**Masaryk University**

**Faculty of Arts**

# Mindful Emotion Regulation

Habilitation thesis

PhDr. Miroslav Světlák, Ph.D. 2019

I declare that I wrote this habilitation thesis myself using the sources listed in the literature.

Date: Signature:

**Acknowledgment**

I am grateful to have been born at this time, in this place, among people I love.

## Preface

The theme of the presented habilitation thesis reflects my clinical practice and research interests of over the past 16 years. I started to study emotion regulation processes somewhat indirectly within my postgraduate study at the Department of Physiology of the Faculty of Medicine at Masaryk University in 2003, where I studied the motivations for smoking behavior. I was primarily involved in the study of the transtheoretical model approach applied to smoking acquisition and cessation in adolescent and adult smokers. Through the transtheoretical model of behavioral changes, we were able to describe smoker's motivational stages and the processes of change they use at various stages (Svetlak & Kukleta, 2003, 2004, 2006a, 2006b; Svetlak, Konecny, & Kukleta, 2007; Svetlak, 2007, 2010a; Svetlak et al., 2013).

Through the study of motivations for smoking acquisition and cessation, I came to the study of the self-medication hypothesis, which posits that risky behaviors such as smoking, overeating, and self-harm could be ways that some people regulate their dysregulated emotions or cognitive deficits. For example, we found that symptoms of distress can act as triggers that evoke strong urges to use tobacco and motivate smokers across all stages, including initiation and experimentation, maintenance, and relapse (Svetlak et al., 2010). We found a similar association between stress-related psychopathology and food cravings (Svetlak, 2010). We also described a relationship between food craving and body weight in older school-age children (Svetlak & Psenicova, 2012). In the context of smoking cessation and acquisition, we found some significant differences in psychophysiological reactivity between smokers and nonsmokers (Svetlak et al., 2010b).

The study of psychophysiology led me to the study of stress and stress reactivity on a more general level (Roman, Svetlak, Damborska, & Kukleta, 2014). Concretely, we studied electrodermal activity (EDA) during the Stroop task with the aim of determining whether a non-linear analysis of EDA and electroencephalograph (EEG) could provide new information about psychophysiological reactivity to stress and stress-related psychopathology (Svetlak et al., 2010c; Svetlak et al., 2013; Bob & Svetlak, 2011). During this period, I had the unique opportunity to participate in the research of intracranial EEG analysis in patients with epilepsy (Roman et al., 2013; Bob et al., 2014).

When I began working as a psychologist at the Department of Psychiatry of the Faculty of Medicine of University Hospital Brno, in 2010, I started to deal with the topics of emotional

awareness and emotion regulation more intensively. It has become increasingly clear to me that patients with various types of diagnoses have very low levels of emotional awareness and that their emotion regulation strategies are very often non-adaptive (Svetlak, Roman, Damborska, & Obereigneru, 2014). In daily life inpatient and outpatient practice, I have come to realize that one of the main missions of the clinical psychologist is to help people become aware of what they experience, how they regulate their emotions, and what mediates the relationship between their experience and dysregulated emotions and behavior. In this context, I have begun thinking about almost each resulting clinical picture as the original and creative way (even if non-adaptive) that each person regulates emotions. For example, the central function of eating disorders such as anorexia nervosa or bulimia nervosa can be understood as an attempt to control unwanted or dysregulated emotions. The body dissatisfaction, self-loathing, and excessive focus on body shape and weight can be understood as the displacement of primary unprocessed negative emotions into the body. The dietary restrictions are then the way that people with anorexia nervosa decrease emotional awareness and interoceptive sensitivity and thus protect themselves from unwanted emotions. This is the often observed cascade from emotional to behavioral dysregulation (Bernatova & Svetlak, 2017; Bernatova, Svetlak, Roman, & Kasparek, 2017). We also addressed the topic of how to measure levels of emotional awareness in adults and children (Svetlak, Bernatova, Pavlikova, & Winklerova, 2015; Svetlak, Marsova, Bernatova, & Winklerova, 2017). We worked on the topic of dysregulated emotional processing in the etiology of functional neurological disorders (Sojka, Bares, Kasparek, & Svetlak, 2018).

As a clinical psychologist and psychotherapist trained in Gestalt psychotherapy, which originated in phenomenology, existentialism, and field theory, I always focused on my own and my patients' subjective experience in the present moment during psychotherapy. My implicit aim in psychotherapy is to help patients became aware of the process of organizing their experience to have the choice to react in various ways. In this context, I gradually noticed the similarity between my psychotherapeutic approach and mindfulness practice. In the last decade, the association between emotional awareness, emotion regulation, and mindfulness have been discussed with increasing frequency by psychologists and researchers from the affective neurosciences field. For me, the mindfulness approach has become another effective method of helping people to regulate their dysregulated emotions. I do not understand mindfulness programs as replacing psychotherapy; I see them as another effective way to help people without psychotherapy or as a way to augment psychotherapy. We started to use some basic

components of formal mindfulness practice in adolescent inpatients during relatively brief hospitalizations (Svetlak, Theiner, & Kubicova, 2018). We prepared an eight-week online mindfulness program based on mindfulness-based cognitive therapy for students, teachers, and staff of Masaryk University (Svetlak et al., 2019). At the time of submission of this habilitation thesis, 1500 people had already participated in this program. The eight-week program is organized twice a year. Our main aim is to offer students a regular and evidence-based program that helps them to support their mental health and acquire healthy mind habits. The same program is being prepared by our research group for patients with cancer.

The topic of mindfulness is an important interest of mine, integrating my previous and current personal, clinical, and research directions.

**Annotation**

People most often seek help from mental health professionals because of a form of suffering that could generally be regarded as emotional dysregulation. Setting aside the diagnostic criteria of international classification of mental and behavioral disorders, people generally seek help because they feel and show the right emotion but at an inappropriate intensity (e.g., experiencing worry as anxiety), or they may feel the right emotion, but show it in an inappropriate way (e.g., overeating instead of expressing anger), or they may feel and express an inappropriate emotion (e.g., experiencing fear in a safe situation). They also often look for help from mental health professionals when they are experiencing symptoms that at first sight have nothing to do with emotions (e.g., insomnia, chronic fatigue, difficulty across different organ systems, fibromyalgia, somatoform disorder, and conversions). These symptoms are often classified as psychosomatic or medically unexplained; emotion processing is often a significant etiological factor of these symptoms. In this context, it is evident that emotion processing is a key etiological co-factor of many mental and somatic disorders. The way emotions are regulated is an important mediator between feelings and mental and physical health under stress. A general goal of any treatment should thus be to help patients regain control over their emotions. Finding effective ways to do this is one of the major challenges for mental health services.

In recent years, there has been an enormous increase in research evidence indicating that mindfulness-based interventions (MBIs) are very effective in improving mental health in healthy people and in those with various psychiatric or somatic conditions. MBI therapies are increasingly being adopted in education and counseling to support mental health and in clinical practice to treat various psychological disorders. It is evident that MBIs and follow-up programs integrating mindfulness and psychotherapy present ways to change human experience at a fundamental level through the ability to regulate emotions and thoughts. Many psychological disorders have, at their core, emotion dysregulation; MBIs should be a basic method of treatment in mental health care. To face this challenge, it is necessary to understand how mindfulness practice works, what mediates its effect on mental and somatic health and disease, and which concrete mechanisms investigated in Western science, especially in the field of emotion regulation research, can describe and explain mindfulness.

This habilitation thesis aims to integrate the constructs of mindfulness and emotion regulation. The thesis first describes traditional psychological models of emotion regulation, it

operationalizes the mindfulness concept, and it explains how mindfulness practice works and what mediates the positive effects of MBIs. The thesis then explores how emotion regulation processes differ from the mindfulness approach to emotion regulation in terms of the underlying mechanisms they address. Another aim of the thesis is to answer the question of whether the mindfulness approach is a unique emotion regulation strategy or a set of many of strategies that could be called “mindful emotion regulation.”

One part of the thesis is also a presentation of some results of our research group verifying the effectiveness of an eight-week online mindfulness program based on mindfulness-based cognitive therapy (MBCT) for students, teachers, and staff of Masaryk University. The initial results of our research group, describing the relationship between mindfulness and emotion regulation, are also presented.

## Contents

# Introduction

A search for the word “mindfulness” in the abstract, title, or keywords of articles published between 1970 and 2019 in the Scopus and the Web of Science databases shows 12,070 empirical scientific articles. In 1977, only three articles about mindfulness had been published; in 2018 alone, 1,940 articles came out. Just for comparison, the same search for the term “psychotherapy” showed 2,701 articles in 2018. The primary impulse behind the growing number of articles was probably the foundation of a mindfulness-based stress reduction (MBSR) program by Jon Kabat-Zinn at the University of Massachusetts in Boston in 1979. Kabat-Zinn took a Buddhist meditation technique that was 2,500 years old, removed its mysticism, and transplanted it to a university hospital in the United States. He defines mindfulness as an “awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally” (Kabat-Zinn, 1990). The first published article about MBSR described reduced pain and symptoms of negative mood in a group of 51 patients with chronic pain (Kabat-Zinn, 1982).

An important milestone in the development of interest in mindfulness among scientists and clinicians was the foundation of the Mind and Life Institute in 1991. Annual dialogues were held there between the Dalai Lama and scientists and clinicians as well as regular summer research meetings (Nicholas et al., 2017). Over the twenty-eight years since then, mindfulness has become a hugely influential approach in clinical practice in the treatment and prevention of many mental and physical diseases as well as a fundamental approach to supporting mental health and well-being. The UK National Institute for Health and Clinical Excellence recommends mindfulness-based cognitive therapy (MBCT) over other recommended treatments (e.g., antidepressants) for preventing depressive relapse (Crane & Kuyken, 2012, as cited in Van Dam et al., 2018). The impact of mindfulness on the general public was documented in an extensive study by Ella Rhodes (2015) during which mindfulness training was implemented in seventy-six schools in London, involving nearly 6000 students ages eleven to fourteen. Scientific reports on mindfulness have been monitored and promoted by media of all kinds. In February 2014, “Time” magazine even dedicated its front page to the topic with the headline “The Mindful Revolution.” Unfortunately, the effect of mindfulness on various medical conditions/diagnoses is often exaggerated and taken out of context; for this reason, there is a growing misunderstanding among the general public about the potential benefits of mindfulness practices (Van Dam et al., 2018). The interest of the public in mindfulness is

reflected in the increasing number of mindfulness-based mobile apps; a search identified 560 available applications (Mani et al., 2015). Mindfulness represents a new approach to health and disease, but it is still necessary to ask the same questions as for any treatment approach: *For whom is this the best form of treatment? For what kind of suffering? In what period of life? In what life context?* It is essential to be able to answer these questions in order to protect patients and the public from being harmed, cheated, disappointed, or dissatisfied. Answering these questions will help practitioners to find an appropriate position for the mindfulness approach in medicine and psychotherapy. This is the challenge for any mental health expert interested in the mindfulness approach.

To face this challenge, it is necessary to understand how mindfulness practice works, what mediates its effect on mental and somatic health and disease, and which concrete mechanisms investigated in Western science can describe and explain mindfulness. Another critical question is whether the mindfulness technique is a unique approach that enriches clinical practice and provides a completely new component of treatment.

From the literature and a clinical perspective, distinct and interacting mechanisms are at play in producing the benefits of mindfulness training. The common denominator in the background of behavioral and experiential changes induced by mindfulness could be probably called "enhanced self-regulation" or "emotion regulation" more specifically (Hölzel et al., 2011; Tang et al., 2015). It seems that MBSR (Kabat-Zinn, 2013) and follow-up programs integrating mindfulness and psychotherapy (Hayes & Wilson, 1994; Linehan, 1993; Segal, Williams, & Teasdale, 2002) address the alteration of human experience at some fundamental level: the ability to regulate emotions or the ability to regulate the core valuations of the world. (Chambers, Gullone, & Allen, 2009; Aldao, Nolen-Hoeksema, & Schweizer, 2010). In a unique article, Martin (1997) proposed mindfulness as a core psychotherapy process or even as a common factor of psychotherapy. Horowitz (2002) shared a similar opinion. Mulder, Murray, and Rucklidge (2017) wrote a review describing a common factor model for psychotherapy in which mindfulness is implicitly included. Although the hypothesis that mindfulness is a common factor of psychotherapy is very interesting, its verification is beyond the scope of this habilitation thesis because of its complexity and the lack of empirical evidence in the literature.

On the other hand, the hypothesis that mindfulness is a unique emotion regulation strategy or a set of many strategies is testable, and some authors have even reported on "mindful emotion regulation" (Chambers et al., 2009). Moreover, clinical experience and research (e.g., Aldao et

al., 2010) have shown that people most often seek help from psychiatrists, clinical psychologists, and psychotherapists because of emotional dysregulation. In this context, the general goal of any treatment should be to help patients regain control over their emotions. Finding effective ways to do this is one of the major challenges for mental health services. Each psychotherapeutic approach has emotion regulation incorporated implicitly as one of its general goals. A few therapeutic approaches even integrate some form of emotion regulation training explicitly, including dialectical behavioral therapy (DBT; Linehan, 1993), emotion-focused therapy (EFT; Greenberg, 2002), acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999), MBCT (Segal et al., 2002), MBSR (Kabat-Zinn, 1993), and emotion-regulation therapy (ERT; Mennin & Fresco, 2009). MBIs, including MBSR and MBCT, that are used in clinical practice and Buddhist psychology and counseling (de Silva, 2014) have emotion regulation as their core mechanism of effect on positive outcomes such as increasing well-being and decreasing various symptoms of psychopathology (e.g., Goldberg et al., 2018).

The psychological investigation of emotion regulation can be dated back to Josef Breuer and Sigmund Freud (1957) and Anna Freud (1936), who focused on psychological defenses/ego defense mechanism, and to Richard S. Lazarus (1996), who focused on stress and coping. Before the early 1990s, however, there were relatively few papers containing the term "emotion regulation" (Gross, 2014, p. 3). A search for "emotion regulation" using the Scopus and Web of Science databases in the abstract, title, or keywords of articles published between 1970 and 2019 shows 17,239 empirical scientific articles. In 1977, only one article about emotion regulation was published; in 2018 alone, there were 2,222 articles. Emotion regulation research is currently one of the fastest growing areas within the field of psychology (Gross, 2014, p. 3).

The goal of this theoretical thesis is to put mindfulness interventions into the context of emotion regulation theory and to answer these questions:

1) To what extent can mindfulness be described in terms of emotion regulation theory?
2) Through which emotion regulation strategies does mindfulness practice lead to positive outcomes?
3) Is mindfulness a unique emotion regulation strategy that could be called "mindful emotion regulation"?

## Emotion regulation and dysregulation: a key topic for mental health professionals

People most often seek help from mental health professionals because of a form of suffering that could generally be regarded as emotional dysregulation.

Ray et al. (in 2006, as cited in Neacsiu, Bohus, & Linehan, 2014) describe emotion dysregulation as "the inability, even when one's best efforts are applied, to change in a desired way emotional cues, experiences, actions, verbal responses, and/ or nonverbal expressions under normative conditions. Characteristics of emotion dysregulation include an excess of aversive emotional experiences, an inability to regulate intense physiological arousal, problems turning attention away from stimuli, cognitive distortions and failures in information processing, insufficient control of impulsive behaviors related to strong emotions, difficulties organizing and coordinating activities to achieve non-mood-dependent goals when emotionally aroused, and a tendency to 'freeze' or dissociate under very high stress".

Generally, people seek professional help when their emotional reactions are inappropriate in one of three ways (Ekman, 2007). They may feel and show the right emotion but at an inappropriate intensity (e.g., experiencing worry as anxiety); they may feel the right emotion, but show it in an inappropriate way (e.g., overeating instead of expressing anger); or they may experience an altogether inappropriate emotion (e.g., experiencing fear in a safe situation). Many negative emotions are not triggered by real dangers; they are the result of the human capacity for self-awareness and self-relevant thoughts. This capacity predisposes people to have many feelings that are not associated with the process of life regulation but are instead the result of the ability to think self-consciously. Leary and Gohar (2014, p. 377) describe how people's emotions are affected when they 1) compare themselves to their personal standards, 2) think about themselves in the past and future, 3) evaluate their personal characteristics, and 4) think about how they are perceived by other people.

On the other hand, people often seek help from mental health professionals with symptoms that at first sight have nothing to do with emotions (e.g., insomnia, chronic fatigue, difficulty across different organ systems, fibromyalgia, somatoform disorder, conversions, etc.). These symptoms are often classified as psychosomatic or medically unexplained (Brown, 2004). Emotion processing can be a significant etiological factor in these symptoms (e.g., Brown,

2004; Sojka et al., 2018[1]; Bernatova & Svetlak, 2017[2]). For example, Escobar et al. (1998) indicate that 22% of primary care patients meet the criteria for an "abridged somatization" construct. In a systematic review and meta-analysis, Haller et al. (2015) reveal that the percentage of patients complaining of at least one medically unexplained symptom ranged from 40.2% to 49%.

Research and clinical practice repeatedly show that there is no problem with emotions in and of themselves. Rather, the way emotions are regulated is an important mediator between the emotions and mental and physical health (Nyklicek, Vingerhoets, & Zeelenberg, 2011). Many concepts in psychological research, validated in daily clinical practice, explain and describe these mediators and their effect on health and well-being. For example, Freud's ego defense mechanisms represent some mechanism or process defending the self against threatening emotions such as blame, shame, and anxiety (Cramer, 1991; Freud, 1936). Other examples are the concept of alexithymia (Sifneos, 1973), emotional disclosure (Pennebaker & Beall, 1986), repression (Weinberger et al., 1979) and the Type C coping pattern (Temoshok, 1987). These concepts describe mechanisms through which emotions can harm a person's health.

## Clinical and research evidence that emotion regulation strategies mediate the relationship between emotion and psychopathology

Gross (2014) defines emotion regulation as a functional process that influences the intensity, duration, and type of emotion experienced. The concept of emotion regulation is an integral part of the etiological models of psychopathology and mental health (Aldao et al., 2010). Numerous studies have documented that difficulties in emotion regulation represent a key factor in the development and maintenance of psychopathology. Sloan et al. (2017) proposed emotion regulation as a transdiagnostic construct or an underlying mechanism in psychopathology. Studies have repeatedly documented that some emotion regulation strategies and their combinations are associated with various mental diseases and that change at the level

[1] Sojka, P., Bareš, M., Kašpárek, T., & Světlák, M. (2018). Processing of emotion in functional neurological disorder. *Frontiers in Psychiatry, 9*(OCT) doi:10.3389/fpsyt.2018.00479

[2] Bernatova, T., & Svetlak, M. (2017). Emotional and interoceptive awareness and its relationship to restriction in young women with eating disorders and healthy controls: A cascade from emotional to behavioral dysregulation. *Activitas Nervosa Superior, 59*(2), 78-86. doi:10.1007/s41470-017-0006-z

of emotion regulation can be an effective treatment in, for example, patients with borderline personality disorders (e.g., Linehan, 1993).

At the most general level, emotion regulation strategies can be divided into two groups: adaptive and maladaptive (Aldao et al., 2010). Maladaptive strategies are based primarily on their relationship with the etiology and maintenance of clinical disorders. This division is the logical outcome of efforts to describe mental health and disease using models of specific psychopathologies incorporating emotion and emotion regulation/dysregulation. These models include DBT (Linehan, 1993) in borderline personality disorder (BPD), major depressive disorder (e.g., Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008), generalized anxiety disorder (GAD; e.g., Mennin et al., 2007), bipolar disorder (e.g., Johnson, 2005), social anxiety disorder (SAD; e.g., Kashdan & Breen, 2008), eating disorders (e.g., Bydlowski et al., 2005), alcohol-related disorders (e.g., Sher & Grekin, 2007), and substance-related disorders (e.g., Tice, Bratslavsky, & Baumeister, 2001). These models demonstrate that the way the intensity, duration, and meaning of emotions are modulated and modified has an essential effect on the ability to cope with situations/stimuli adaptively or maladaptively.

## The concrete emotion regulation strategies associated with psychopathology

From the extensive research of stress and coping in the 1980s (e.g., Folkman & Lazarus, 1986) and the development of cognitive-behavioral therapy (Beck, 1976), the most studied adaptive emotion strategies were reappraisal and problem-solving; from the 1970s and the development of mindfulness approaches (Kabat-Zinn, 1993), adaptive emotion strategies included acceptance (Aldao et al., 2010).

Reappraisal is the strategy of reinterpreting emotional stimulus. For example, we can imagine that a negative event had a positive outcome. The problem-solving strategy is a conscious attempt to change a stressful situation. Emotions are not regulated directly, but by modifying or eliminating stressors. Acceptance means seeing things as they are in the present moment, non-judgmentally (Kabat-Zinn, 2013).

The most studied maladaptive emotion regulation strategies are suppression, avoidance, and rumination (Aldao et al., 2010; Gross, 2014). Emotions, thoughts, experiences, and behavior can be suppressed. For example, we can act in such a manner that an observer would be unable

to guess how we are feeling (Webb et al., 2012). Avoidance is conceptualized in experience (Hayes et al., 1999) and in the behavioral (Mowrer, 1947) domain. The main function of avoidance is withdrawing from aversive stimuli/situation. Nolen-Hoeksema et al., (2008) define rumination in their "response style" theory as "a mode of responding to aversive situations that involves repetitively and passively focusing on symptoms related to stress and on the possible causes and consequences of these symptoms." Rumination does not lead to active problem solving to change the circumstances surrounding these symptoms. Instead, people who ruminate remain fixated on the problems and their feelings about them without acting. In their review, Gellatly and Beck (2016) document that catastrophization is another maladaptive strategy of emotion regulation that is significantly associated with phobias, panic disorder, health anxiety disorder, obsessive-compulsive disorder, post-traumatic stress disorder, and pain. Catastrophizing can be described as a tendency to explicitly emphasize the terror of an experience.

