity is recommended to ensure greater validity and reliability of results.

In order to compare different meditation dosage strategies in a more meaningful way, a larger time frame should be chosen. Especially as studies have suggested, responses to distressing emotions are likely to be automatic and habitual. In order to allow a new habit to develop, especially short-term conditions should allow for an adequate time frame for these to formulate, and thereby explore this explanation possibility. As the present results suggest that three weeks are not enough time, it is recommenced to increase the time frame.

Lastly, a more structured and traceable approach of intervention should be applied. Within this study, meditation interventions relied on an application. As not only emotion regulation is difficult to be extracted from self-report measures, but assuring that the intervention has been adequately applied, a more interactive participant-researcher approach is recommended. This could be through the initiation of meditation groups in which attendance can be monitored. Here, various methods of meditation dosage could be tested as well, for example daily meditation. It is recommended to maintain the time period of guided meditations when researching meditation beginners, as the novelty of the practice places

restrains on attention capacity. It is possible to increase meditation lengths over time, for which other studies should be reviewed.

Conclusion

To conclude, this study's findings might serve as a preliminary indication that mindfulness cultivation through short-term meditation of three weeks as a fast approach to enhancing emotion regulation capacities is difficult to realize. Habit transformation towards mindfulness strategies might take longer to realize than this time period, although previous research has indicated physiological and psychological changes in some cases after a few weeks.

Nonetheless, results have to be seen in relation to the under-representative sample size, time constrictions, and the reliance on self-report when measuring emotion regulation. Conclusive statements on the evaluation of either approach to short-term meditation in relation to emotion regulation skills have to be made with caution. Indications of exploratory evaluations of results could hold as possible trends to explore more thoroughly. Future efforts should be dedicated towards improving validity and reliability of data collection, especially concerning sample size and structure of intervention. Such findings could be used to extract beneficial short-term meditation methods that can be applied by individuals with constrictions in time availability and high emotionally-distressing contexts. Overall, it appears beneficial to continue the search for alternative ways to manage emotional stress through self-regulation and self-help in order to contribute to public well-being.

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Appendix A

Difficulty in Emotion Regulation Scale - DERS (participant version)

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

1	2	3	4	5
almost never (0-10%)	sometimes (11-35%)	about half the time (36-65%)	most of the time (66-90%)	almost always (91-100%)

_____ 1) I am clear about my feelings.
_____ 2) I pay attention to how I feel.
_____ 3) I experience my emotions as overwhelming and out of control.
_____ 4) I have no idea how I am feeling.
_____ 5) I have difficulty making sense out of my feelings.
_____ 6) I am attentive to my feelings.
_____ 7) I know exactly how I am feeling.
_____ 8) I care about what I am feeling.
_____ 9) I am confused about how I feel.
_____ 10) When I'm upset, I acknowledge my emotions.
_____ 11) When I'm upset, I become angry with myself for feeling that way.
_____ 12) When I'm upset, I become embarrassed for feeling that way.
_____ 13) When I'm upset, I have difficulty getting work done.
_____ 14) When I'm upset, I become out of control.
_____ 15) When I'm upset, I believe that I will remain that way for a long time.
_____ 16) When I'm upset, I believe that I will end up feeling very depressed.
_____ 17) When I'm upset, I believe that my feelings are valid and important.
_____ 18) When I'm upset, I have difficulty focusing on other things.
_____ 19) When I'm upset, I feel out of control.
_____ 20) When I'm upset, I can still get things done.
_____ 21) When I'm upset, I feel ashamed at myself for feeling that way.
_____ 22) When I'm upset, I know that I can find a way to eventually feel better.
_____ 23) When I'm upset, I feel like I am weak.
_____ 24) When I'm upset, I feel like I can remain in control of my behaviors.
_____ 25) When I'm upset, I feel guilty for feeling that way.
_____ 26) When I'm upset, I have difficulty concentrating.
_____ 27) When I'm upset, I have difficulty controlling my behaviors.
_____ 28) When I'm upset, I believe there is nothing I can do to make myself feel better.
_____ 29) When I'm upset, I become irritated at myself for feeling that way.
_____ 30) When I'm upset, I start to feel very bad about myself.
_____ 31) When I'm upset, I believe that wallowing in it is all I can do.
_____ 32) When I'm upset, I lose control over my behavior.
_____ 33) When I'm upset, I have difficulty thinking about anything else.
_____ 34) When I'm upset I take time to figure out what I'm really feeling.
_____ 35) When I'm upset, it takes me a long time to feel better.
_____ 36) When I'm upset, my emotions feel overwhelming.

Appendix B

Log sheet (FS, NME, LME

Participant Number:_____

Date	Trigger	Cognition/ Thought	Emotion/ Feeling	Sensation	Intensity Before	Coping Strategy	Intensity After

Appendix C

Log sheet (AR)

Participant Number:_____

Date	Trigger	Cognition/ Thought	Emotion/ Feeling	Sensation	Intensity Before	Intensity After