In their meta-analytic review, Nolen-Hoeksema et al. (2008) documented that maladaptive strategies such as avoidance, suppression, and rumination were positively associated, with medium to large effects, with psychopathology (depression, anxiety, substance abuse, and eating disorders). Conversely, adaptive strategies, such as problem-solving (medium to large effect) and reappraisal (small to medium effect) are repeatedly negatively associated with psychopathology. No association was found between acceptance and psychopathology. These results support the notion that maladaptive strategies are more strongly related to psychopathology than adaptive strategies are. This may indicate that the presence of a maladaptive emotion regulation strategy has a more negative impact on mental health than the absence of particular adaptive strategies (Aldao, Nolen-Hoeksema, & Schweizer, 2010).

In one of our studies (Marsova, 2016; results presented as a diploma thesis), we found that adaptive (cognitive reappraisal) and maladaptive (suppression) emotion regulation strategies mediated the relationship between emotion and prevailing positive/negative emotivity in 330 healthy adolescents. The level of emotional awareness was not found to have any influence on this relationship. Results are summarized in Figure 1.

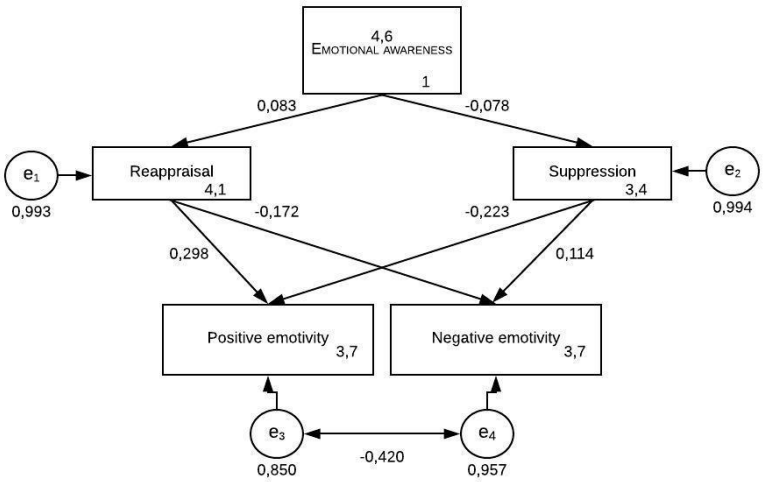


**Figure 1** The path analysis of emotional awareness, emotional regulation strategies, and positive and negative affect

It can be concluded that achieving adaptive emotion regulation is the main goal of education, psychotherapy, and any health promotion program. The emotion regulation process is distinct from the emotion generation process, both conceptually (the latter precedes the former) and neurophysiologically (Ochsner, Silvers, & Buhle, 2012). Emotions are the primary target of emotion regulation. To understand how emotion regulation works, it is necessary to have an idea of how emotions are generated and how these automatic action programs are translated or transformed to various levels of conscious experience in the form of conscious feelings.

# The nature of emotions

## The nature of emotions: from survival circuits to emotions

It is clear that an organism's ability to determine the adaptive significance of stimuli is central to survival. This is the case for both physical and psychological adaptation (Elliot, 2006). The human body is a highly integrated system that consists of multiple subsystems working as an integrated whole to sustain life. An important category of life-sustaining brain functions are the survival circuits involved in defense[3], energy maintenance and nutritional supply, fluid balance, thermoregulation, and reproduction (LeDoux, 2012). Survival circuits have their origins in prehistoric mechanisms that were present in early life forms. These functions can be recognized at a basic level even in single-cell organisms such as bacteria, which has the capacity to retract from harmful chemicals and to accept chemicals that have nutritional value (Macnab & Koshland, 1972). These general functions of life linked to specific brain circuits are highly conserved across vertebrate brain structures and associated behavior in reaction to the internal and external world (Damasio & Carvalho, 2013; LeDoux, 2012). In general, the main function of survival circuits is to maintain homeostasis. On the most general level, the activation of these circuits is manifested as approach or avoidance behavior. Activation of these neural circuits leads to triggering "action programs."

Damasio and Carvalho (2013) define these action programs as a set of innate physiological actions triggered by changes in the internal or external environments and aimed at maintaining or restoring homeostatic balance. The actions include changes in viscera and internal milieu (for example, alterations in heart rate, breathing, and hormonal secretion), striated muscle (for example, facial expressions and running) and cognition (for example, focusing attention and favoring certain ideas and modes of thinking). Action programs include drives and emotions. Drives are aimed at satisfying basic, instinctual physiological needs. Examples of such needs include hunger, thirst, care of progeny, and attachment to mates. Emotions are action programs largely triggered by external stimuli (perceived or recalled). Examples of basics emotions are sadness, anger, surprise, fear, disgust, and joy (Ekman, 2007). On the most general level, emotional responses appear to be organized in terms of a few fundamental dimensions, including valence and arousal (Russell, 2003; Osgood, 1969; Osgood et al., 1975).

[3] This topic was elaborated in detail: Roman, R., Světlák, M., Damborská, A., & Kukleta, M. (2014). Neurophysiology of defence behaviour. [Neurofyziologie obranného chování] *Ceska a Slovenska Psychiatrie, 110*(2), 96-104.

## The nature of feelings: from emotions to feelings

Action programs (emotion and drives) are triggered automatically, without conscious control from the external (perceived via exteroceptive senses) or internal (via interoceptive system) stimuli that are continually monitored in topographical homeostatic maps in the brain. Changes in the internal environment (e.g. heart rate, levels of metabolites, high blood osmolarity, the degree of contraction of visceral muscles) are displayed as neural interoceptive maps. Changes in the external world are monitored as neural maps of the external world (Damasio & Carvalho, 2013). These topographical maps are also in many cases part of the executive neural network triggering corrective homeostatic actions with the aim of correcting homeostatic deflections[4]. Changes in the body state induced via action programs are sensed by the interoceptive system, displayed in sensory maps of the body, and may be experienced consciously as feelings (Damasio, 1999). Damasio says that feelings "provide a subjective experiential window into the processes of life regulation" and "allow a glimpse into ongoing homeostatic regulation, ranging from basic processes such as metabolism to complex social emotions." This process is shown in Figure 2.

[4] Presented in more detail in the chapter "Neural systems involved in generating and monitoring emotions: from homeostatic regulation to conscious feelings"

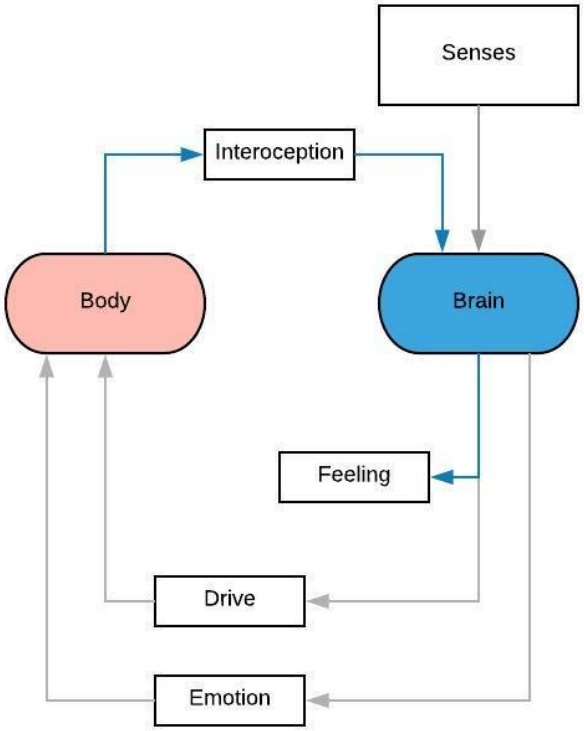


**Figure 2** Drives, emotions, and feelings (Damasio & Carvalho, 2013)

## The core valuation of the world: "good for me" versus "bad for me" state

The subjectively experienced feelings associated with activated action programs (emotions, drives, and implicit homeostatic programs) serve as or are integrated with the motivation state associated with action/behavior. In this context, emotions can be viewed as "push" forces that predispose people to act in a certain way (Frijda, 1987). Each object is valuated according to its feeling tone, which falls into one of three categories: pleasant, unpleasant, or neutral. The approach and avoidance responses represent the fundamental motivational forces that organize the behavior of every living organism on the planet[5]. Even a single-cell amoeba is equipped

[5] Approach and avoidance concepts and constructs have been utilized across a range of scholarly disciplines, theoretical traditions, and empirical content areas. Scholars have made use of the approach-avoidance distinction for well over 2000 years. Elliot (2008) states that it first appeared in the writings of the ancient Greek philosopher Democritus of Abdera (460–370 B.C.E.). Democritus articulated an ethical hedonism in which the immediate pursuit of pleasure and avoidance of pain were prescribed as the guide for human action (pp. 4). William James, in his classic *Principles of Psychology*, describes pleasure and pain as "springs of action," noting that pleasure is a "tremendous reinforcer" of behavior and pain a "tremendous inhibitor" of behavior. Wilhelm Wundt also conceptualized pleasure and pain as unique psychic elements brought into consciousness by sensation, emotion, and cognition. The approach to pleasure and the avoidance of displeasure are basic motivational forces underlying psychodynamic activity in Sigmund Freud's theory. He divided the superego into two parts—the ego ideal,

with at least some basic form of approach-avoidance mechanism that produces or regulates movement toward potentially beneficial stimuli and away from potentially harmful stimuli (Schneirla, 1959). Lewin (1935) described the approach motivation as the energization of behavior by, or the direction of behavior toward, positive stimuli (objects, events, possibilities), whereas the avoidance motivation may be defined as the energization of behavior by, or the direction of behavior away from, negative stimuli (objects, events, possibilities). This process between stimuli and basic "awareness" of the actual state/present moment that triggers behavior is described in Figure 3. Avoidance or approach as a behavior can be triggered automatically without conscious processing or awareness of the core evaluations that trigger the behavior. For example, we can jump away from a snake in the forest and then find out that it was just a tree branch on the ground (automatic avoidance) or we can decide not to go to the forest because of a bad feeling (conscious avoidance). In both cases, the survival circuits were activated. The difference is in the time dynamics and the level of conscious processing of survival circuit activation. For instance, the approach motivation could be activated by stimuli with high valence and medium-level arousal, and the avoidance motivation could be activated by stimuli with negative valence and high arousal[6].

representing what the person should do, and the conscience, representing what the person should not do. Elaboration of this theory of motivation is more explicit in the work of Edward Thorndike. In his "law of effect," he described how responses followed by satisfaction are more likely to appear and responses followed by discomfort are less likely to be presented. Ivan Petrovic Pavlov describes his observation about two types of reflexive responses to stimuli, an orienting response toward the stimulus and a defensive response away from the stimulus. Burrhus Frederic Skinner, in his theory of operant conditioning, distinguished between reinforcers that strengthen responses and punishing stimuli that weaken responses and differentiated positive reinforcement (the provision of a positive) from negative reinforcement (the removal of a negative). Raymond Cattell describes two basic motives: the innate motives of exploration (an appetitive motive) and escape to security (an aversive motive). It is evident from this short historical overview that the approach-avoidance distinction has been elaborated in all the major theories explaining behavior.

[6] We applied this theory in a study that examined children's emotional responses to cigarette text warnings: Světlák, M., Hodoval, R., Damborská, A., Pilát, M., Roman, R., Černík, M., Bob, P. (2013). The emotional impact of the text of cigarette package health warnings on older school age and adolescent children. [Emoční reakce vyvolaná textovými zdravotními varováními na obalech tabákových výrobků u dětí staršího školního věku a adolescentů] *Cesko-Slovenska Pediatrie, 68*(2), 78-91.

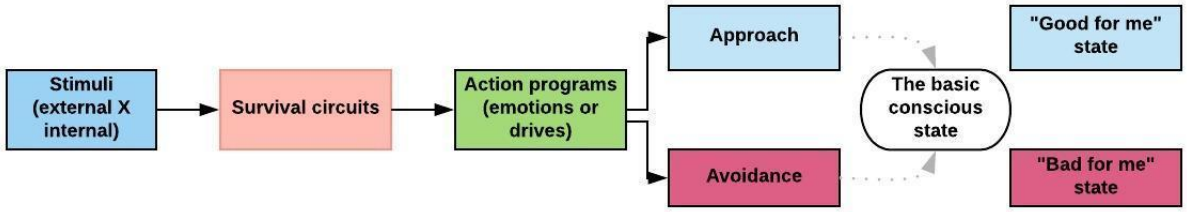


**Figure** 3 The process from stimuli to motivation

## Emotional awareness: the conscious levels of experience

It seems clear that there are always some conscious feelings associated with the processes of life regulation (Damasio, 1999). Emotion is a multifaceted phenomenon and consists of sets of physiological (autonomic, immune, endocrine), motor (movement, facial expression), cognitive, and subjective changes that arise from conscious or nonconscious core valuations depending on stimulus characteristics, context, and the individual's currently active goals (Etkin, Büchel, & Gross, 2015). It is thus possible to be aware of the different levels of this phenomenon. The level of emotional awareness varies interindividually and intraindividually as a function of disposition, individual experience, and learning (Lane & Schwartz, 1987).

Emotional awareness can be defined as the extent to which one can identify and describe one's own emotions (Moon & Berenbaum, 2009). It represents the ability to consciously perceive and be aware of emotional states as well as the ability to match emotional experiences with appropriate semantic categories. Interoception refers to the conscious experiencing of internal bodily changes (Garfinkel et al., 2015). It is clear that conscious feelings originate from the perception of the bodily sensations and their dynamic changes (Damasio, 1999) and that the ability to consciously perceive and be aware of somatic components of affective states is both the basis of an authentic experience of self (Dolhanty & Greenberg, 2007) and necessary for adaptive emotion regulation (Gross, 2014).

Interoceptive sensitivity to the somatic component of emotional signals is a necessary condition for higher cognitive/verbal processing of emotions. It means connecting specific symbolic representations (verbal) with specific classes of somatic states (Damasio, 1999). On the other hand, the inability to become aware of this component and a deficit in its conscious and verbal

processing can intensify and prolong an unwanted emotional state (Subic-Wrana et al., 2010; Ciarrochi, Caputi, & Mayer, 2003).

Lane and Schartz (1987) suggest the cognitive-developmental theory of levels of emotional awareness (LEA). The authors posited five levels of emotional awareness, with each level representing a hierarchical increase in differentiation and integration from the previous level. According to this theory, it is possible to differentiate our experiences: the implicit expression of affective arousal in the form of physical sensations such as heart rate, breathing, and sweating (LEA 1); action tendencies represented in basic motivational states such as avoidance or approach (LEA 2); explicit representation of affective arousal as distinct feeling states such as sadness, happiness, and anger (LEA 3); a blend of feelings at one time, such as happy and sad together (LEA 4); and awareness of different blends of feelings in the self and others (LEA 5). The peripheral physiological arousal/somatic sensations and action tendencies associated with emotion are implicit in the sense that they occur automatically and do not require conscious processing to be executed. If conscious attention is focused only on a somatic sensation or action tendencies, emotion is implicit. To be able to name it as a basic emotion requires processing at higher levels. LEA 3, LEA 4, and LEA 5 are conscious emotional experiences at different levels of complexity; they reflect explicit emotion awareness. The LEA theory puts implicit and explicit processes on the same continuum (Lane, 2008). Individuals may differ in the level of emotional awareness they are capable of at any moment. Each level represents a different component of the emotional experience, and each level is also a potential object of emotion regulation.

Greater emotional awareness is associated with higher self-reported impulse control (Lane, 2000), greater openness to feelings (Lane et al., 1990) and a higher level of well-being (Ciarrochi et al., 2003). In contrast, lower levels of emotional awareness were found in patients with borderline personality disorder (BPD; Levine, 1997), posttraumatic stress disorder (PTSD; e.g., Frewen et al, 2008), obesity, anorexia nervosa and bulimia nervosa (e.g., Bydlowski et al., 2005; Bernatova & Svetlak, 2017), and various psychosomatic diseases (Subic-Wrana, et al., 2005). It seems that emotional awareness is an important ability necessary for adaptive emotion regulation, well-being, and mental and somatic health (Lane, 2008).

In the context of this thesis, it is important to mention that physical and emotional awareness are among the components proposed to describe the mechanisms through which mindfulness

has positive outcomes on health (Alsubaie et al., 2017; Hölzel et al., 2011; López et al., 2018; Tang et al., 2015).

## Neural systems involved in generating and monitoring emotions: from homeostatic regulation to conscious feelings

Many regions in the brain are included in generating drives and emotions. These areas can be found at different levels of the central nervous system. The most frequently mentioned areas that are key in the core evaluations of internal and external stimuli include the amygdalae, the ventral striatum, the ventromedial prefrontal cortex (vmPFC), and the insular cortex (Ochsner et al., 2012).

The amygdalae are responsible for fast and automatic responses to aversive stimuli without conscious control, and they are responsible for the expression of fear. The revolutionary studies by Joseph LeDoux in rodents (reviewed in LeDoux, 2012) and functional imaging and lesion results in human studies (Whalen & Phelps, 2009) show that the amygdalae play a key role in Pavlovian defense conditioning.

The ventral striatum (nucleus accumbens) is involved in learning which cues (ranging from social signals, like smiling faces, to actions, to abstract objects) predict rewarding or reinforcing outcomes (O'Doherty, 2004).

The ventromedial prefrontal cortex (vmPFC) is a key structure for integrating affective valuations of specific stimuli generated by the amygdalae and ventral striatum and inputs from other regions, including the medial temporal lobe memory systems that provide historical context for the stimuli, and also inputs from the brainstem motivational and prefrontal control areas (e.g., dorsolateral prefrontal cortex, dlPFC) that provide information about current behavioral goals (Ochsner et al., 2012; Etkin et al., 2015). The vmPFC has direct reciprocal connections with appraisal systems such as the amygdalae and ventral striatum (Ochsner & Gross, 2005).

The insula, which is a higher order topographic map of the body state via interoceptive input integration (Craig, 2009), has also been implicated in negative affective experience in general. The posterior-anterior functional gradient in the insula, with posterior regions associated with primary representations of sensations from the body and anterior regions associated with

interoceptive awareness of the body and in motivational and affective states, has been described (Critchley et al., 2004). The integration successively includes homeostatic, environmental, hedonic, motivational, social, and cognitive activity to produce a "global emotional moment" that represents the sentient self at one moment in time (Craig, 2009). Duquette (2017) made an exciting attempt to integrate these neuroscientific findings with psychotherapy.

The brainstem structures, such as the nucleus tractus solitarius, area postrema, parabrachial nucleus, ventral tegmental area, other monoamine nuclei, substantia nigra and the red nucleus, periaqueductal gray, the deep layers of the superior colliculus, and the hypothalamus (Damasio & Carvalho, 2013) are also involved in generating corrective homeostatic actions. These interconnected areas generate basic actions that are subsequently monitored via the interoceptive system and topographically mapped in the brainstem and remapped at the higher floors of the central nervous system (Craig, 2002; 2009).

The nucleus tractus solitarius, parabrachial nucleus, periaqueductal gray, and superior colliculus display topographic maps of body states and represents the first order level of monitoring that Damasio (2003) terms the "proto-self". At the level of the cerebral cortex, a few areas are described that play key roles in conscious awareness of what is happening in the body in the present moment (Damasio, 2003; Craig 2002; 2009; Critchley et al., 2004). The insular and somatosensory cortices are topographically organized maps of the body, and thus provide neural substrates of second-order level of monitoring of conscious feelings. The anterior cingulate cortices (ACC) also exhibit a mapped organization (Etkin, Egner, & Kalisch, 2011). However, it is more critical in emotional regulation (Etkin et al., 2015). The dorsal regions of the ACC are involved in monitoring the extent to which current reappraisals are changing emotional responses in the desired direction (Botvinick, Cohen, & Cameron, 2004).

The feelings we perceive from our bodies include temperature, pain, itch, tickle, sensual touch, muscular and visceral sensations, vasomotor flush, hunger, thirst, air hunger, and others related to the body's state. The main parts of interoception are chemosensation, thermo-algic sensation (temperature and pain perception), visceral sensation, and partly proprioception. This information is obtained via the main interoceptive pathways such as vagus nerve and the lamina I spino-thalamo-cortical pathway. The lamina I spino-thalamo-cortical pathway is an afferent way conveying both thermo-algic and chemosensory information from most tissues of the body to the spinal cord and brainstem (trigeminal nucleus). The vagus nerve carries signals from visceral systems (cardiovascular, respiratory, gastrointestinal, and genito-urinary systems) to

the nucleus tractus solitarius in the lower brainstem. Additional structures involved in interoception are the circumventricular organs as specialized structures involved in homeostatic functions, such as energy metabolism and water balance (Damasio & Carvalho, 2013).

Structures including the amygdalae, ventral striatum, ventral pallidum, and other parts of the basal ganglia and basal forebrain sectors are key structures in generating homeostatic actions such as the core evaluation of stimuli salience (ventral striatum) and the triggering of motor, endocrine, and autonomic actions (amygdaloid nuclei). These emotion-generating areas do not appear to represent topographic maps of the body. However, the actions they generate are monitored at many levels of the nervous system (Damasio, 2003; Damasio & Carvalho, 2013).

## Emotion regulation process: from emotions to their regulation

### The conceptual framework of understanding emotion regulation

The process of valuation is at the core of emotions. An action program/emotion is automatically activated whenever we encounter external or internal biologically significant stimuli. From this perspective, an emotion can be described as a perception–valuation–action (PVA) sequence (Figure 4; Ochsner, 2014) in which input from the external or internal world is perceived and valued. The result of core valuation triggers the set of action programs (emotion, drives) that alter the homeostasis (physiological and psychological) in general. The effect of the action is perceived via a feedback loop. For example, air hunger (the urge to breath) motivates awakening from sleep (internal stimuli); fear might motivate avoidance of a dangerous situation; and joy may lead to an individual repeating an action/behavior.

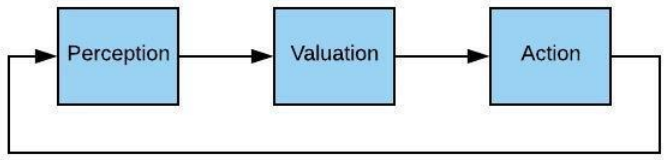


**Figure 4** Perception–valuation–action (PVA) sequence (Figure 1; Ochsner, 2014; Etkin et al., 2015)

The emotion regulation process is started when the action/emotional reaction itself (the action output of an emotional-reactivity PVA sequence) becomes the target of another PVA sequence (Figure 5) or when there is a conflict between different emotional-reactivity PVAs in determining behavior.

Emotion is a multifaceted phenomenon, so the effect of emotion regulation can be seen across all modalities of emotional responses, including behavior, physiology, thoughts, and feelings. Each modality or level of emotional awareness is a potential trigger of emotion regulation. On the most general level, emotional responding appears to be organized in terms of a few fundamental dimensions, including valence, arousal, and approach-avoidance (Russell, 2003; Osgood, 1969; Osgood et al., 1975). The influence of emotion regulation on people's emotional states is therefore likely to be similarly dimensional. In other words, emotion regulation may not be so much concerned with getting people in or out of discrete emotional states like anger, sadness, or joy. Rather, emotion regulation may change people's emotional states along the mentioned dimensions (Koole, 2009).

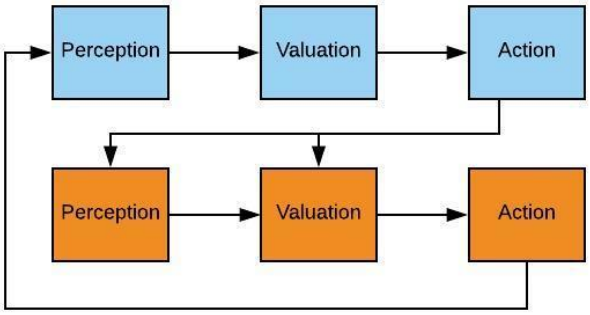


**Figure 5** A valuation perspective on emotional reactivity and regulation (Etkin et al., 2015)

## The process model of emotion regulation

The process model of emotion regulation by Gross (1998) is perhaps the most widely used model to date. The model highlights five points along a temporal dimension at which individuals can regulate their emotions. These five stages represent five families of the emotion generation and regulation process (see Figure 6).

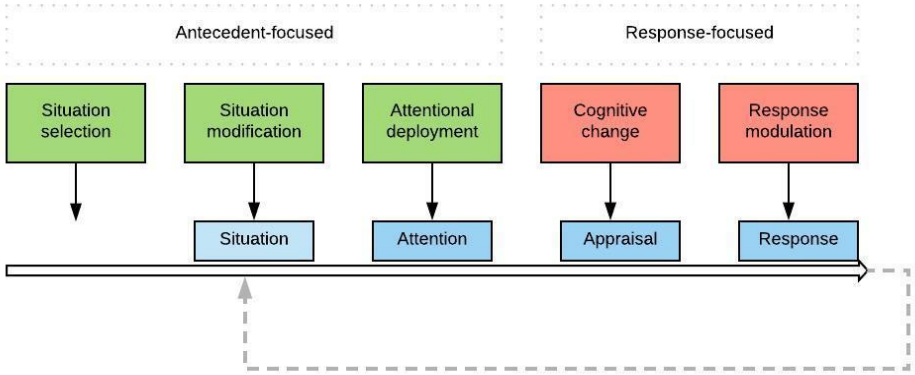


**Figure 6** The process model of emotion regulation (Gross, 1998; 2014)

The movement in the figure from left to right represents the process of emotion regulation in time. The feedback arrow shows that each selected emotion regulation strategy changes the primary stimuli and thus the triggering situation. It is thus possible to change the inner and outer reality by changing its valuation or its modulation. In the context of this thesis, this part of the emotion regulation process is significant for categorizing mindfulness practice. A process model is a tool enabling the analysis of the emotion-generative process beyond emotion regulation.

**Situation selection** is the first step in this process. It reflects the fact that it is possible to choose the situation which is or is not associated with desired emotions. For example, we can call a friend with whom we can have a good time and who always makes us laugh; we can turn off a television program because of an unpleasantly scary plot.

**Situation modification** refers to directly modifying a situation to alter its emotional impact. For instance, while writing an article, we can jump to less demanding parts to avoid frustration or anger. Although such strategies are undoubtedly effective (Davis, Gross, & Ochsner, 2011), they can be difficult to study (Ochsner, 2012).

**Attentional deployment** is the process of directing attention within a given situation to influence emotions (Gross, 2014). One of the most common strategies of this emotion regulation process is distraction. For example, we can focus our attention on something positive that is unrelated to the focal emotion or emotional stimulus (such as inner thoughts and fantasies or something outside the stimulus) in order to distract ourselves. We might distract ourselves from the unpleasantness of removing an adhesive bandage by counting trees out the window or by listening to music or singing silently. The second most commonly studied strategy is selective attention, which involves shifting the focus of attention toward or away from stimuli or their attributes (Ochsner, 2012). For example, smokers do not see the health warnings on the cigarette package. These types of strategies differ from situation selection in that they do not involve physically altering the proximity or relationship to an emotional stimulus, but instead they manipulate attention so as to change the emotional response.

**Cognitive change** refers to the selection of situation meaning. It is possible to choose the meaning of a situation. An example is the central idea of logotherapy: when people are no longer able to change a situation, they are challenged to change themselves (Frankl, 1963). Cognitive change can be applied to an external condition (e.g., "It does not matter that the car is broken, I can go on foot, which is healthy") or to an internal situation (e.g., "Writing this habilitation thesis is a gift and opportunity to study the topic of emotion regulation in depth"). The most commonly studied cognitive change strategy is reappraisal (Ochsner, 2012).

The last group of emotion regulatory processes is **response modulation**. These are attempts to influence emotions after they already have been triggered. Examples include the strategy of using relaxation to relieve anxiety or using alcohol to reduce physiological responses such as cardiac hyperactivity. The most commonly studied strategy in this group is suppression.

At the broadest level, Gross (2014) distinguishes between antecedent- and response-focused emotion regulation strategies. Antecedent-focused strategies represent whatever we do before the emotion response appears and changes our behavior and peripheral physiological response. Such strategies include the first three stages of the process model: situation selection, situation modification, and attentional deployment. An example of an antecedent-focused regulation is not watching the online news to protect ourselves from anxiety. Response-focused strategies refer to processes that are activated when an emotion is already underway. These strategies include cognitive change and response modulation. An example of a response-focused emotion regulation strategy is hiding our anxiety and fear from our children when taking them to the

doctor. The operational definitions of each process as used in different studies are in the systematic review and meta-analysis by Webb et al. (2012), summarized in Table 1. They describe the taxonomy of emotion regulation processes defined in Gross's model, which maps the relationship between emotion regulation processes and specific emotion regulation strategies and strategy subtypes.

**Table 1** A taxonomy for linking emotion regulation processes with specific strategies and strategy subtypes (Webb et al., 2012)

| Process | Strategy | Subtype | Definition |
|---|---|---|---|
| **Attentional deployment** | **Distraction** | Active positive distraction | The instructions explicitly direct participants to think about something positive that is unrelated to the focal emotion or emotional stimulus, in order to distract themselves. |
| | | Passive positive distraction | Participants are provided with emotionally positive materials or a task that is positive and unrelated to the focal emotion or emotional stimulus. |
| | | Active neutral distraction | The instructions explicitly direct participants to think about something neutral that is unrelated to the focal emotion or emotional stimulus, in order to distract themselves |
| | | Passive neutral distraction | Participants are provided with materials or a task that is neutral and unrelated to the focal emotion or emotional stimulus. |
| | **Concentration** | Concentrate on feelings | The instructions direct participants to attend to, focus on, make judgments about, or relive their emotional experience. |
| | | Concentrate on causes and implications | The instructions direct participants to think about the causes, meanings, or consequences of or the reasons for their feelings. |
| | | Concentrate–mixed | The instructions direct participants to concentrate on feelings, causes, and implications. |
| **Cognitive change** | **Reappraisal** | Reappraise emotional response | Participants are instructed to interpret the focal emotion in a particular manner. For example, participants may be told that the emotion is normal or that they should accept or not judge the emotion. |
| | | Reappraise emotional stimulus | Participants are instructed to reinterpret the emotional stimulus (the context or the cause of the emotion). For example, participants might be asked to imagine that a negative event had a positive outcome. |
| | | Reappraise via perspective taking | The instructions ask participants to alter the impact of the emotional stimulus by adopting a more or a less objective perspective. For example, participants may be asked to imagine themselves in the situation depicted or may be asked to be objective or to view the stimulus as detached observers. |
| | | Reappraisal–mixed | The instructions are framed such that the strategy could involve reappraising the emotional response and/or reappraising the emotional stimulus and/or reappraisal via perspective taking. |
| **Response modulation** | **Suppression** | Suppress the expression of emotion | Participants are instructed to hide the way that they are feeling (e.g., not to smile) and are told to act in such a manner that an observer could not guess how they are feeling. |
| | | Suppress the experience of emotion | Participants are instructed to control their emotional experience. Participants are told to control or not allow themselves to experience the focal emotion. |
| | | Suppress thoughts of the event eliciting emotion | Participants are instructed to control thoughts of or not allow themselves to think about the emotion-eliciting event. |
| | | Suppression–mixed | Participants are instructed both to hide the focal emotion and to control or not allow themselves to experience that emotion. |

## Nonconscious regulation of emotion

There are many intentional, conscious forms of emotion regulation. Significant evidence from clinical practice and empirical studies show that emotion regulation and self-regulation have nonconscious/implicit/automatic forms that operate independently of conscious control (see review in Bargh & Williams, 2007). Gyurak and Etkin (2014) conceptualize emotion regulation as occurring along a spectrum, from conscious, effortful, and controlled regulation (which they call *explicit*) to unconscious, possibly effortless, and automatic regulations (*implicit*). Bargh and Williams (2007) defined nonconscious emotion regulation "as the unintentional, automatic, and relatively effortless control of one's exposure to, processing of, and response to emotionally evocative events." The implicit emotion regulation mode is essential for the understanding of mindful emotion regulation, especially after long-term training.

In their dual process model of emotion regulation, Gyurak, Gross and Etkin, (2011) report various implicit emotion regulation strategies, such as the regulation of emotional conflict and congruency effect, anticipatory response to emotional stimuli, and error-related regulation. For the purposes of this thesis, the most important are extinction and habituation regulation and the influence of goals, values, beliefs, and attitudes on emotion regulation.

### Extinction and habituation

Extinction and habituation are basic forms of learning also shared with invertebrate animals. These strategies are crucial for adaptive responses to emotional challenges. These processes are blended with implicit and explicit emotion regulation processes (e.g., Olsson & Phelps, 2007). Extinction involves the repeated presentation of a conditioned stimulus (CS), previously associated with aversive stimuli (unconditioned stimuli, UC) and able to trigger defensive behavior, in the absence of the aversive stimuli. Through repeated presentation without an aversive outcome, a new inhibitory memory is formed between the harmless stimulus and absence of an aversive outcome, such that the conditioned defensive reaction is no longer elicited. Extinction can happen without conscious awareness. However, consciously registering the extinction process facilitates extinction (Lovibond, 2004). It is very important for psychotherapy processes. One element is the patient's experience of a safe relationship with the psychotherapist and the second element is the verbal reflection of it. Conscious framing can then facilitate the process of fear extinction in exposition to significant others.

The neural circuits supporting extinction include the ventral anterior cingulate cortex (vACC) and the amygdalae. Specifically, the vACC and vmPFC reduce fear responses through interconnection with the amygdalae and hippocampus during extinction learning and recall of extinction memories (reviewed by Gyurak & Etkin, 2014). The vACC is a neural correlate of the regulation of emotional conflict (Egner et al., 2008). More successful extinction is associated with activation of the dorsal anterior cingulate cortex (dACC) (Milad et al., 2009).

Habituation is an adaptive reduction of the initial response to biologically significant stimuli that is no longer associated with reward or punishment. The activity of the amygdalae decrease as participants are exposed repeatedly to the new stimuli (e.g., Hare et al., 2008). The vmPFC and vACC also play important roles in habituation (Heilbronner & Hayden, 2016). During the habituation process, the activation of the vmPFC and vACC is negatively correlated with amygdala activity (Hare et al., 2008). Extinction and habituation are processes that are impaired in people with PTSD and GAD. The decreased activity of vmPFC and vACC and increased amygdala activity at the same time has been repeatedly documented in people with emotion dysregulation (Ochsner, 2012).

## The influence of goals, values, beliefs, and attitudes on emotion regulation

The primary function of attitudes is to provide a rapid assessment of objects in the environment to facilitate appropriate behavior in a timely fashion (Jones, Kirkland, & Cunningham, 2014). Attitudes, goals, and beliefs can be implicit and they can be activated automatically. Fazio et al. (1986), in the context of the findings of numerous experiments indicating that lexical decisions for concepts associated with the prime were facilitated by exposure to the prime (e.g., Schneider & Shiffrin, 1977), showed that that a similar priming effect is apparent for attitudes. Studies from this area have concluded that attitudes, goals, and beliefs automatically influence what is perceived, how it is interpreted, and how it is evaluated (reviewed by Fazio, 2001).

For example, Tamir et al. (2007) documented that the habitual use of emotion regulation is related to an individual's implicit theories about emotions. Mindfulness is also an implicit theory about emotions in some respects. Some people view emotions as static and unchangeable (entity theorists), and some as more transient and thus ''regulate-able'' (incremental theorists). In their longitudinal study, Tamir et al. (2007) found that the beliefs of entity theorists were related to lower emotion regulation, self-efficacy perceptions, and less use of cognitive

reappraisal. These results indirectly support the notion that education alone can have an effect on emotion regulation. It also indirectly supports the hypothesis that awareness of emotions as transient events in the stream of experience is a more adaptive strategy.

## Explicit – implicit emotion regulation continuum

Frequent use of an explicit strategy can quickly render the initiation of the strategy more implicit during regulation, thus making it more implicit over time (Gyurak et al., 2011). In terms of reinforcement learning, experience with concrete emotion regulation strategies influences how the emotions will be regulated. Reinforcement learning has an essential role in developing ego-defense mechanisms (McWilliams, 2011, p. 113), which are excellent representations of implicit emotion regulation strategies. Several recent studies show that the habitual use of reappraisal strategies for emotion regulation is an effective mediator between emotions and positive psychosocial outcomes (Gross & John, 2003; Magar, Phillips, & Hosie, 2008; Richards & Gross, 2000). Williams et al. (2009) documented that nonconscious reappraisal priming helps those who do not spontaneously use reappraisal strategies in their emotion regulation attempts to a greater extent than explicit instructions to reappraise would. Mauss et al. (2007) revealed that people who habitually reappraise their emotions respond more adaptively to an emotional stimulus than those who use reappraisal strategies less frequently. Concretely, low reappraisers report experiencing more anger and negative emotions and have a worse cardiac output profile than those who use reappraisal more during situations triggering anger. These studies have documented that emotion regulatory goals, attitudes, values, and beliefs are effective and important forms of implicit emotion regulation (Gyurak et al., 2011).

Implicit emotion regulation strategies that were explicit initially are accessible to conscious processing. The paths to awareness of these strategies can be mediated through psychotherapy and mindfulness practice as well. Awareness depends on the level of automaticity and the meaning and the power of the preceding emotion to which the strategy is a response (this is especially true with ego defense mechanisms). Implicit strategies such as ego defense mechanisms, habituation, and extinction can sometimes prevent such strong and threatening emotions that awareness of the background of this regulation is almost impossible without the support of psychotherapy. In this context, psychotherapy and mindfulness are complementary to one another, and one follows the other. To be successful in psychotherapy, it is necessary to learn some basic aspects of mindfulness (Martin, 1997). To overcome some aversive states that

often appear during mindfulness practice, support from psychotherapy is needed, especially with unintegrated traumatic experiences (Epstein, 1995).

The valuations of emotional reactions may be inherent or learned through experience and they may be driven by contextual factors or individual goals. People's primary emotional responses presumably reflect their emotional sensitivity, whereas their secondary emotional responses presumably reflect emotion regulation (Koole, 2009). Emotional sensitivity is influenced by any variable that influences a person's initial emotional response to a situation, including temperament, stimuli characteristics, the context of the situation, and individual experience (Koole, 2009). For example, it is evident that caregivers may play a key role in learning and regulating children's emotional states[7] (Fonagy et al., 2002), and it has also been shown that natural environments can promote recovery from stress more rapidly than urban environments (Van den Berg, Hartig, & Staats, 2007). The action output of the emotion-regulation PVA sequence is the process of emotion regulation itself, which may be carried out consciously or nonconsciously and may potentially target any component of the emotional-reactivity PVA sequence (Etkin et al., 2015).

## Neural systems involved in emotion regulation

Neuro-imaging studies focusing on the neural basis of emotion regulation strategies might provide particular insights into the understanding of mindfulness as a specific emotion regulation strategy. The understanding of which brain areas are activated or deactivated when people regulate their emotions can help understand the effects of mindfulness practice. It also can help clarify whether mindfulness could be described as a top-down or bottom-up emotion regulation strategy.

In general, the neural basis of emotion regulation is found in interactions between a regulation network, involving the prefrontal, parietal, and cingulate systems that implement control and inhibition processes and regulated subcortical systems such as the amygdalae or the ventral striatum that are involved in emotion generation and affective appraisal. More precisely, the ventromedial prefrontal cortex (vmPFC), dorsomedial prefrontal cortex (dmPFC), dorsolateral

[7] This topic was elaborated in detail: Světlák, M., Roman, R., Obereignerů, R., Damborská, A. (2014). How do you feel " here and now"? Neural correlates of emotional awareness [Jak se cítíte „teď a tady"? Neuronální pozadí emočního uvědomění]. *Psychoterapie*, 2, 132-141.

prefrontal cortex (dlPFC), ventrolateral prefrontal cortex (vlPFC), inferior parietal cortex (IPC), and the anterior cingulate cortex (ACC) are considered to be the neural background underlying emotion control (Etkin et al., 2015; Dörfel et al., 2014; Ochsner et al., 2012). It has been repeatedly verified that the dlPFC plays a crucial role in all regulation strategies because of its importance in executive processes, especially for the manipulation of stimuli in working memory (e.g., Dörfel et al., 2014). The differences in neural activation within different emotion regulation strategies are presented in Table 2. Strategies associated with increased activity in the prefrontal brain regions and their inhibitory influence on emotion-generative brain regions, such as the amygdalae, are classified as top-down regulations (Ochsner, 2012). Strategies that are characterized by direct reduced reactivity of the "lower" emotion-generative brain regions without cognitively reappraised stimuli and without the active recruitment of "higher" brain regions, such as the PFC (Chiesa, Serretti, & Jakobsen, 2013) are called bottom-up strategies. The critical question is whether top-down emotion regulation strategies are always the most appropriate, and whether there are other effective forms of emotion regulation that are not based on top-down mechanisms.

In their valuable review, Etkin et al. (2015) propose distinguishing between model-free and model-based emotion regulation. This conceptual distinction allows the integration of neuroscientific findings and different modes of regulating emotions. The distinction between these two modes of emotion regulation is conceptually essential for explaining the running process between effortful and automatic emotion regulation. This conceptual distinction also makes it possible to understand what happens during the process of learning and why different neural correlates are found in various practice stages in mindfulness meditation.

**Model-free emotion regulation** is primarily based on prediction error feedback. The best example of this model is fear conditioning and emotional conflict regulation. Through learning in the form of classical and operational conditioning, an implicit emotion regulation model is reached that helps get from a "bad for me" state to a "good for me" state. At the neural level, fear-conditioned stimulus activates regions such as the amygdalae, insula, dorsal dACC, and PAG (LeDoux, 2012).

Fear extinction is a different process, involving activating the vACC–vmPFC during fear-conditioned stimuli without the occurrence of aversive unconditioned stimuli (e.g., Etkin et al., 2011). Many studies have documented that vACC–vmPFC activation is a general neural correlate of fear extinction when fear is inhibited (Lissek et al., 2014). In other words, this is

the neural correlate for putting an individual into a more "good for me" state. Concrete emotion regulation strategies such as attentional deployment or ego defense mechanisms such as denial are automatically used to get to a "good for me" state.

**Model-based emotion regulation** is associated with an internal model with the aim of guiding experience and behavior. It can be categorized as an explicit emotion regulation. In fact, an internal model is referenced in all forms of explicit emotion regulation, even though the specific strategies may differ (e.g., suppression, reappraisal, and situation selection). For example, it is possible to use reappraisal to decrease negative emotions by seeking various meanings of stimulus (such as someone's tears reflecting joy rather than sadness). Unlike the model-free regulation, frontoparietal regions such as the vlPFC, dlPFC, PC, pre-SMA, and SMA are recruited (Buhle et al., 2013). An intact working memory capacity is required to construct and/or make use of internal models. This is probably one reason that children with ADHD are unable to behave according to their teacher's verbal recommendations. Schmeichel, Volokhov, and Demaree (2008) described a negative relation between reappraisal ability and working memory capacity. Qin et al. (2009) showed that acute stress impairs working memory and decreases dlPFC activity, consequently disrupting the ability to reappraise and reduce autonomic system responses (ANSr) to aversive stimuli. Figure 7 shows the main differences in emotion regulation neural backgrounds. The emotion generative structures such as the amygdalae are primarily inhibited with vACC and vmPFC in model-free regulation. This is the most observed neural correlate of extinction, habituation, emotional conflict adaptation, and anticipatory response to emotional stimuli (Gyurak & Etkin, 2014). On the other hand, emotion generative structures are more inhibited with the lateral prefrontal cortex in model-based regulation. This is the most observed neural correlate of cognitive reappraisal and verbal labeling (Gyurak & Etkin, 2014).

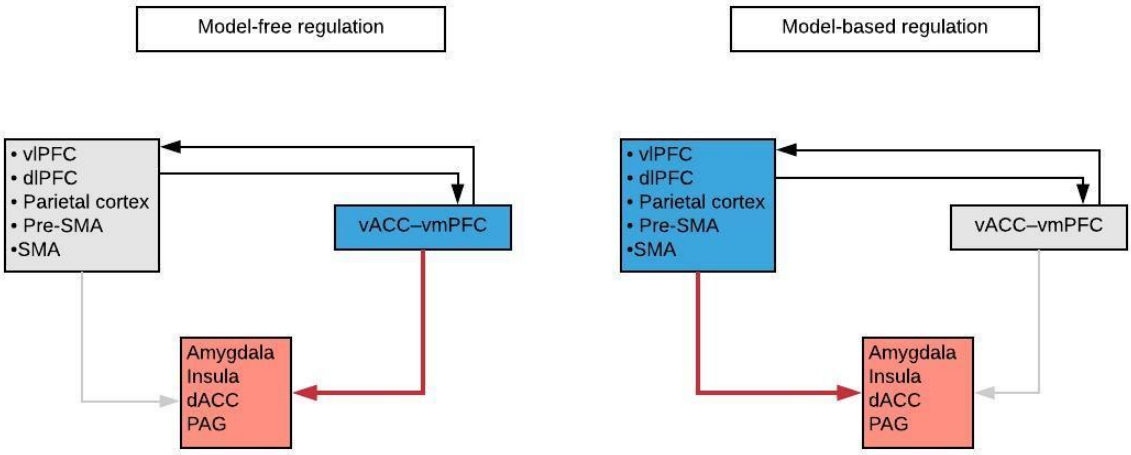


**Figure 7** Schematic of model-based and model-free emotion regulation (Etkin et al., 2015)

**Table 2** The associations between neural structures and concrete emotion regulation strategies

| Strategy | Explicit | Study |
|---|---|---|
| Cognitive Reappraisal | Activation: dmPFC, dlPFC, vlPFC, and posterior parietal lobe | Buhle et al., 2014; Ochsner & Gross, 2005 |
| Distraction | Activation: ACC, vlPFC, PC, Left IPC<br>Deactivation: left and right amygdala | Dörfel et al., 2014; McRae et al., 2010 |
| Reinterpretation | Activation: left dlPFC, left vlPFC, OFC<br>Deactivation: left and right amygdala, reductions in insula activation | Ochsner et al., 2012; Dörfel et al., 2014; Buhle et al., 2013 |
| Detachment | Activation: right dlPFC, bilateral IPC, dACC, dorsal and anterior portions of the mPFC, right superior frontal cortex, right angular gyrus | Ochsner et al., 2012; Dörfel et al., 2014 |
| Expressive Suppression | Activation: bilateral dmPFC, right dlPFC, left vlPFC, SMA, Pre-SMA | Phillips et al. 2008 |
| Reinterpretation to Expressive Suppression | Superior frontal gyrus and the posterior part of the middle frontal gyrus was more strongly activated by Reinterpretation as compared to Expressive Suppression. The superior frontal sulcus and the supplementary motor area (SMA) were more active during Expressive Suppression than during Reinterpretation. | Vrticka et al., 2011 |
| Detachment to Expressive Suppression | Expressive Suppression produced late vmPFC, dlPFC, and ACC responses, decreased negative emotion behavior and experience, but increased amygdala and insular responses. Detachment produced enhanced (early) responses in dPFC, amPFC, vlPFC, and OFC. | Goldin et al., 2008 |
| Reappraisal to Distraction | Reappraisal produced activation of OFC as compared to Distraction. Both strategies were successful in reducing subjective emotional state and lowered activity in the bilateral amygdalae. | Kanske et al., 2011 |
| Reinterpretation to Distraction | Both strategies resulted in decreased activation in the amygdala. Distraction relative to Reinterpretation led to greater increases in dmPFC, bilateral dlPFC, and vlPFC and several left-sided clusters in temporal cortex. Distraction relative to Reinterpretation led to greater decreases in amygdala activation and to greater increases in activation in posterior frontal cortex, right lateral PFC, and bilateral superior parietal cortex. Reinterpretation specifically activated left vlPFC, while Distraction uniquely activated left dlPFC. All regulation strategies inhibited amygdala activity. | McRae et al. 2010 |
| Reinterpretation to Detachment | Detachment let to stronger activation in right vmPFC and IPC. Reinterpretation showed greater activation in left and right lateral PFC including dlPFC and vlPFC, but also in precentral gyrus, temporal gyrus and supramarginal gyrus. Both strategies showed reduced activation in left posterior insula and left amygdala. | Ochsner et al., 2004 |

*Notes*: ACC – anterior cingulate cortex; amPFC – anterior medial prefrontal cortex; dACC – dosal anterior cingulate; dmPFC – dorsomedial prefrontal cortex; IPC – inferior parietal cortex; mPFC – medial prefrontal cortex; OFC – orbitofrontal cortex; PC – parietal cortex; dPFC – dorsal prefrontal cortex; dlPFC – dorsolateral prefrontal cortex; vlPFC – ventrolateral prefrontal cortex; SMA - supplemental motor area; pre-SMA – pre-supplemental motor area.

# Definition and classification of emotion regulation strategies

## Definition of emotion regulation

From the clinical and daily life perspective, it is possible to define emotion regulation at the lowest level with examples: *I look for the positive side of things*; *I tell myself that there are worse things in life*; *I wore my lucky socks the day of the exam*; *I read everything I could find about it*, and *I had a nice hot bath*. People use countless such real-time responses to deal with conditions in the external or internal world that induce emotion, stress, or stress-related emotions. The potential variety of emotion-regulation strategies is enormous, given that any activity that affects people's emotions may be considered as an emotion regulation (Koole, 2009). Regardless of how often people are exposed to emotional stimuli, they usually resist being carried away by the actual immediate emotional influence of the event. During emotion regulation, people may increase, maintain, or decrease positive and negative emotions (Koole, 2009). The general aim of emotion regulation could be defined as the effort people make to get closer to the emotional state that they want. Actions in reaction to emotions should lead to the achievement of a more "good for me" state or a less "bad for me" state (Etkin et al., 2015).

Emotion regulation is defined as the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goal (Thompson, 1994). Gross (2014) defines emotion regulation as a functional process that influences the intensity, duration, and type of emotion experienced. Gyurak and Etkin (2014) conceptualize emotion regulation as occurring along a spectrum from conscious, effortful, and controlled regulation (which they called *explicit*) to unconscious, and possibly effortless, or automatic regulation (*implicit*). In its broadest sense, emotion regulation subsumes the regulation of all states that are emotionally charged, including moods, stress, and positive or negative affect.

The mentioned studies dealing with the association between regulation strategies and psychopathology are limited to a few well-defined strategies. In contrast, clinical experience shows an endless wealth of possible ways by which people regulate their emotions. To make the topic easier, it is possible to ask three basic questions:

1) **How** are emotions regulated? The answer is concrete emotion processing and behavior (classification);

2) **Why** are emotions regulated? The answer is the goal of the process (personal needs, goals, experience); and
3) **What** is regulated? The answer is every component of emotion (physiology and cognition).

The "how" question also has other aspects, such as the time dynamic of the emotion regulation. The question was framed with the PVA sequence and process model above.

### *Classification of emotion regulation: How emotions are regulated*

Many different classifications of emotion regulation strategies have been proposed. The potential number of emotion regulation strategies is huge, and many classifications are just phenomenological, without an explanation of the underlying process (Koole, 2009). To be able to classify mindfulness intervention as an emotion regulation strategy, these classifications need to be described and defined.

One of the most cited and actually one of the first studies to deal with the classification of emotion strategies focused on strategies for changing a bad mood (Thayer, Newman, & McClain, 1994). It described 32 categories for methods of changing a bad mood. Using exploratory factor analysis, it identified six general factors describing typical ways to try to change a bad mood: **active mood management** (e.g., relaxation techniques, stress management, sex, humor, and exercise), **seeking pleasurable activities and distraction** (e.g., humor, engaging in a hobby, listening to music, avoiding thing or people, and controlling thoughts), **passive mood management** (e.g., television, coffee, and eating), **social support, ventilation, and gratification** (e.g., talking to someone, engaging in emotional activity – crying, screaming), **direct tension reduction** (e.g., drugs, alcohol, sex), and **withdrawal-avoidance** (e.g., trying to be alone, avoiding things or people). They also identified three general groups/factor of strategies/activities employed for short-term energy enhancement: **activity: physical, social, cognitive** (e.g., going outside, exercising, or doing something to keep busy), **reduced activity and rest** (e.g., taking a shower, sleeping, or watching television), **caffeine, food, and passive stimulation** (e.g., drinking coffee, eating something, or smoking) and three general factors describing strategies used to reduce nervousness, tension, or anxiety: **emotional expression, food, and drugs** (e.g., alcohol, cigarettes, drugs, or music), **muscle release, cognitive control, and stress management** (e.g., relaxation techniques, taking a

shower, or stress management) and **pleasant distraction** (e.g., shopping, engaging in a hobby, sex, reading or writing, or exercise). The authors concluded that exercise was the most effective mood-regulating behavior, and that one of the best general strategies for changing a bad mood is a combination of relaxation, stress management, cognitive activity, and exercise techniques (Thayer, Newman, & McClain, 1994).

Parkinson and Totterdell's (1999) taxonomy classified different affect regulation strategies. This taxonomy was developed by asking participants to sort 162 relatively distinct affect regulation strategies into meaningful categories. The primary distinction emerging from this analysis was between cognitive and behavioral strategies (i.e., between strategies involving thought and those involving physical action), between diversion and engagement strategies, and between active distraction and direct avoidance, and for specific lower-level groupings of strategies relating to venting, reappraisal, and seeking social support. The results are summarized in Table 3. These two classifications are based on factor analysis (the first one) and rational sorting (the second one), which involves grouping items that share common features and separating items that differ.

The constructs of coping theory and coping strategies are closely related to emotion regulation (Lazarus, 1996). Coping can be defined as an individual's cognitive and behavioral efforts to manage stress (Lazarus & Folkman, 1984). In the context of survival circuits and the process of core evaluation, the experience of stress is mediated through the experience of an aversive affect triggered and perpetuated with an event (any perceived object). The key antecedent of psychobiological stress response is the appraisal of what the stressful event is and what it is not. The physiological stress response changes into chronic stress through the using of maladaptive coping and emotion regulation strategies (Ayers & de Visser, 2011, p. 55). A very valuable review by Skinner et al. (2003) found 400 concrete coping strategies and proposed several concepts that are potentially useful for emotion regulation categorization. The authors sorted the strategies into fourteen higher order coping categories. In addition to problem-focused strategies, their classifications included categories of emotion regulation (e.g., emotion-focused coping, avoidance, appraisal, and proactive coping). The results of this review are summarized in Table 4.

**Table 3** Classification of affect regulation strategies (Parkinson & Totterdell, 1999).

| | | | **Cognitive** | **Behavioral** |
|---|---|---|---|---|
| **Diversion** | | | | |
| | **Disengagement** | | Avoid thinking about the problem | Avoid problematic situations |
| | **Distraction** | Seek pleasure or relaxation | Think about something pleasant | Do something pleasant |
| | | | Think relaxing thoughts | Do something relaxing |
| | | Reallocate resources | Think about something that occupies attention | Perform a demanding activity |
| **Engagement** | | | Reappraise (usually affect-directed) | Vent feelings (usually affect-directed |
| | | | | Seek help or comfort from others |
| | | | Think about how to solve the problem (usually situation-directed) | Take action to solve the problem (usually situation-directed) |

**Table 4** Higher-order coping categories (Skinner et al., 2003).

| **Category** | **Definition** |
|---|---|
| Emotion-focused coping vs. problem-focused coping | "Coping that is aimed at managing or altering the problem causing the distress" vs. "coping that is directed at regulating emotional responses to the problem" |
| Problem-focused coping vs. emotion-focused coping vs. appraisal-focused coping | "Dealing with the reality of the situation seeks to modify or eliminate the source of the stress" vs. "handling emotions aroused by a situation response whose primary function is to manage the emotions aroused by stressors and thereby maintain affective equilibrium" vs. "primary focus on appraising and reappraising a situation . . . involves attempts to define the meaning of a situation" |
| Responses that modify the situation vs. responses that function to control the meaning of the problem vs. responses that function for the management of stress | "Responses that change the situation out of which the strainful experience arises" vs. "responses that control the meaning of the strainful experience after it occurs but before the emergence of stress" vs. "responses that function more for the control of the stress itself after it has emerged" |
| Approach vs. avoidance | "Cognitive and emotional activity that is oriented either toward or away from threat" |
| Engagement vs. disengagement | "Responses that are oriented toward either the source of stress, or toward one's emotions and thoughts" vs. "responses that are oriented away from the stressor or one's emotions/thoughts" |
| Control vs. escape | "Proactive take-charge approach" vs. "staying clear of the person or situation or trying not to get concerned about it" |
| Primary vs. secondary vs. relinquishment of control coping | "Efforts to influence objective events or conditions vs. efforts to maximize one's fit with the current situation vs. relinquishment of control" |
| Assimilation (vs. helplessness)<br>Accommodation (vs. rigid perseverance) | "Transforming developmental circumstances in accordance with personal preferences" and "Adjusting personal preferences to situational constraints" |
| Alloplastic vs. autoplastic coping | "Coping directed toward changing the environment vs. directed toward changing the Self " |
| Volitional, effortful, controlled vs. involuntary, automatic coping | Responses to stress that involve volition and conscious effort by the individual vs. responses that are automatized and not under conscious control |
| Behavioral vs. cognitive coping | "Taking action or doing something" vs. "mental strategies and self-talk" |
| Social vs. solitary coping | "Utilize methods that involve other people" vs. methods that can "be done alone" |
| Proactive coping | "Efforts undertaken in advance of a potentially stressful event to prevent it or modify its form before it occurs" |
| Direct vs. indirect coping | "Coping in which an individual emits an overt motor behavior to deal with a stressful event" vs. coping in which "the organism responds to the stressful event by enlisting the aid of a conspecific" |

### *Classification of emotion regulation: What is regulated and Why*

Emotion regulation can be described from the perspective of what people usually do with their emotion when they regulate it (classification) and in which time manner (process model, Gross, 1998; PVA model, Etkin et al., 2015). Koole (2009) offers the classification of emotion-regulation strategies in terms of their targets and functions. This approach allows the organization of research findings on emotion regulation strategies in a meaningful whole and also provides a framework for the integration of psychological concepts such as coping and ego defense mechanisms.

### *Why are emotions regulated? Needs, goals, and values*

The question "why" is answered by the functions of emotion regulation. The functions of emotion regulation are a fundamental category for characterizing different emotion strategies, a category that is independent of which emotion-generating system outcome is targeted (Koole, 2009).

#### Need-oriented regulation

The first motivational force behind emotion regulation is hedonic needs that are aimed at promoting pleasure and preventing pain. Approach and avoidance are the fundamental motivational forces that organize the behavior of every living organism on the planet. Lewin (1935) described approach motivation as the energization of behavior by, or the direction of behavior toward, positive stimuli (objects, events, possibilities), whereas avoidance motivation may be defined as the energization of behavior by, or the direction of behavior away from, negative stimuli (objects, events, possibilities). The core valuation of incoming stimuli operates automatically on subcognitive and subcortical information processing (e.g., LeDoux, 1999; Panksepp, 1999). This kind of emotion regulation often has an impulsive quality, and it is short-term oriented (Tice et al., 2001). In this mode of regulation, we maximize short-term emotional benefits at the expense of long-term well-being. For instance, in their three experiments, Tice, et al. (2001) found that participants regulated their emotions under emotional distress by eating a fattening snack, seeking immediate gratification, and engaging in procrastination. Such impulsive self-regulation disruptions are usually inconsistent with long-term goals. Dysregulated behavior, such as binge-eating or non-suicidal self-injury, often occurs during

times of emotional distress and it is thus very probably in some cases a means of emotion regulation driven by need (Selby, Anestis, & Joiner, 2008).

On an attentional level, need-oriented emotional regulation is evident in subjects with repressive coping. When these subjects are faced with threatening information, they tend to shift attention to the positive aspects of the situation (Langens & Morth, 2003) to avoid unpleasurable feelings. Repressors also have a lower level of emotional awareness and lower introspective ability (Lane et al., 2000). Ego defense mechanisms are another example of need-oriented emotion regulation. Negative affects, such as shame, guilt, and anxiety, can be activated when an internal or external event violates the preferred view of the self. In such cases, it is necessary for the self to have some mechanism or process to defend itself against the threatening implications of this event (e.g., Baumeister, Dale, & Sommer, 1998). Denial is a simple example of this process. Denial is the simple refusal to face certain facts. If these facts are highly upsetting or represent potential damage to self-esteem, denial can be, in principle, a very useful defense mechanism (Baumeister et al., 1998). It is fast, automatic, and without conscious control. The distinction between denial and repression, as with repressive coping, is sometimes unclear and difficult to distinguish in a meaningful way (Cramer, 1998). The need-oriented function of emotional regulation has model-free emotion regulation in its background.

Although hedonic needs are important, they cannot explain the full range of emotion-regulation processes. For instance, social interactions often require people to remain "cool and collected," and hence may lead people to down-regulate both negative and positive moods (Erber & Erber, 2000).

### Goal-oriented emotion regulation

The second function of emotion regulation is goal oriented. A single verbally reportable goal or attitude directs this emotional regulation in combination with beliefs about the benefit of particular emotional states. Goals generally represent a top-down strategy of emotion regulation. Achieving the goals is mediated by attention (Posner & Rothbart, 2007). In this context, attention is a primary target for goal-oriented emotion regulation strategies. It is an example of model-based strategies. The ability to use distracting stimuli is a key factor in the goal-oriented regulation of attention. An example of this in everyday life is telling sad people to stop thinking about sad things. Recent studies show that concrete distractors (e.g., "Think

about a red Ferrari") are more effective than simple neutral instructions (e.g., "Do not think about it") and even more effective than thought suppression (Wegner et al., 1993; Wegner, 1994; Wegner & Gold, 1995). For instance, self-distraction could involve reading a book instead of ruminating before going to sleep. Clinical research has found that depressed individuals have difficulty finding suitable self-distracters (Wenzlaff, Wegner & Roper, 1998; Joorman & Siemer, 2004). Another goal-oriented emotion regulation strategy is cognitive reappraisal. This is the process by which the emotional impact of an event is changed by changing the subjective evaluation of it, for example by using humor. Cognitive reappraisal is the most frequently investigated process of emotion regulation, coupled with suppression (Gross, 2014). Research in affective neuroscience repeatedly reveals that cognitive reappraisal is a top-down emotion regulation strategy and reappraisal activates some of the same brain regions as tasks involving top-down attention control (Ochsner et al., 2012). Suppression is another goal-oriented strategy. It can be focused on the body, thoughts, behavior, or feelings. Focusing this strategy on the body is expressive suppression (Gross, 2014), in which emotional expressions are actively inhibited. For example, we might take deep breaths to keep calm and suppress the urge to cry. Studies show that expressive suppression does not prevent the experience of unwanted emotion, despite the body expression inhibition (Gross, 2014). Chang et al. (2018) documented that individuals who reported greater tendencies to regulate emotions via expressive suppression have greater projection biasing memory of negative emotions. Robinson and Demaree (2007) describe "expressive dissonance," a discrepancy between inner experience and outer expression. This can be often observed within individual psychotherapy in which patients manage their behavior based on their inner beliefs and past experiences instead of on the demands of the present moment. The opposite of expressive suppression is venting, which is a popular strategy for controlling anger and aggression (Bushman et al., 2001). Catharsis theory predicts that venting anger should get rid of it and should, therefore, reduce subsequent aggression. Although venting is widely recommended, research indicates that venting anger increases anger and aggression and heightens the activation of angry thoughts and action tendencies (Bushman, 2002).

### Person-oriented emotion regulation

This function of emotion regulation is characterized by a holistic focus. Whereas need-oriented and goal-oriented emotion regulation focus only on some aspects of emotional or task-related

functioning, person-oriented emotion regulation is related to the functioning of the whole person (Koole, 2009). Integration is the primary signature of this function: the integration and coordination of different and often antagonistic personality systems (negative versus positive emotions; body versus mind; top-down versus bottom-up processing). Person-oriented emotion regulation is different from the need-oriented strategies associated with long-term benefits (Koole, 2009).

The research by Koole (2009) is in the counter-regulation principle category, which is defined by Rothermund et al. (2008) as attentional biases that prevent the perseveration of current motivational or emotional states. According to this principle, when we experience a negative emotion, positive information captures our attention, fostering the processes of positive reappraisal and dampening negative feelings of sadness, frustration, or anger. Counter-regulation is also a highly adaptive mechanism when positive emotions are experienced; allocating attention to negative information when experiencing intense positive emotions allows for a more balanced and realistic view of the current situation (Schwager & Rothermund, 2014).

Another person-oriented emotion regulation strategy is putting traumatic experience and related strong emotions in perspective (Van der Kolk & Fisler, 1995). This means that an emotional experience is integrated into the larger narrative network of life, and emotions are down-regulated through this network. The integration of aversive emotional experiences is an essential form of emotion regulation, and it is the key implicit goal of individual psychotherapy, regardless of the psychotherapeutic approach. Expressive writing is an example of down-regulating emotions by integrating the emotional experience in a narrative network/ autobiographical memory. There is evidence that this improves both physical and psychological health (Pennebaker, 2018). Autobiographical narratives are considered to affect the down-regulation of emotions (Pascuzzi & Smorti, 2017). Functions of emotion regulation and different strategies mentioned in Koole's model (2009) are summarized in Figure 8.

There is not yet a clear explanation of how people resolve conflicts between need-, goal-, and person-oriented functions. Koole's model describes options of emotional regulation, and the individual experience in the process of reinforcement learning, physical maturation, and spiritual growth determine the ratio and context of the use of concrete emotion regulation.

In general, each integrative whole-body feeling can be reduced on the basic emotional dimension of valence. We compare our desired emotions, feelings, beliefs, goals, and attitudes with our actual state, and the difference is always implicitly or explicitly valuated. The result of this core valuation is a positive or negative state ("bad for me" or "good for me"). This notion is closed to the cybernetic self-regulation model of Carver and Scheier (1981). They supposed a tendency to maintain a steady state or equilibrium. Given this overarching goal of maintaining a steady state, emotional responses represent a break in the equilibrium that should, according to the theory, automatically provoke emotion-regulatory responses.

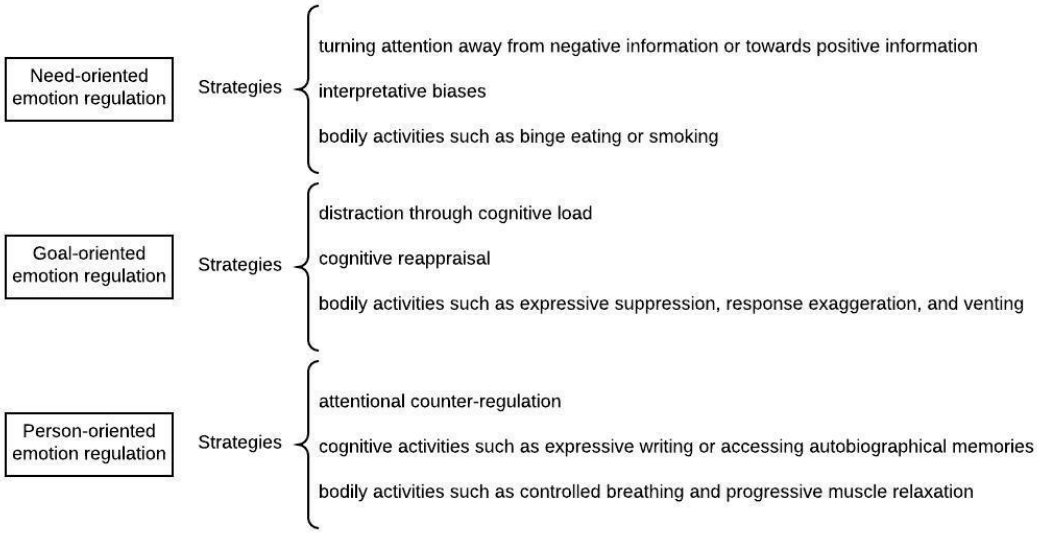


**Figure 8** Functions and associated strategies of emotion regulation (Koole, 2009).

### *What is regulated: Targets*

Emotion regulation is always directed at manipulating emotional response (actions in PVA model generated by survival circuits). Emotion is a multifaceted phenomenon that can be described on many levels, including physiological (autonomic nervous system reactivity, immune system, endocrine system), motor/behavioral (movement, facial expression), cognitive (attention, memory, thinking), and subjective (feelings[8]). Our emotions depend on what is currently available to our conscious awareness (in the process from emotion to feeling). In their developmental theory of emotional awareness, Lane and Schwartz (1987) distinguish five

[8] Feelings can be classified as cognition as well (Damasio, 1999; Schwartz and Lane, 1987).

levels of emotional experience (described in this thesis in the chapter on emotional awareness). The inputs for emotional regulation are the first three levels: somatic sensations (e.g., heartbeat, sweating), action tendencies (basic motivational states such as avoidance and withdrawal), and basic emotions (e.g., sadness, anger, fear, joy). Each level of emotional expression can be a target of emotion regulation.

For example, people with social anxiety may be afraid of blushing, and they usually want to regulate just this expression/symptom. In other cases, people may want to regulate their unpleasurable thoughts (most often they are aggressive, sexual, or religious). Among the three most widely studied emotion regulation mediator systems are attention, knowledge, and bodily expressions of emotion (Koole, 2009). The question "What is regulated?" identifies the target of the concept of emotion regulation.

## Integrative model of emotion regulation

Figure 9 presents an integration of the presented models. It integrates time dynamics, targets, functions, and classifications of emotion regulation. Each inner and outer stimulus is perceived and valuated in a "core valuation process" as pleasant, aversive, or natural. The result of this process is an emotion (action) that manifests as a behavioral, physiological, feeling, and thought change. These reactions are targets of emotion regulation, which is influenced and driven by individual goals, is regulated at some level (body, knowledge, attention), and is regulated with various inherent or learned methods (classification). Each emotion regulation leads to the change of perceived inner or outer stimuli via a feedback loop. The whole process can be implicit or explicit. Perception is influenced through antecedent-focused strategies (situation selection, situation modification, and attentional deployment). Valuation can be influenced through cognitive change. Response/action can be changed or modified with response modulation.

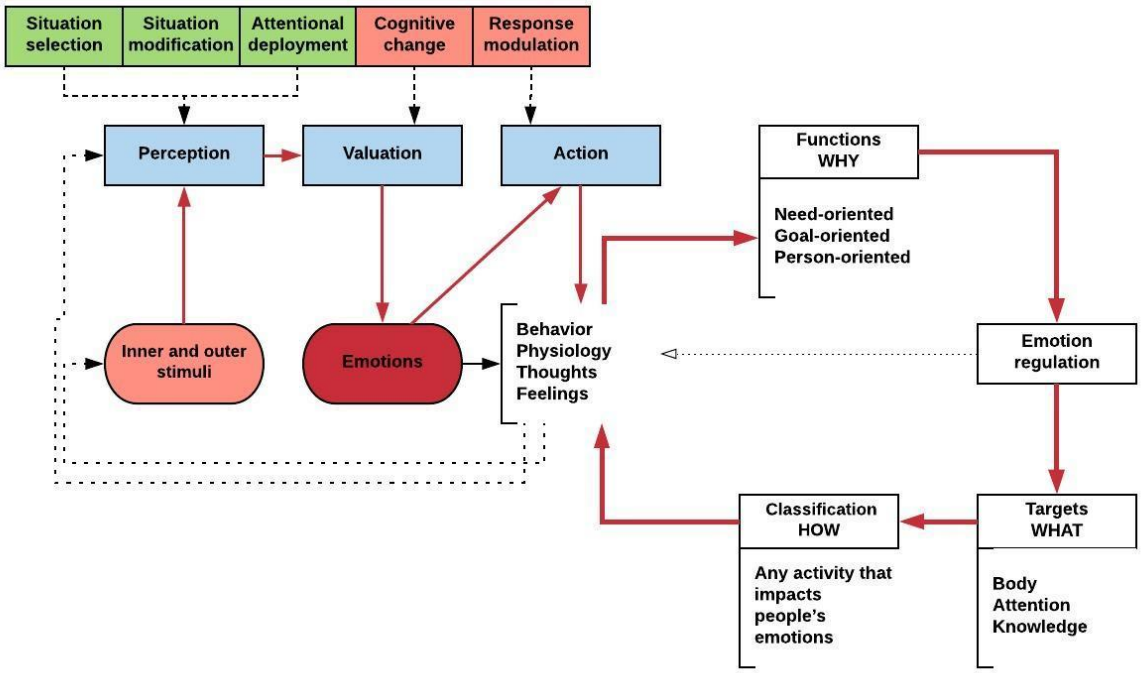


**Figure 9** The integrative model of emotion regulation

# Mindfulness

## How mindfulness relieves human suffering: the relevant origins of Buddhist teaching for clinical practice

The Buddhist analysis of the nature and origins of suffering can be summarized in the Four Noble Truths. These truths are four key insights explaining how to awaken and how to find greater freedom and lasting peace and happiness (Teasdale & Chaskalson, 2011). Buddhism credits these insights to Gautama Buddha. Siddhartha Gautama (also known as the Buddha, the Enlightened One, or The Awakened) was from a large clan called the Shakyas in Lumbini (in what is now Nepal). He became profoundly dissatisfied with the life of pleasure he had been leading. He posed one of the basic human questions: "What is the ultimately satisfying way of being, and how can we escape from human suffering?" He left his life of luxury and comfort to achieve enlightenment in reaction to this existential emptiness. At the end of his spiritual journey, as an act of compassion, he offered the Four Noble Truths as a guide for others seeking a more satisfying life.

With only some exaggeration, it could be said that the individuals who seek psychotherapy or MBSR and MBCT are in the same position as the Buddha was. At the start, they are mostly looking for relief from stress, pain, sadness, or recurrent depression, rather than the resolution of some existential disease. They just want to be in a "good for me" state. Suffering is the first step in seeking a spiritual path. Anyone could be the Buddha. Everyone shares the same existential emptiness which is covered with the fragile hope of an endless life without suffering. The denial of transience and the unpredictability of life represent a deep alienation from reality and thus from the self (Epstein, 1995, p. 49). To maintain this illusion, people spend a huge amount of energy protecting themselves from the overwhelming truth that everything will die at some point.

The key concept of Buddhist learning is *dukkha*, a Pali[9] word with no real adequate English or Czech translation. Dukkha is often translated as suffering, but this translation can be quite misleading (Teasdale & Chaskalson, 2011). A better translation, as the Buddha probably thought it, is "dissatisfaction". It reflects the fact, that transient things in the world are not able to bring the relief of suffering caused by profound dissatisfaction in life. For this reason, many

[9] Pali is one of the ancient Indian languages in which the Buddha's teachings were first recorded.

people prefer not to translate dukkha, and simply use the Pali word. Dukkha is a central component of the Four Noble Truths.

## The first Noble Truth

The first Noble Truth can be expressed very simply: suffering *dukkha* is a key part of life. This is the universal experience of every human being. We are all in the same boat together, whether we are teachers, patients, clients, psychologists, or doctors. All of us share two things: suffering and the simple wish to be happy and not suffer. This realization can help us feel a greater sense of connection and compassion for all human beings (Teasdale & Chaskalson, 2011).

Buddhist teachings helpfully distinguish three domains or bases of dukkha (Teasdale & Chaskalson, 2011): unsatisfactoriness related to situations of "ordinary" obvious suffering, unsatisfactoriness related to change, and unsatisfactoriness related to conditionality.

The Buddha saw that unpleasant or uncomfortable physical sensations or emotional feelings are inherent in life. He shows that these sensations and feelings are not, in and of themselves, the problem. Dukkha is a result of the way we relate to unpleasant feelings and somatic sensations. One level of suffering is pain, which is inherent in our lives. A second level, which increases suffering, is ruminating about what pain will mean if are ill for a whole month and how it will influence the money in the bank account that we need for summer vacation. Another example is depression. The first imaginary arrow of a simple feeling of sadness is transformed into a more intense and persistent state of depression when we add the second imaginary arrow of ruminative thinking (Teasdale & Chaskalson, 2011).

The second source of suffering is our desire for happiness and joy to continue indefinitely. The third source of dukkha is our unrealistic desire for the world to be predictable and under our full control.

A fundamental source of human suffering is the belief that our self and self-related experience exist as an objective structure or object. The essence of Buddhist psychology lies in the teaching that there is no such thing as a permanent, unchanging self (Olendzki, 2010). We usually talk about our thoughts and feelings with faith that they are the truth. We overidentify with them. This faith is in the background of the permanent protection of our self. We believe in their existence so much that we also experience injury when anybody says anything unpleasant about

us. For example, when anybody says anything that contradicts our own thoughts and feelings about ourselves.

Viewed as a medical parallel, the first Noble Truth is the diagnosis. Suffering is inherent to all human beings. Suffering in its various forms is the symptom or disease for which our patients seek help.

## The second Noble Truth

The key insight of the second Noble Truth is that the immediate cause of suffering is *tạnha*, which is translated from Pali as craving or attachment to desire. The key message of the second Noble Truth is that the experience itself is not the problem; the problem is our relationship to the experience and our need to have it be a particular way (Teasdale & Chaskalson, 2011). The suffering is generated by our unwillingness to simply let everything, including life, go in its natural way. We want to have our life (e.g., things, people, relationships, health, youth) forever, although life is uncertain, unstable, and finite. This attachment is the cause of suffering. The problem is not in the satisfaction of our basic needs; our existence depends on their satisfaction, and needs like hunger, thirst, sexual appetite can be satisfied. The problem is that we want to satisfy our needs in some specific way (e.g., I do not want just to have a place to live, I want a house with a garden), we want to experience satisfaction for controlled lengths of time (e.g., I'm not grateful for sex and love at this time, I want to experience pleasure constantly) and we want to be some specific self (e.g., It is not enough for me read the book, I want to remember it all).

The medical parallel of the second Noble Truth is a description of the etiology of the symptom being suffered. The attachment to life and to our notion of how life should be is a predisposing, precipitating, and perpetuating factor of suffering.

## The third Noble Truth

The cessation of dukkha comes with the cessation of desire and attachment. As we are the ultimate cause of our own suffering, we also have the potential to resolve it. It is not possible to change the laws of life, but it is possible to change the response to them.

The medical parallel of the third Noble Truth is a description of therapy.

### The fourth Noble Truth

There is a path that leads from dukkha. Buddhist teachings offer a program of practice, the Noble Eightfold Path, to bring dukkha to an end. The Eightfold Path is a set of ethical, moral, and practice recommendations: right understanding, right aspiration, right speech, right bodily action, right livelihood, right effort, right mindfulness, and right concentration (DeSilva, 2014). Mindfulness is a core component of this path to freedom and awakening (Teasdale &Chaskalson, 2011).

The medical parallel of the fourth Noble Truth is the concrete steps of therapy. Mindfulness is the primary focus of contemporary mindfulness-based applications such as MBSR and MBCT.

## How mindfulness relieves suffering: three strategies for change

Imagine that you get an email from your boss at 10:00 pm on a Sunday evening. He unexpectedly wants to talk about something important immediately on Monday morning. You are surprised and frightened. You find yourself upset and irritable, dwelling on thoughts about the email. You think about the reasons for the meeting and create catastrophic scenarios. You probably start to ruminate and find it difficult to fall asleep. People undergoing mindfulness training usually report that they are increasingly able to cope with such situations and to stop their prolonged stress reaction. How does mindfulness training work in these situations? Teasdale & Chaskalson (2011) consider three possible explanations for such a transformation of suffering.

### Change in the “what” that is processed

Attention is automatically attracted to important stimuli in the environment. Our attention is reactive, and our minds usually focus on aspects of experience that support suffering. In the context of an upsetting email, we may have learned to selectively attend to memories and thoughts related to the origins of the upset (e.g., “What did I do wrong?”). Such selective

retrieval from memory represents ruminative thought patterns that are thought to be an important etiological factor in depressed or angry emotions (Watkins, 2008).

In contrast to this automatic reaction, it is possible to consciously allocate our attention to particular objects or classes of objects. For example, we can switch from the habitual disposition to attend to memories and thoughts related to a distressing email and, instead, intentionally attend to relatively neutral sensory stimuli, such as the breath or the sounds in our environment. In that way, we change the contents of our thoughts so that they are less likely to create further suffering (Teasdale & Chaskalson, 2011). Maintaining the focus of attention on the sensations in the body and on the movements of the breath is the first step of most MBI training and many forms of Buddhist insight meditation.

## Change in "how" experience is processed

To change the "how" with which we process experience, the mindful response to the distress that is induced by an unexpected email involves a shift from ruminating about the email and its effects and future consequences, to an awareness of the thoughts, feelings, and bodily sensations known directly and experientially, as aspects of experience at the moment. Suffering is a result of our rigid need for experiences to be different from how they actually are, as described in the second Noble Truth. This process represents the error-related regulation implicit in emotion regulation strategy (Etkin et al., 2015). Mindfulness makes it possible to allow things to be just as they are. A mindful response to the upset of the email is a deliberate stance of letting the experience of the moment, the unpleasant thoughts, feelings, and bodily sensations, be just as they are, to hold the experience in awareness, and through pure observation, to start to understand the link between the modes of thinking and suffering (Teasdale & Chaskalson, 2011). This process enables the knowledge that suffering is the result of a way of thinking. This knowledge cannot be reached through education; it must be lived and experienced repeatedly. The change in "how" is shown in the foundations of mindfulness practice presented by Kabat-Zinn (2014, p. 20), who states that seven basic attitudes to experience are important for the transformation of suffering: non-judging, patience, beginner's mind, trust, non-striving, acceptance, and letting go. Shapiro et al. (2006) define mindfulness as an intention to kindly pay attention. They design a three-component model of mindfulness: intention, attention, and attitude. The model pillar of attitude involves accessing experience with acceptance, non-

judgment, curiosity, and kindness. This is the core change of perception induced with mindfulness: open to whatever appears.

## Change in the view

Buddhist teaching states that basic emotions can be activated on the basis of ignorance. In Buddhist literature, of ignorance, anger, and greed are referred to as the "Three Poisons" (DeSilva, 2014). They are referred to in this way because they arise as a result of the mistaken experience of the separation of the perceiver, the perceived object, and the act of perception, which are understood to be inseparable (Chambers et al., 2009). They then give rise to higher-order emotions in the background of human suffering: desire, jealousy, anger, pride, and ignorance (DeSilva, 2014). The ignorance involves looking through a lens that: (1) presents experience in terms of independently existing, enduring objects and selfs, rather than in terms of dynamic and transitory processes; and (2) leads us to identify personally with experiences as "me" or "mine," when in fact they are impersonal phenomena that arise as a function of certain conditions. In principle, suffering can be transformed by changing the prism through which we view the world. Mindfulness helps create new lenses.

The fundamental assumption of Buddhism and Buddhist psychology is that there is no such thing as a permanent, unchanging self (Epstein, 1988). The self is more of a process in the present moment than a solid structure stored in the autobiographical memory. Meditation practice leads to enhanced internal awareness, and meditators usually report that they can observe mental processes with increasing clarity; meditation facilitates a detachment from identification with the static sense of self (Hölzel et al., 2011). This change in perspective of the self is often subjectively experienced as a feeling of freedom and liberation. Half the participants in a study by Allen et al. (2009) reported that MBCT led to "a new perspective on their depression-related thoughts and feelings that can be summarized as 'These thoughts and feelings are not me'." In the email example, this would involve making the unpleasant thoughts and emotions the focus of attention as events in the stream of consciousness, rather than viewing them as "me."

## Definition and mechanisms of mindfulness

### What is mindfulness

The historical context of the definition of mindfulness is very complex and complicated. Many Buddhist traditions are involved in the historical development of the definition. In a study of the historical depth behind definitions of mindfulness, Anālayo (2019) states that early Buddhist thought and practices developed from about the fifth to the third century BCE. The source material for this earliest phase in the history of Buddhism, which forms the common starting point for the different Buddhist traditions in existence today, are the "early discourses." These early discourses are found in the textual collections called *Nikāya*s in Pali, as well as in parallel collections known as *Āgama*s. These *Āgama* parallels have for the most part not yet been translated from Chinese, Sanskrit, and Tibetan into English. There is thus not very much available information about early forms of Buddhism. It is evident that each Buddhist tradition, in its own specific historical and social context, developed an approach to and understanding of mindfulness (Anālayo, 2019). This process can be also seen in current clinical mindfulness-based approaches that define mindfulness in various contexts and functions.

A detailed summary of the Buddha's teachings are described in the Buddhist canonical texts called *Abhidhamma Pitaka* (Mendis, 2006). Their origin is dated to sometime around the third century BCE, 100 to 200 years after the death of the Buddha. These texts include the reorganization and generalization of the Buddha's teachings. They are presented in a common language and narrative form in *Sutras*; the texts are extensive and extremely detailed in their analysis and classification of awareness and mental states (Grabovac, Lau, & Willett, 2011).

To better understand what mindfulness is, it is necessary to ask the question "What does mindfulness do?" Early Buddhism defines mindfulness as a mental faculty (Pali *indriya*, Sanskrit *indriya*, Chinese 根, Tibetan *dbang po*). Mindfulness is considered to be "remembering" in one of its aspects (Anālayo, 2019). It consists of remembering to be aware and pay attention to the present moment. In this process or practice, the practitioner is reminded: "Remember: be aware!" (Siegel, Germer, & Olendzki, 2009). This view shows a constant close connection between the function of memory and attention (Vago & Silbersweig, 2012). The English translation of the Pali word *sati* connotes awareness, attention, and remembering (Siegel et al., 2009). Sati is translated as a "Všímavost" in the Czech language (Frýba, 2003; Benda, 2007).

The best known and most widespread definition of mindfulness in the West is that of Kabat-Zinn (1990), the founder of MBSR: "Mindfulness is an awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally." Williams (2007, p. 47), the founder of MBCT, has defined mindfulness as "the awareness that arises from paying attention on purpose, in the present moment and non-judgmentally to things as they are."

Intuitively, everybody practicing mindfulness has their own working definition, operationalized through the contents of everyday practice. There is no single universally accepted technical definition of "mindfulness" nor any agreement about the detailed components of the underlying concept to which it refers (Van Dame et al., 2018). The ambiguity of the mindfulness concept also reflects the existence of many self-reported scales of mindfulness. In a systematic review of mindfulness outcome measures, Park et al. (2013) reported ten existing scales. The number of methods reflects the diversity of the definitions of mindfulness that have been proposed (Williams et al., 2014). Each available questionnaire represents an attempt to operationalize mindfulness by self-reported items describing its essence (Baer et al., 2006). The review by Baer et al. (2006) shows that current mindfulness scales have important conceptual differences, and none can be strongly recommended. It is evident that mindfulness is a multifaceted construct (Baer et al., 2006). One attempt to verify the factor structure and to integrate frequently used questionnaires (the Mindfulness Attention Awareness Scale, MAAS, Brown & Ryan, 2003; the Freiburg Mindfulness Inventory, FMI; Buchheld, Grossman, & Walach, 2001; the Kentucky Inventory of Mindfulness Skills, KIMS; Baer, Smith, & Allen, 2004; the Cognitive and Affective Mindfulness Scale, CAMS; Feldman et al., 2004; and the Mindfulness Questionnaire, MQ; Chadwick et al., 2005) into one multifaceted tool is the Five Facet Mindfulness Questionnaire (FFMQ, Baer et al., 2001). The FFMQ received the highest possible rating for two properties, internal consistency and construct validation by hypothesis testing (Park et al., 2013). A factor analysis of the various methods confirmed that at least four of the identified factors are components of an overall mindfulness construct and that the factor structure of mindfulness may vary with meditation experience (Baer et al., 2006). It yielded five facets of mindfulness: observing (attending to or noticing internal and external stimuli, such as sensations, emotions, cognitions, sights, sounds, and smells); describing (mentally labeling these stimuli with words); acting with awareness (attending to one's current actions, as opposed to behaving automatically or absentmindedly); nonjudging of inner experience (refraining from evaluating one's sensations, cognitions, and emotions); and nonreactivity to

inner experience (allowing thoughts and feelings to come and go, without attention-getting caught in them).

Another source of ambiguity is the existence of various psychotherapeutic approaches incorporating mindfulness, such as dialectical behavioral therapy (Linehan, 1993), acceptance and commitment therapy (Hayes et al., 1999), and mindfulness-based cognitive therapy (MBCT; Segal et al., 2002). These interventions, referred to collectively as "third wave cognitive therapies" (Hayes, 2004), have provided the initial cognitive operationalization of mindfulness upon which much of the current psychological literature is based (Chambers et al., 2009). The mindfulness-based programs used in clinical and counseling practice are very complex, and it is not clear which processes and mechanisms of the positive effect of the program are activated.

In their critical review, Van Dame et al. (2017) urge scientists, practitioners, instructors, and the public news media to move away from relying on the broad, umbrella rubric of "mindfulness" and toward more explicit and differentiated explanations of exactly what mental states, processes, and functions are being taught, practiced, and investigated.

### *The two-component model of mindfulness*

A growing number of theoretical studies have attempted to operationalize the mindfulness concept. In their oft-cited review, Bishop et al. (2004) define mindfulness as follows:

"Broadly conceptualized, mindfulness has been described as a kind of nonelaborative, nonjudgmental, present-centered awareness in which each thought, feeling, or sensation that arises in the attentional field is acknowledged and accepted as it is." They further state that: "in the state of mindfulness, thoughts and feelings are observed as events in mind, without over-identifying with them and without reacting to them in an automatic, habitual pattern of reactivity. This dispassionate state of self-observation is thought to introduce a 'space' between one's perception and response. Thus, mindfulness is thought to enable one to respond to situations more reflectively (as opposed to reflexively)."

Bishop et al. (2004) provide a two-component definition of mindfulness as a state. The first component involves the self-regulation of attention. It represents the focusing of attention and its maintenance on the present experience from moment to moment. The object of attention is

whatever appears. The second component involves the attitude of openness, acceptance, and curiosity toward whatever arises.

### The first component – self-regulation of attention

A basic Buddhist practice of mindfulness meditation involves sustaining selective attention moment by moment on a chosen object. In focused attention meditation, the chosen focus is usually the breath. In this practice, attention is focused on the sensations caused by respiration. In the manner of open monitoring practice, attention is focused on the dynamically changing stream of consciousness in the present moment (feelings, thoughts, somatic sensations, and perceptions).

To be able to sustain attention, it is necessary to constantly monitor the quality of focus. At first, the attention wanders away from the chosen object, and the typical instructions across various mindfulness approaches are to recognize the wandering and bring the attention back to the chosen object. For example, while we are trying to focus our attention on our breathing in the abdominal area, we might notice that our attention shifts to a pain in our shoulder. We then "release" this distraction and return to the breathing in the abdomen. This practice fosters and develops three attention skills: monitoring the locus of attention, disengaging from distraction, and shifting attention back to its intended target (Lutz et al., 2008).

Bishop et al. (2004) describe sustained attention and attention shifting as key components of mindfulness meditation practice. This description of mindfulness meditation practice as a process makes it possible to conceptualize it with the help of cognitive psychology concepts. It is thus possible to hypothesize, based on the self-regulation model, that the development of mindfulness practice will be associated with increased performance in sustained attention and attention switching (Bishop et al., 2004). Attentional processes underlying mindfulness are often measured with the attention network test (Fan et al., 2002). It is still unclear how different meditation practices differentially affect the specific attentional components (Tang et al., 2015). For example, MacCoon et al. (2014) did not find any differences in the performance of sustained attention between MBSR and active control in a longitudinal randomized trial study. In contrast, they did find some evidence for improved visual discrimination when comparing mindfulness trial subjects with control subjects.

Another process underlying mindfulness is the inhibition of secondary elaborative processing of thoughts, feelings, and sensations that arise in the stream of consciousness. This refers to experiences and the mindfulness practice recommendation that rather than get caught up in the ruminative and elaborative thought and feeling stream of experience, it is better to only observe it without amplifying it. This is not thought suppression: thoughts and their contents are welcome, but the meaning is not the target of attention. Mindfulness thus involves the capacity to be aware of internal and external events and occurrences as phenomena, "rather than as the objects of a conceptually constructed world" (Olendzki, 2005, p. 253). This is a kind of meta-cognition. It could be objectively measured using tasks that require the inhibition of semantic processing, such as Stroop tasks. For instance, greater dlPFC responses were found during executive processing within an emotional Stroop task in healthy individuals after six weeks of mindfulness training (Allen et al., 2012).

One more attentional process underlying mindfulness practice as defined by Bishop et al. (2004) could be described as an increased sensitivity or capacity to perceive the world through a "beginner mind" lens. The authors expected that this process could be measured using tasks in which successful performance depends on detecting stimuli in an unexpected setting. These tests are not usually standard parts of neuropsychological test batteries such as attentional tests. Their unique variants are found as parts of experimental designs of various studies (e.g., Jiang, Summerfield, & Egner, 2013; Kumaran & Maguire, 2006). Performance in this ability has not yet been experimentally measured in mindfulness research.

### Orientation to experience

Orientation to experience or, more precisely, attitude to mindfulness practice is the second core component of mindfulness (Bishop et al., 2004). This conception is very close to the attitude component in the mindfulness model by Shapiro et al. (2006). This component involves the commitment to maintain an attitude of curiosity about where the mind wanders, no matter where it is. Practitioners do not try to produce a particular state such as relaxation or the change of experience; they simply take note of whatever appears in the present moment in the changing and unstoppable stream of consciousness.

The key part of this component is acceptance, one of the basic attitudes in mindfulness practice as described in MBSR by Kabat-Zinn (2013). Acceptance means seeing things as they actually

are in the present moment. In mediation practice, we cultivate acceptance by taking each moment as it comes and being with it fully, as it is. The practitioner is reminded to be receptive and open to whatever they are feeling, thinking, or seeing, and to accept it because it is here right now (Kabat-Zinn, 2013, pp. 27). The stance of curiosity and acceptance during mindfulness practice could be monitored in the use of cognitive and behavioral strategies to avoid aspects of an experience. The effect of mindfulness practice should lead to a decrease in the measures of repressive coping and avoidance. Changes in some emotional regulation strategies such as rumination, self-blame, other blame, and suppression, are also possible. The relationship between mindfulness and emotion regulation will be elaborated in detail in the last part of the thesis. Another measure in which mindfulness has an effect on orientation to experience can be found in openness to experience and conscientiousness (NEO Five-Factor Inventory, NEO-FFI; Costa & McCrae, 1992). The association between openness, conscientiousness, and mindfulness was proved in a recent meta-analysis (Giluk, 2009). A change in attributed importance to life satisfaction components is also possible[10]. Emotional distress would be experienced as less unpleasant and threatening because of the change of subjective meaning via acceptance (Bishop et al., 2004).

Self-observation is another subcomponent of orientation to experience. Mindfulness practice leads to greater sensitivity to a variable and dynamically changing stream and content of consciousness. Consequently, practitioners are more aware of the complexity of the mind. In other words, practitioners have a higher sampling rate of our awareness. For example, they could experience an increase in emotional awareness (LEAS[11]; Lane et al., 1990).

Further, via mindfulness practice, practitioners start to realize that life events are transient and do not represent inherent aspects of the self or valid reflections of reality (Segal et al., 2002). Mindfulness training encourages participants to notice specific details of their environment and accept all experiences without judging or avoiding them. It is likely to improve autobiographical memory specificity, which refers to the ability to retrieve memories of specific personal events that happened at particular times and locations. Mindfulness leads to reducing over generic

[10] The results of our research group dealing with this topic are presented below.

[11] A Czech version of this test for children and adults was translated and standardized by our research group.
Světlák, M., Bernátová, T., Pavlíková, E., & Winklerová, L. (2015). Measuring emotional awareness - A pilot study of psychometric properties of the Czech adaptation of the levels of emotional awareness scale. *Ceska a Slovenska Neurologie a Neurochirurgie, 78*(6), 680-686. doi:10.14735/amcsnn2017197
Světlák, M., Marsová, K., Bernátová, T., & Winklerová, L. (2017). Emotional awareness in adolescents - A pilot study of psychometric properties of the Czech adaptation of the levels of emotional awareness scale for children LEAS-C. *Ceska a Slovenska Neurologie a Neurochirurgie, 80*(2), 197-207. doi:10.14735/amcsnn2017197

encoding of situations and the suppression of unpleasant memory retrieval (Williams et al., 2000). Deficits in emotion regulation, such as ruminative thinking, are associated with reduced autobiographical memory specificity (Williams et al., 2007). The structure of the two-component model of mindfulness is described in Figure 10.

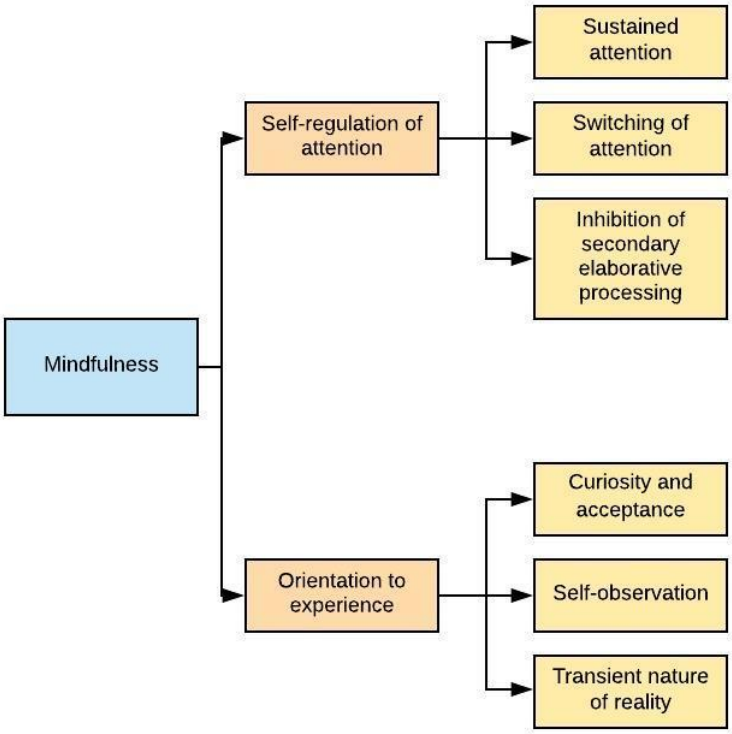


**Figure 10** Two-component model of mindfulness (Bishop et al., 2004).

## Is mindfulness a state or a trait?

Cross-sectional studies raise the important question of whether mindfulness practitioners could have "pre-existing" differences linked to their interest in meditation, personality, and temperament (Wheeler, Arnkoff, & Glass, 2016). Guendelman, Medeiros, and Rampes (2017) describe different usages of the mindfulness concept: 1) dispositional mindfulness, understood as a mental trait or stable characteristic of personality, which can vary between and within individuals across time, 2) mindfulness as practice, referring to the concrete formal and informal practice of mindfulness meditation, and 3) mindfulness as a state, representing the first-person non-judgmental and accepted experience of the present moment. Vago and Silbersweig (2012) describe mindfulness as 1) a temporary state of non-judgmental, non-

reactive, present-centered attention and awareness that is cultivated during meditation practice, 2) an enduring trait that can be described as a dispositional pattern of cognition, emotional, or behavioral tendency, 3) a meditation practice, and 4) an intervention. There are at least eight self-reported scales for measuring dispositional mindfulness (reviewed by Park et al., 2013).

For instance, Brown and Ryan (2003) show that both dispositional and state mindfulness predict self-regulated behavior and positive emotional states. In their volumetric analysis of structural MRI images obtained from 155 healthy adults, Taren, Creswell, and Gianaros (2013) revealed that higher dispositional mindfulness is associated with decreased gray matter volume in the right amygdala and the left caudate. These neural associations persist even after controlling for demographic and individual difference factors (i.e., age, total gray matter volume, neuroticism, depression). Brown et al. (2012) showed that higher dispositional (trait) mindfulness is associated with lower cortisol reactivity following psychosocial stress. Dispositional mindfulness was also found to be associated with decreased connectivity within the midline regions, including the PCC and mPFC during resting state functional connectivity fMRI (Way et al., 2010). The medial parts of the brain are part of the default mode network (DMN), which is related to mind-wandering and self-referential processing (Qin and Northoff, 2011). The DMN represents the regions that are active when the brain is not engaged in task-induced activity (Gusnard et al., 2001). Creswell et al. (2007) found that levels of dispositional mindfulness were related to higher activations in the right vmPFC and right vlPFC and major deactivation of the right amygdala in an affect labeling task during fMRI. Longitudinal studies have revealed that transient meditation states can be transformed through time and practice to trait mindfulness (Tang et al., 2015; Coleman & Davidson, 2017). Brefczynski-Lewis et al. (2007) report an inverted U-shape relationship between frontal activity and meditator expertise. These results show that the more trained subjects showed less frontal activity. This supports the notion of an altered core valuation process. This is moreover the implicit aim of meditation: to transform from an effortful practice to an effortless way of mindfully being. Dispositional mindfulness is usually assessed through self-reported questionnaires; this is an important methodological shortcoming.

## Is mindfulness one technique?

How are meditation practices to be categorized? There is a growing consensus that at least two broad categories of meditation techniques can be discerned[12]: focused attention and open monitoring (Lutz et al., 2008; Tang et al., 2015). Some authors add loving-kindness practices to this classification (Lippelt et al., 2014). Travis and Shear (2010) suggest a fourth category of meditation practice, automatic self-transcending, which includes techniques designed to transcend their own activity.

### *Focused attention meditation*

Focused attention (FA) practices are based on the concentration of attention on a particular external or internal object while ignoring all irrelevant stimuli (most often it is breath, body sensations, or a mantra; Kabat-Zinn, 2005; Lutz et al., 2008). For example, while we are focusing our attention on our breathing in the abdominal area, we might notice that our attention has shifted to a pain in our shoulder. We then "release" this distraction and return to the intended breathing in the abdomen. This practice fosters and develops three attention skills: monitoring the locus of attention, disengaging from distraction, and shifting attention back to its intended target (Lutz et al., 2008). This meditation process is associated with power increases in high frequency EEG beta2 and gamma activity (Travis & Shear, 2010). In their meta-analysis dealing with the functional neuroanatomy of meditation, Fox et al. (2016) categorize mantra recitation meditation as a different subdivision of FA. Mantra meditation is a form of "transcendental meditation" and involves the repetition of a sound, word, or sentence (repeated aloud or silently in one's mind) with the goals of maintaining focus and avoiding mind-wandering (Travis, 2014). Mantra meditation differs from FA in that the object of focus is a voluntary verbal-motor production instead of breath or body sensations.

### *Open monitoring*

Open monitoring (OM) practice involves bringing attention to the present moment in a non-judgmental manner. Practitioners observe all mental, physical, and exteroceptive contents (thoughts, emotions, sensations, perceptions via sensors, etc.) as they naturally arise from

[12] A detailed description of the neural correlates of each category is presented in the next chapter.

moment to moment without focusing on any of them. In OM, the goal is to be open to any experience with an accepting attitude (Kabat-Zinn, 2005). It is characterized by increased theta activity in EEG (Travis and Shear, 2010).

### *Loving-kindness and compassion meditations*

The basic point of the loving-kindness (LK) meditation is to focus kind and loving energy toward oneself and others. Loving-kindness meditation involves generating feelings of kindness, love, and joy toward the meditators themselves, then progressively extending these feelings to imagined loved ones, acquaintances, strangers, enemies, and eventually all living beings (Kabat-Zinn, 2005; Lutz et al., 2008). Sentences are usually repeated during the meditation: "May I be free from suffering," "May I be as happy and healthy as it is possible for me to be," and "May I have ease of being" (Williams & Penman, 2011). The content of the sentences varies somewhat. Compassion meditation and loving-kindness meditation are overlapping. Neff (2003) operationalized self-compassion as consisting of three main elements: kindness, a sense of common humanity, and mindfulness. Self-kindness entails being warm and understanding toward oneself when suffering, failing, or feeling inadequate, rather than self-flagellating with criticism (Neff, 2003).

### *Automatic self-transcending practice*

Automatic self-transcending (AST) practice could be characterized by the absence of a focus of attention, individual control, and effort. It is reflected in alpha1 activity in EEG (Travis & Shear, 2010). AST includes meditations that transcend the steps of meditation practice. They begin with thinking and end with "being" or wakefulness without customary mental and emotional content (Travis, 2014). Transcendental meditation can be described as ''thinking" a mantra—a meaningless sound—and going back to it when the mantra is forgotten. The mantra can be seen as a vehicle for transcending rather than as a technique of keeping the mantra in awareness, thereby differing from FA (Travis & Parim, 2017). This understanding differs from Fox et al. (2016), who classify the mantra recitation meditation as a different subdivision of FA.

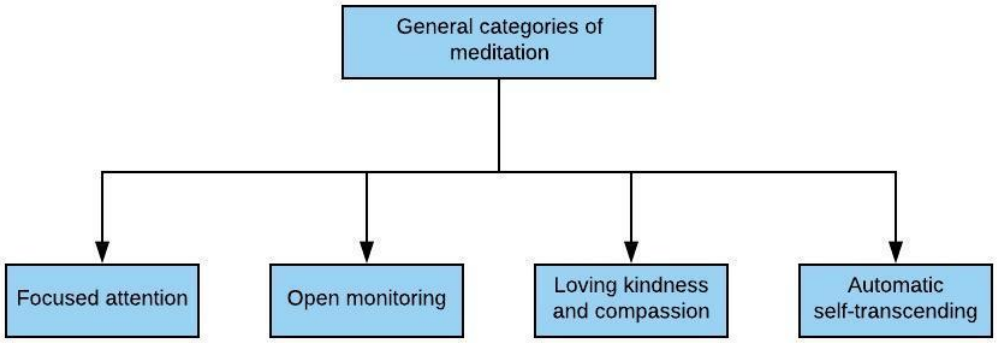


**Figure 11** How meditation practices are to be categorized

Only the first three categories are relevant to the current thesis. These are also components of frequently used mindfulness-based programs. Of course, this categorization is not intended to be exhaustive. This classification is a pragmatic resolution organized according to the available evidence in recent studies dealing with mindfulness. Different forms of meditation can be found in almost all cultures and religions (Tang et al., 2015), including various yogic traditions. Fox et al. (2016) mention the yoga exercises of visualization meditation and withdrawal of the senses (*pratyahara* in Sanskrit), non-dual awareness practices, yoga nidra (literally "sleep yoga"), and dream yoga ("lucid" dreaming), practices that are investigated only marginally or not at all.

## Neural systems involved in mindfulness

A growing number of studies have demonstrated changes in brain structures induced by mindfulness meditation. Multiple measurements have been used to investigate the effects on both gray and white matter. Studies have captured cortical thickness, gray-matter volume, and density. It is evident from the recent literature that the effects of meditation might involve large-scale brain networks; individual studies have reported various findings in multiple brain regions, including the subcortical gray and white matter, cerebral cortex, brainstem, and cerebellum (Tang et al., 2015). It is not surprising that the effect of mindfulness training/meditation is the result of the interplay of multiple complex cognitive and affective

processes with many neural networks in the background. Even though many studies have been done over the past twenty years in the neuroscience of mindfulness, this mini-review focuses only on a recent meta-analysis of results. Only a meta-analysis can provide a description of regular neural functional and structural patterns beyond the mindfulness effect because of the huge heterogeneity of study results and their varied methodological quality.

In their systematic review and meta-analysis of morphometric neuroimaging in meditation practitioners using an activation likelihood estimation (ALE), Fox et al. (2014) arrived at eight brain regions consistently altered in meditators across the studies (global effect size Cohen's - d= 0.46; r = .19): 1) the frontopolar cortex: related to enhanced meta-awareness following meditation practice, 2) the sensory cortices and 3) the insular cortex: related to body awareness, 4) the hippocampus: related to memory processes, 5) the anterior cingulate cortex and mid-cingulate cortex and 6) orbitofrontal cortex: areas related to self and emotion regulation, 7) the superior longitudinal fasciculus and 8) corpus callosum: structures related to intra- and inter-hemispherical communication. This meta-analysis did not evaluate the study results according to forms of meditation practice. Most mindfulness-based programs such as MBSR, MBCT, integrative body-mind training (IBMT), and DBT are very complex and composed of multiple categories of meditation practice (focused attention meditation is almost always combined with, or followed by, open monitoring and compassion types of meditation). In general, numerous studies mix practitioners from multiple traditions in their analyses. Fox et al. (2016) considered this limitation in their subsequent meta-analysis, in which they described distinct neural correlates of distinct patterns of meditation practice. The results are presented in Table 5.

Another meta-analytic study based on ALE with the goal of testing whether there are consistent activations across studies, independent of the meditative technique, that could represent a core cortical network for meditation (Sperduti, Martinelli, & Piolino, 2012). The authors included only studies conducted on expert meditators. Activations were found in the left entorhinal cortex (parahippocampus, thought to control the mental stream of thoughts and possibly stop mind wandering), left caudate body (thought, with the putamen, to have a role in attentional disengagement from irrelevant information, allowing a meditative state to be achieved and maintained), and the medial prefrontal cortex (mPFC, probably supports enhanced self-awareness during meditation). The mPFC (especially BA 10) is associated with self-referential processing (e.g., Northoff et al., 2006). A recent meta-analysis performed by van der Meer et al. (2010) shows that the mPFC is usually activated when subjects are asked to decide if an

adjective refers to them. The authors did not find the expected activations in the lateral prefrontal cortex, anterior cingulate cortex (ACC), or parietal lobe, as is often reported in the literature (see studies above). These results suggest that the cortical structures responsible for attentional and cognitive control are not a key network underlying meditation in meditation experts. These results also open the discussion about the relationship between meditation experience and different neural networks of practice background. Brefczynski-Lewis et al. (2007) report an inverted U-shape relationship between frontal activity and meditator expertise. These results show that the more trained subjects showed less frontal activity. This suggests the disengagement of attentional control within meditation training. This neural process pattern (less activity in the lateral areas of the frontal cortex during meditation practice) may show a meditation session dynamic in which the frontal regions are activated at the beginning of meditation to allow the other structures to maintain the meditative state, as was suggested by Travis and Wallace (1999) and Newberg and Iverson (2003).

**Table 5** Distinct neural correlates of distinct patterns of meditation practice (Fox et al., 2016)

| Category | Structure | Study |
|---|---|---|
| Focused Attention | **Activation** | Fox et al., 2016 |
| | Pre-motor cortex (BA 6) | |
| | Dorsal anterior cingulate cortex (BA 24) | |
| | The dorsolateral prefrontal cortex (BA 8/9) | |
| | **Deactivation** | |
| | Ventral posterior cingulate cortex (BA 31) | |
| | Left inferior parietal lobule (BA 39) | |
| Mantra recitation meditation | **Activation** | Fox et al., 2016 |
| | Posterior dorsolateral prefrontal cortex/left premotor cortex (BA 6/8) | |
| | Pre-supplementary motor cortex supplementary motor cortex (BA 6) | |
| | Putamen/lateral globus pallidus including the fusiform gyrus, cuneus (BA 18), moreover, precuneus (BA7) | |
| | **Deactivation** | |
| | Left anterior insula (BA 13)/claustrum | |
| Open monitoring meditation | **Activation** | Fox et al., 2016 |
| | Insula (BA 13) | |
| | Left inferior frontal gyrus (BA 44/45) | |
| | Pre-supplementary motor area (BA 32) | |
| | Supplementary motor area (BA 6) | |
| | Premotor cortex (BA 6) | |
| | Smaller (non-significant) clusters were observed in the rostrolateral prefrontal cortex (BA 10) and mid-dorsolateral prefrontal cortex (BA 9/46). | |
| | **Deactivation** | |
| | Right thalamus | |
| Loving-kindness and compassion meditation | **Activation** | Fox et al., 2016 |
| | Right anterior insula/frontal operculum (BA 13) and secondary somatosensory areas extending into the anterior inferior parietal lobule (BA 2/40), parieto-occipital sulcus (BA 23/31). | |

*Note*: BA – Brodmann area

## Therapeutic application of mindfulness

The first documented clinical effect of MBI was described in patients with chronic pain (Kabat-Zinn, 1982) for whom mindfulness brought relief from the pain.

A few therapeutic approaches incorporate mindfulness explicitly, including dialectical behavioral therapy (Linehan, 1993), acceptance and commitment therapy (ACT; Hayes et al., 1999), mindfulness-based cognitive therapy (MBCT; Segal et al., 2002) and mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1993). Currently, there is so much literature on these mindfulness-based approaches that it is no longer possible to summarize them. MBIs such as MBSR and MBCT, the ones most used in clinical practice, are presented here as the most representative and applicable in clinical practice. These two approaches are also the background for closely related interventions developed for specific populations. These include mindfulness-based childbirth and parenting (MBCP; Bardacke, 2012), mindfulness-based eating awareness training (MB-EAT; Kristeller, Wolever, & Sheets, 2013), mindfulness-based elder care (MBEC; McBee, 2008), and mindfulness-based relapse prevention (MBRP) for addictive behavior (Bowen, Chawla, & Marlatt, 2011). Buddhist psychology and counseling (de Silva, 2014) are also psychotherapy approaches integrating mindfulness, but this is beyond the scope of this thesis because it is a complex topic[13].

The difference between MBCT and MBSR depends partly on the client group at which the course is aimed. MBSR was originally aimed at people with chronic pain and stress (Kabat-Zinn, 1982). MBCT was aimed at people with an affective disorder, especially those with recurrent depression (Segal, Williams, & Teasdale, 2002). There are now many "generic" forms of both programs adapted to make it relevant to anyone from nonclinical populations seeking stress reduction and support of well-being. In this context, a recent meta-analysis conducted by Parsons et al. (2017) comparing the effects of MBCT and MBSR on physical and psychological functioning did not document any significant differences.

Mindfulness techniques, as part of the "third wave" of cognitive and behavioral therapies, help to target contexts and functions of psychological phenomena, not just their form (Hayes, 2016). Unlike other therapeutic strategies, such as cognitive behavioral therapy, MBIs do not

[13] Presented in detail in Czech in Ennenbach, M. (2018). Buddhistická psychoterapie: Techniky pro uzdravující změny. Praha: Fontána, or in Epstein, M., (2013). Myšlenky bez myslitele: psychoterapie z pohledu buddhismu. Praha: MAITREA

emphasize changing the contents of mental events as much as changing the awareness of and relationship to them (Segal et al., 2002). Participants learn to disempower emotionally charged thoughts or attitudes by bringing to their experience a sense of "allowing" it to be just as it is, without a constant need for the situation to match their desired states (Segal et al., 2002). This chapter described how mindfulness relieves human suffering and introduce two main MBI programs that are considered essential in this area (MBSR and MBCT).

## Mindfulness-based stress reduction program

Mindfulness-based stress reduction (MBSR) was developed as an outpatient program at the University of Massachusetts Medical School in 1979. Jon Kabat-Zinn based it on his own experience with *vipassana* (insight) meditation, a practice that originated in the Theravada Buddhist tradition. It was developed for patients with chronic pain and stress-related conditions.

### *Program structure and content*

The changes are based on the general framework of a manualized eight-week program of meditation and gentle Hatha yoga training. Participants attend weekly group sessions with ten to thirty participants with a wide range of disorders and conditions, where they are introduced to formal meditation practices, gentle yoga, and psychosocial education. The program also includes a silent meditation retreat day that falls in the second half of the course. Group members are asked to practice yoga and meditation for approximately forty-five minutes a day as homework (45 min/day; averages reported of 246 min/week). Participants are encouraged to keep a diary to describe their practice and reflections and insights. Formal meditation practices include focused attention on breathing, body scans and open monitoring of sounds, thoughts, feelings, and bodily sensations.

Group sessions generally last for 2.5 hours and focus on group meditation practice and discussion of these practices. Other commonly discussed themes include stress and the body, habitual patterns of reactivity, and creative ways to respond to stress. Group dialogue on difficulties in performing practices and insights gained are valuable components of an MBSR course. During these dialogues, instructors model key components of mindful awareness, such as noticing the body sensations that accompany different thoughts and impulses. As part of the

weekly homework, courses often include diary exercises, which are later discussed in the group setting. Commonly, participants spend a week taking notice of pleasant events, then a week on unpleasant events, and another week on monitoring stressful communications. However, common even to these externalized practices, there is an emphasis on how these events occurred from an interoceptive perspective (i.e., how one felt in one's body during these events).

### *Weeks 1 and 2*

The first group's mindfulness activity is the raisin exercise, conducted during the first session. Participants are guided through a slow process of observing all the aspects of raisins and the process of eating them (for details, see Kabat-Zinn, 2013, p. 15–16). The raisin exercise provides an opportunity to be mindful in an activity often done in so-called "automatic pilot mode," or without awareness.

The practice of these first two weeks focuses on formal and informal practice development (Kabat-Zinn, 2013, p. 77). It includes formal training, especially body scan meditation sitting meditation, as well as what is called "informal practice" – cultivating mindfulness in daily life. Patients/participants are supported in bringing moment-to-moment awareness to routine activities such as waking up in the morning, brushing their teeth, taking a shower, drying their body, getting dressed, eating, driving, taking out the garbage, shopping, cooking, doing the dishes, even checking their email. The list could be endless. The aim is to "experience what you are doing in a fully embodied way as you are actually doing it" (Kabat-Zinn, 2013, p. 160).

Body scan meditation is a practice that reestablishes contact with the body. Within this practice, attention is directed to any sensations in the fingers, the thumbs, then the palms and backs of the hands, then, in turn, the wrists, the forearms, the elbows, the upper arms, then returning to the shoulders. Then we move into the neck and throat, and finally all the regions of the face, the back of the head, and the top of the head. In MBSR, the body scan is practiced intensively for at least the first four weeks of the program. The body scan is the first formal practice of MBSR. It provides the foundation for all the other meditation practices that patients will work with later, including sitting meditation. Through body scan practice, the patients learn to keep their attention focused over an extended period (for more details, see Kabat-Zinn, 2013, p. 77).

In the first two weeks of the program, patients practice the body scan at least once a day, six days a week, using a Body Scan Meditation CD they receive from the trainer[14].

The sitting meditation is referred to as a core of the formal meditation practice. Participants start with this in the second week of the training. It consists of five exercises: sitting with the breath, sitting with the breath and the body as a whole, sitting with sound, sitting with thoughts and feelings, and sitting with choiceless awareness (Kabat-Zinn, 2013, p. 54–74).

### *Weeks 3 and 4*

An integral part of MBSR is mindful yoga, aimed at cultivating strength, balance, and flexibility. The practice starts in the second week of the training. It is composed of basic exercises from hatha yoga. Participants learn concrete exercise at the second session. They also get pictures of the exercises and a CD with an audio exercise guide. Participants practice body scan meditation and mindful yoga training. Participants also continue in practice of sitting meditation for fifteen to twenty minutes a day in week 3 and up to thirty minutes a day in week 4.

For some participants, sitting or lying still, as required by sitting meditation and the body scan, can be uncomfortable, irritating, and aversive. Walking meditation can be helpful to them, and it is also one of the basic parts of MBSR formal practice. It includes slow, deliberate walking to practice focusing on the sensations in the body while moving. Participants are encouraged to notice when their minds wander off and to gently bring their attention back to the sensations of walking.

The informal practice in week 3 involves being aware of one pleasant event a day. Participants are encouraged to keep a calendar for the week, noting the pleasant experience. In week 4, there is support to do the same thing for one unpleasant or stressful event a day.

### *Week 5 and 6*

In weeks 5 and 6, participants are advised to stop doing the body scan for a while and replace it with forty-five minutes of guided sitting meditation practice, alternating with mindful yoga.

[14] A CD with all the recordings needed for the MBSR program was translated and recorded in Czech by Jaroslav Chýle. He is the first certificated MBSR teacher in the Czech Republic. Relevant information can be found at www.mbsr.cz

The guidance on the CD is recommended. At this time, participants are also advised to try sitting meditation without guidance once a week. The various modes of sitting meditation as described above can be used or combined. For example, participants can start with focusing on the breath as a primary object of attention and then they can freely continue in open monitoring focusing. In weeks 5 and 6, participants at the stress reduction clinic alternate forty-five minutes of sitting meditation one day with yoga practice the next. If they do not do the yoga, then they can alternate sitting meditation with body scans during this week. They are also allowed to do just sitting meditation (Kabat-Zinn, 2013, p. 161).

### *Week 7*

Week 7 is dedicated to practicing without the CD for guidance. The aim is to encourage self-directed practice and increasing self-reliance (Kabat-Zinn, 2013, p. 162). Participants can combine yoga, sitting meditation, and body scanning for forty-five minutes a day. They are encouraged to experiment, perhaps by using two or even three of the different practices together on the same day (for example, thirty minutes of yoga followed by fifteen minutes of sitting).

### *Week 8*

In week 8 of MBSR, participants come back to the CDs. In this week, they are encouraged to practice with the CD with the aim of experiencing guidance after the period without guidance in week 7. There is a notion in MBSR that this comeback deepens the meditation practice by revealing differences between self-guided practice and original guidance. It can reveal the practitioner's mindfulness practice. At this point of mindfulness practice, participants recognize that they now have at least some familiarity, if not intimacy, with all four of the formal mindfulness practices of MBSR.

Loving-kindness meditation is not a standard practice in MBSR. It is usually offered during the all-day meditation session (Kabat-Zinn, 2013). However, not all MBSR programs include the all-day session. In their review, Carmody and Baer (2009) revealed that only thirteen of the thirty published studies of MBSR (43%) included it.

### *The formal structure of sessions*

Each weekly session includes a group discussion in which participants share their experience and mindfulness practice development. It is known as an inquiry into this approach. This part of the training provides social support and helps relationship development; it is also an opportunity for the mindfulness teacher to facilitate mindfulness development by focusing on a detailed exploration of the participants' experience while modeling a curious, interested, open, nonjudgmental, and accepting stance toward them no matter how they are (Baer, 2014, p. 9).

The incorporation of poetry and metaphors is an important part of MBSR sessions. MBSR instructors include the reading of poetry and excerpts from novels in their weekly sessions to illustrate important elements of mindfulness which are difficult to express using ordinary language. The use of metaphors or symbols to describe complex phenomenon is usual in psychotherapy as well.

### *The all-day meditation session*

The all-day session is usually held on a weekend day between week 6 and 7. Participants engage in sitting and walking meditations, body scans, yoga, and mindful eating (lunch) over the course of six to eight hours. Most of the day is spent in silence, except for instructions provided by trainer and a period of sharing at the end of the day.

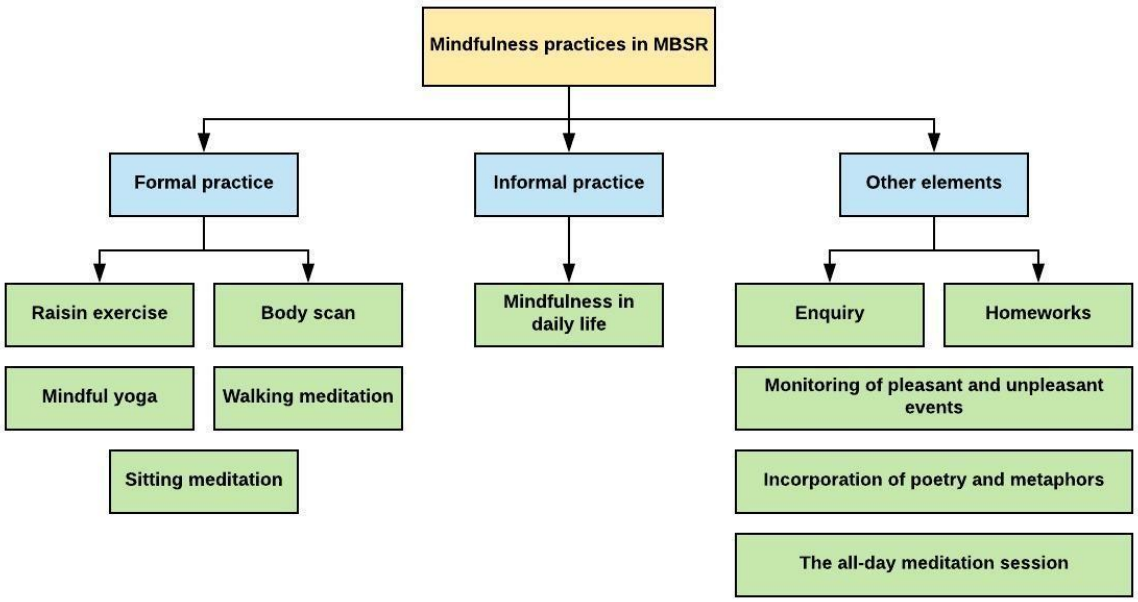

**Figure 12** Mindfulness practices in MBSR

## Mindfulness-based cognitive therapy

Mindfulness-based cognitive therapy (MBCT) was developed to target the specific challenges inherent in chronic mood disorders. It combines systematic mindfulness training with cognitive-behavioral therapy (CBT) to help people with a history of depression learn vital skills (Segal et al., 2012). MBCT was developed to help people learn to recognize automatic cognitive–affective–behavioral patterns, adopt a more decentered perspective, and relate to their experience with curiosity, patience, equanimity, and compassion (Kuyken & Evans, 2014, p. 33).

MBCT is based largely on MBSR. Many of its parts are the same. The raisin exercise, body scan, sitting meditation, yoga, and walking meditation are incorporated into MBCT, along with informal practices of mindfulness in daily life. Poetry and metaphors are also incorporated (Baer, 2014, p. 13).

### *Program structure and content*

The MBCT program usually involves groups between eight and thirteen participants, as in group psychotherapy. The length of sessions ranges from two to two-and-a-half hours according to participants' actual needs and topics. The full-day retreat takes place between the sixth and seventh weeks of the program. Meditation practices include the body scan, gentle yoga, and mindful walking, as well as sitting meditation practices with a focus on the breath, sounds, body sensations, and thoughts, as in MBSR. Each session includes a report about the home practice. MBCT also has specifically developed exercises.

### *The three-minute space exercise*

The three-minute breathing space is specifically designed for MBCT. It is a short formal exercise which allows participants to step out of automatic pilot at any time, and re-establish awareness of the present moment. It is composed of three steps (each practiced for approximately one minute). The first step is to focus awareness on the range of internal

experiences in the current stream of awareness in the present moment. The participant asks, "What is my experience right now?" and notices any bodily sensations, thoughts, and emotions that are present. A stance of non-judgmental acceptance and openness is encouraged. No experience is pushed away or suppressed. The participant acknowledges all of them, even if they are unpleasant or unwanted. The second step is to focus full attention on the movements and sensations of breathing, noticing each inhalation and exhalation as it occurs. The third step is to expand awareness to the body as a whole, including posture and facial expression, and to notice the sensations that are present, again with acceptance and without judgment (Baer, 2014, p. 13). The breathing space is introduced in session 3 of the eight-week program. Participants are encouraged to practice it several times a day.

### *Deliberately bringing difficulties to mind in sitting meditation*

The purpose of this exercise is to counteract the intuitive tendency to avoid difficult or painful feelings. The exercise is introduced and trained in week 5. Within this exercise, the participants are encouraged to call to mind difficult or troubling issues or problems deliberately. The aim is to notice where in the body associated sensations arise. Participants learn that difficulties can be named, faced, and worked with, and that avoidance is not necessary and may be maladaptive. Participants may realize that their attitude toward aversive experience is hostility rather than kindliness (Baer, 2014, p. 14). This training even more concretely addresses the general mindfulness attitudes such as acceptance, trust, and letting go.

### *Cognitive therapy-based exercises*

Even though MBCT does not include traditional cognitive therapy focusing on the awareness and recognition of maladaptive cognitive schemas, it integrates several exercises based on elements of cognitive therapy that emphasize a decentered approach to internal experience.

### *Thoughts and feelings exercise*

In week 2, participants are asked to close their eyes and imagine walking down the street and seeing someone they know on the other side. The participant smiles and waves, but the other

person walks by without seeming to notice. Participants are invited to describe the thoughts, feelings, and sensations they experience when imagining this scenario. The ABC model developed by Beck (1995) is applied as a theoretical background. In this model, a situation (A) leads to a thought or interpretation (B) which leads to a feeling or emotion (C). The key idea of this model is that different thoughts at point B can lead to different emotions at point C. Participants learn that those thoughts are not facts. Another fundamental result of this process is that it shows participants that they are not always aware of the valuations occurring at point B, even though those valuations may have powerful emotional effects. Because thoughts/valuations have a strong influence on emotions, it is important to be more aware of them. Practicing mindfulness skills helps develop this awareness (Baer, 2014, p. 15).

### *Discussion of automatic thoughts*

Week 4 includes a discussion of maladaptive cognitive schemas related to depression or dysphoria. The participant is taught that some depressive or stressful thoughts or convictions (e.g., “I am not a good person”) are symptoms of depression rather than true statements about themselves. The main aim of this learning is to help people see thoughts as mental events rather than as representations of truth or reality.

### *Moods, thoughts, and alternative viewpoints exercise*

This exercise is trained in week 6. It again involves imagining scenarios of different daily life situations. The aim is to demonstrate to participants that thoughts have a powerful influence on feelings. Practicing mindfulness of thoughts will help remember that thoughts are not facts and that thoughts can be allowed to come and go.

### *Pleasure and mastery activities*

This exercise occurs in week 7. It is based on the recognition that taking action can be a critical step in the prevention of prolonged distress reactions, even in depressive episodes. When the mood is low, motivation to be active is also low. However, lowered activity levels often worsen distress and related emotions such as depression and anxiety. It is thus important to be able to

increase activity level even when the motivation to do so is low. Participants recognize that they have two general options for reacting to stress and negative moods: pleasure and mastery activities. Pleasure activities are fun or enjoyable, such as watching a movie, talking with a friend, or eating a delicious dessert. Mastery activities provide a sense of accomplishment, pride, or satisfaction in having achieved something, such as playing sports, walking, or completing work-related tasks. Participants are asked to generate lists of such activities that they could engage in at times when their mood is low. These lists then become useful in the development of relapse prevention action plans (Baer, 2014, p. 17).

Loving-kindness meditation is sometimes included in MBCT, depending on the participants. For example, MBCT for depressive relapse does not include loving-kindness meditation because of the risk that it may trigger rumination and self-criticism in people vulnerable to depression (Baer, 2014; Segal et al., 2013). In contrast, it is commonly included in MBCT programs for stress reduction (Williams & Penman, 2011).

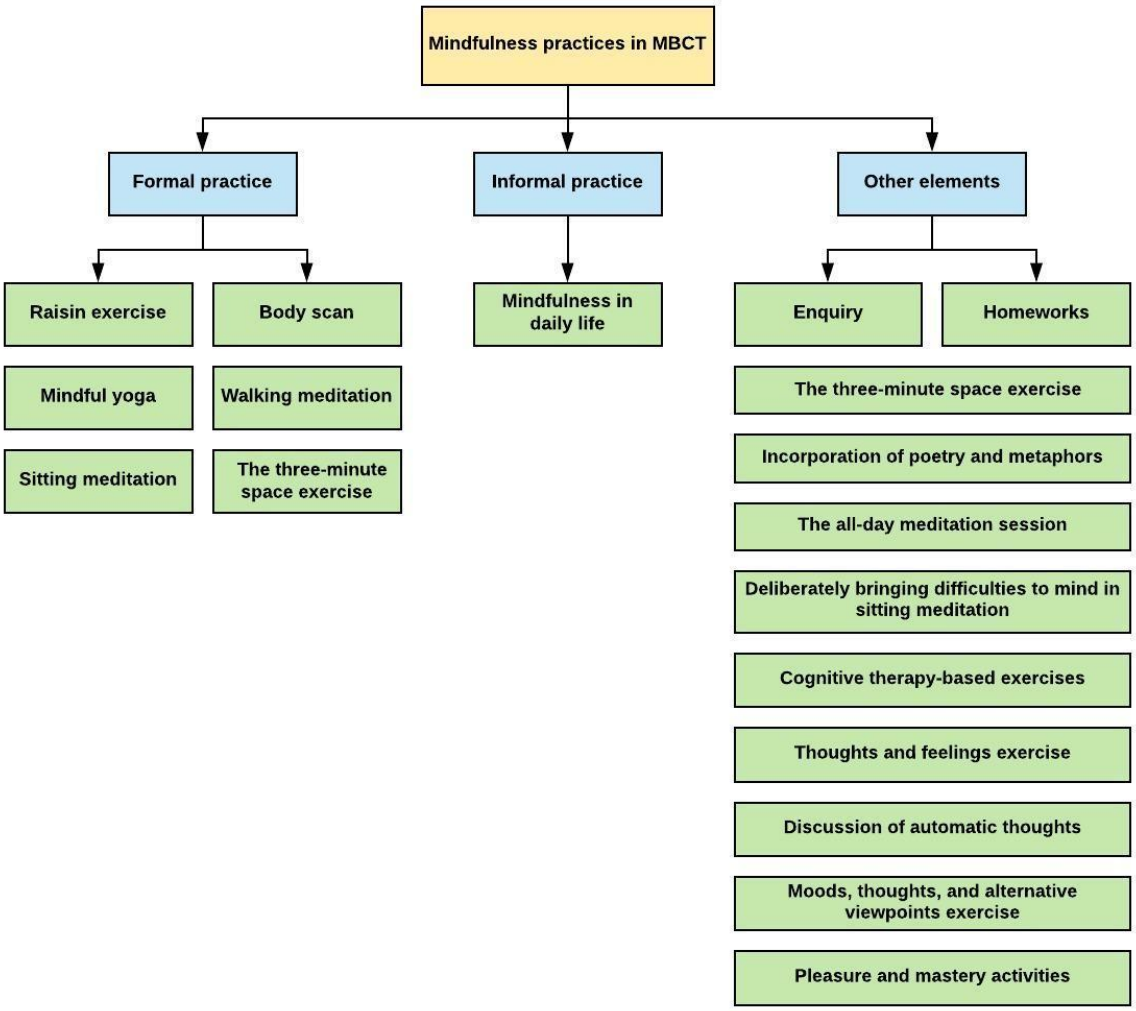


**Figure 13** Mindfulness practices in MBCT

## Effectivity of mindfulness

Ruth Baer (2014), editor of the extensive text *Mindfulness-Based Treatment Approaches: Clinician's Guide to Evidence Base and Applications*, gives a detailed overview of the effective application of the MBIs (especially MBSR and MBCT) in various clinical settings. The authors describe the mindfulness approach to recurrent depression, resistant depression, bipolar disorder, generalized anxiety disorder, overeating and obesity, relapse prevention for addictive behavior, for children, stress reduction, childbirth and parenting, chronic pain, cancer recovery, and strengthening resilience. This list is expanded by the author Fabrizio Didonna (2009) who edited the book *Clinical Handbook of Mindfulness*. The authors show that MBIs can be also used in the treatment of OCD (obsessive-compulsive disorder), suicidality, borderline

personality disorder, eating disorders, trauma and PTSD (post-traumatic stress disorder), ADHD (Attention Deficit Hyperactivity Disorder), and psychosis.

Despite the numerous methodological problems that more and more authors have recently raised (e.g., Nicholas et al., 2017; Tang et al., 2015), the effectiveness of MBI on improving mental health has been repeatedly documented in healthy people (e.g., Antoine et al., 2018; Keng et al., 2011; Tomlinson et al., 2018) and in people with various psychiatric or somatic conditions (e.g., Goldberg et al., 2018; Rahimi-Ardabili et al., 2018). It has specifically been effective in treating a number of physical complaints such as chronic pain (Kabat-Zinn, 1982), psoriasis (Kabat-Zinn et al., 1998), fibromyalgia (Kaplan, Goldenberg, & Galvin-Nadeau, 1993), and many symptoms associated with cancer (Tacon, Caldera, & Ronaghan, 2004). The results also show that mindfulness is effective in the management of severe and chronic physical conditions in children and adolescents (Thompson & Gauntlett-Gilbert, 2008). The mindfulness efficacy has also been proved in preventing relapse of major depression (e.g., Segal et al., 2002) and its residual depressive symptoms (Kingston et al., 2007). It has also been effective in treating anxiety (Evans et al., 2008) and psychosis (Bach & Hayes, 2002; Gaudiano & Herbert, 2006). Many studies have also revealed a significant effect of MBIs in eating disorders (Fairburn, Cooper, & Shafran, 2003; Kristeller & Hallett, 1999; Telch, Agras, & Linehan, 2000). Table 6 summarizes the results of five recent systematic reviews and meta-analyses that, in addition to the effectivity, also describe the mediators and mechanisms of MBI effects. The original results of our research group are presented and discussed in the next chapter. The study assessed the effect of an online version of the MBCT program for stress reduction in medical students.

In their comprehensive meta-analysis, Khoury et al. (2013) showed that MBIs are moderately effective in pre-post comparisons (n = 72; Hedge's g = .55), in comparisons with waitlist controls (n = 67; Hedge's g = .53), and when compared with other active treatments (n = 68; Hedge's g = .33) and other psychological treatments (n = 35; Hedge's g = .22) such as psychoeducation, supportive therapy, relaxation, imagery, and art-therapy. MBIs were more effective in treating psychological disorders than it was in treating physical or medical conditions.

In their review, Chiesa, Brambilla, and Serretti (2010) conclude that MBIs could enhance the regulation of negative emotions through increased activity of frontal cortical structures inhibiting automatic amygdala activation. They also documented significant overlap between

brain areas activated during MBI practice, psychotherapy, and pharmacotherapy, and those activated by expectancy in placebo studies. The authors suggested that MBI practice, psychotherapy, and placebo act through a top-down regulation, while antidepressants could act through a bottom-up process. In general, their results support the notion that MBIs target specific brain areas related to emotions and emotional regulation, as has been repeatedly observed in other interventions, particularly psychotherapy.

**Table 6** The effectivity of MBIs and mediators of its effect

| Study | Type of study | Intervention | Participants | Effect on ↑/↓ | Mediators | Mechanism | Moderator |
|---|---|---|---|---|---|---|---|
| Quaglia et al., 2016 | Systematic review and meta-analysis | MBSR | Healthy and clinical populations | Mindfulness ↑<br>Beneficial intervention outcomes↑ | Mindfulness | Not monitored | Not monitored |
| Van der Velden et al., 2015 | Systematic review | MBCT | Patients with recurrent major depressive disorder | Depression↓<br>Mindfulness skills↑<br>Meta-awareness↑<br>Self-compassion↑<br>Rumination↓<br>Worry↓<br>Cognitive reactivity↓ | Mindfulness skills↑<br>Rumination↓<br>Worry↓<br>Self-compassion↑<br>Suppression of negative thoughts ↓<br>Meta-awareness↑<br>Decentering↑<br>Autobiographical memory specificity? | Not monitored | Not monitored |
| (Gu, et al., 2015) | Systematic review and meta-analysis | MBCT<br>MBSR | Healthy and clinical populations | Depression↓<br>Stress↓<br>Anxiety↓<br>Negative affect↓<br>Mindfulness↑ | Mindfulness↑ | Not monitored | Not monitored |
| | | | | Depression↓<br>Stress↓<br>Global psychological symptoms↓<br>Stress and anxiety↓ | Repetitive negative thinking↓<br>(worry and rumination) | | |
| | | | | Depression↓<br>Anxiety↓<br>Anger expression (Inconsistent results) ↓ | Self-compassion↑ | | |
| | | | | Recurrent depression↓ | Cognitive and emotional reactivity↓ | | |
| | | | | Stress↓<br>Mood ↑ | Psychological flexibility↑ | | |
| Khoury et al., 2013 | Comprehensive meta-analysis | MBSR, MBCT | Healthy and clinical populations | Anxiety ↓<br>Depression ↓<br>Stress ↓ | Not monitored | Not monitored | Not monitored |

| Study | Type of study | Intervention | Participants | Effect on ↑/↓ | Mediators | Mechanism | Moderator |
|---|---|---|---|---|---|---|---|
| Parsons et al., 2017 | Systematic review and meta-analysis | MBSR, MBCT | Healthy and clinical populations | Psychological functioning ↑<br>Physical functioning ↑ | Self-reported home practice ↑ | Not monitored | Not monitored |
| Shapiro et al., 2011 | Randomized controlled trial | MBSR | Undergraduate students | Mindfulness ↑<br>Rumination↓<br>Well-being↑<br>Self-compassion↑<br>Hope↑<br>Empathy↑<br>Forgiveness↑ | Not monitored | Not monitored | Pretreatment trait mindfulness |

## Mindful in Medical School, Thanks to Facebook: Online Mindfulness-Based Mental Health Support Program with Intensive Reminder System[15]

Studies have repeatedly documented that medical students have a higher prevalence of burnout and severe distress symptoms than the general population (Dahlin et al., 2005; Dyrbye et al., 2006; Ishak et al., 2013). Almost half of them experience these symptoms during their studies; from 5 to 10% report suicidal ideation (Dyrbye et al., 2008). The prevalence of burnout syndrome develops over the course of medical education and may persist beyond medical school among residents (Thomas, 2004). Burnout is mainly related to the inadequacies of the learning and work environment (Dyrbye & Shanafelt, 2016). From this point of view, developing a preventive program in this area is a fundamental need for medical faculty teachers and health psychologists. Such a program could positively influence the mental and physical health of medical students, and it could significantly influence the medical practice itself through a fundamental attitude shift among doctors toward themselves and their patients (Epstein, 2017).

Mindfulness-based mental health support programs for medical students are promising. Growing evidence from studies conducted with medical students indicates that stress reduction programs based on mindfulness are beneficial in terms of reducing negative emotions and stress while enhancing mindfulness, empathy, and self-compassion (Dobkin & Hutchinson, 2013; Rosenzweig et al., 2003; Shapiro et al., 1998; Warnecke et al., 2011). This is also reflected in the increasing number of mindfulness centers associated with medical schools and mindfulness-related activities offered to medical students in the United States (Barnes et al., 2017); a similar analysis has not been performed in Europe.

For any treatment, the goal is an approach that will be effective, with minimal economic costs and maximum selected population impact. It is necessary to distinguish the level of change at which the intervention/treatment should be focused. If successful processes of change are efficiently addressed at the right time, intervention could be effective without requiring the deeper analytical level offered by individual psychotherapy (Norcross et al., 2011; Prochaska, 1997). It is unlikely that a single program will work for all participants, but a connection with a technological platform can reach more people and is more likely to address people who are

[15] Svetlak, M., Linhartova, P., Knejzlikova, T., Kosa, B., Sumec, R., Hornickova, V., Jarolinova, K., Lucanska, K., Slezackova, A., Kasparek, T. (submited to Applied Psychology: Health and Well-Being). Mindful in Medical School, Thanks to Facebook: Online Mindfulness-Based Mental Health Support Program with Intensive Reminder System

already ready for a change. There has therefore been an increasing effort to transfer mindfulness-based programs to online versions (Fish et al., 2016).

Even though the therapist-client relationship and dialogue are irreplaceable, online interventions offer some advantages, especially for people who are functioning at a good or adequate personality level. Online programs 1) are easily accessible; 2) are anonymous; 3) are available 24/7 to people during the course of their daily life; 4) do not necessarily require the involvement of a therapist educated in mindfulness; 5) are less expensive; and 6) save time (Andersson & Cuijpers, 2009; Andersson & Titov, 2014; Spijkerman et al. 2016). Almost half of the people in one study would prefer an online format of mindfulness meditation intervention to a face-to-face format (Wahbeh et al., 2014). The preference for online delivery is reflected in the increasing number of mindfulness-based mobile apps; a search identified 560 available applications (Mani et al., 2015).

Increasing evidence supports the advantages and effectiveness of online mindfulness-based programs (Cavanagh et al., 2018; Fish et al., 2016; Spijkerman et al., 2016). The online format of MBI has been shown to be effective in supporting mental health and reducing psychopathology symptoms in patients with cancer (Kubo et al., 2018; Zernicke et al., 2014, 2016), in healthy subjects (Cavanagh et al., 2018; Querstret et al., 2018), and in patients with depression (Lappalainen et al., 2015), anxiety (Krusche et al., 2013), tinnitus (Hesser et al., 2012), chronic pain (Dowd et al., 2015), and fibromyalgia (Davis & Zautra, 2013).

There are important differences in the construction, length, and delivery of interventions in the mindfulness programs currently delivered by technology without facilitator involvement (Fish et al., 2016). These programs vary on the spectrum of interventions, ranging from Audio CDs combined with regular phone call reminders (Altschuler et al., 2012) to web-based programs combined with regular email reminders (Cavanagh et al., 2018; Krusche et al., 2012). A review by Fish et al. (2016) revealed some elements that should be included in future programs, including a modular course structure, use of different materials within the same course (e.g., text, audio, videos, and printouts), and an e-learning approach. From a clinical point of view, each similar online program should have two perspectives. One is the perspective of delivery and of teaching the original content of the selected program – formal and informal practice in MBSR or mindfulness-based cognitive therapy (MBCT); the second perspective is that of helping people to be fully absorbed in the program in each present moment.

We developed a program that integrates these components. Our program also integrates a face-to-face approach, which is common for mindfulness programs in which the facilitator is involved through the introductory lecture and participants are able to meet the whole mindfulness team who prepared the program. Our main aim is to offer students a regular and evidence-based program which helps them to support their mental health and acquire healthy mind habits. Many researchers and practitioners agree that mindfulness meditation, through the nonjudgmental awareness of experiences in the present moment, produces beneficial effects on well-being and ameliorates stress-related symptoms (Alsubaie et al., 2017; Hölzel et al., 2011; López et al., 2018; Tang et al., 2015) through the increase of resilience, positive emotions, more frequent use of adaptive emotion regulation strategies, satisfaction with life, subjective quality of life, and self-compassion (Hölzel et al., 2011).

We hypothesize that an eight-week online mindfulness program will induce a subjectively assessed increase in basic facets of mindfulness, resilience, positive emotions, the frequency of adaptive emotion regulation strategies, satisfaction with life, self-compassion, and quality of life. Specifically, we assume that the importance attributed to the quality of life components will be lower at the end of the program, with an unchanged satisfaction with life. The fundamental assumption of Buddhism and Buddhist psychology is that there is no such thing as a permanent, unchanging self (Epstein, 1988). The self is more of a process in the present moment than a solid structure stored in autobiographical memory. Meditation practice leads to enhanced internal awareness, and meditators usually report that they can observe mental processes with increasing clarity; meditation facilitates a detachment from identification with the static sense of self (Hölzel et al., 2011). This change in perspective of the self is often subjectively experienced as a feeling of freedom and liberation. This shift in the perception and awareness of the transient nature of the self reflects the understanding that things of the external world are also transient. The result of this change in perspective could be monitored as the decreased subjective importance of the life satisfaction components.

## Methods

### *Participants*

In total, 312 Masaryk University medical students participated in the study (mean age 22.2 years with *SD* 2.9, 81% women). Of those, 239 subjects agreed to take part in an eight-week online mindfulness program. The control group was formed from 73 students who did not get into the *Self-Development for Medical Students* course due to the limited capacity. This subject runs at the same time as the on-line program. The students were offered credit for remaining in the study as a control. The university's ethics committee approved the study, and all participants gave their written informed consent.

## Procedure

### *Recruitment*

All subjects were university students recruited through advertisements on the website and Facebook page of the Department of Psychology and Psychosomatics of the Medical Faculty of Masaryk University. The advertisement was also posted to the web news portal of Masaryk University, MUNI.ONLINE.CZ, one month before the program started. The opportunity to participate in the program was announced during lectures at the department and on notice boards at the faculty. *Self-Development for Medical Students* is an optional course that is offered every semester. The interest in the subject usually exceeds the class capacity, and many students are often waitlisted for the next semester. Students are chosen for the course randomly by lot.

### *Data collection*

The program participants completed baseline questionnaires before the introductory lecture (pen and pencil method). The waitlist group completed the questionnaire during an informational meeting before the *Self-Development for Medical Students* course started. The data collection took place in the same week in both groups. The control measure at the end of the program was created in Google Forms. The link to the questionnaires was sent individually through email to each participant. The notification was sent three times, with a one-week spacing between notifications.

## Program

The program was divisible into three parts: 1) the introductory lecture, 2) the program itself, and 3) the reminders to practice. The introductory lecture lasted 90 minutes and had eight parts: 1) introduction of the lecture team, 2) assignment to a Facebook group (for ethical and legal reasons, each student had to be included in the group personally), 3) motivation section aimed at documenting the positive effect of mindfulness on mental and physical health, 4) introduction of the foundations of mindfulness practice and its basic attitudes (Kabat-Zinn, 2013), 5) focus on commitment, self-discipline, intentionality, and personal vision, 6) introduction of basic approaches to formal and informal mindfulness practice, 7) introduction of the structure and delivery mode of the program, and 8) discussion. Our online program followed the structure and content of the two most-researched mindfulness-based stress reduction programs, MBSR (Kabat-Zinn, 2013) and MBCT (Segal et al., 2002). The formal part of the program was run in precise accordance with the book *Mindfulness: A Practical Guide to Finding Peace in a Frantic World* (Williams & Penman 2011). The "reminder messages" of the program were based on the books *The Mindfulness Solution: Everyday Practices for Everyday Problems* (Siegel, 2010) and *Full Catastrophe Living (Revised Edition): Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness* (Kabat-Zinn, 2013). The program ran for over eight weeks, during which participants were asked to practice mindfulness formally and informally six days of the week. The course was organized into eight modules. Each week's module started on Monday morning with a pdf file in which the plan for the whole week was presented and explained. The pdf files ranged from three to five pages; a summary of the whole program is presented in chapter 4: "A Week-by-Week Summary of the Program" (Williams & Penman, 2011). Reminders to practice were delivered through Facebook Messenger. They consist of encouragement reminders, incentives, explanations, and recommendations for formal and informal mindfulness practice. There were 456 reminders in the course of the program (from seven to twelve per day). The first reminder was always sent at 7:30 a.m. and the last one at 9 p.m. The others were delivered with one or two hours spacing within the day. The intensive reminder system was a reaction to our clinical experience and to frequent patient statements of how great it would be if somebody could remind them of important things from their psychotherapy sessions at the right moment in their daily life, before problematic behaviors, thoughts, and emotions appeared. The frequent reminders were in accordance with the need to activate the processes of change, including stimulus control, which is activated by using reminders and cues encouraging healthy behavior as substitutes for those that encourage

unhealthy behavior (Norcross et al., 2011). The structure and content of the reminders are presented in Table 1. Audio recordings recommended in the book (Williams & Penman, 2011) were available for download at the "Books for Better Living" website, Mindfulness Meditation Downloads (2012), where every recommended meditation is freely available (Meditation 1, Mindfulness of Body and Breath; Meditation 2, The Body Scan; Meditation 3, Mindful Movement; Meditation 4, Breath and Body; Meditation 5, Sounds and Thoughts; Meditation 6, Exploring Difficulty; Meditation 7, Befriending; and Meditation 8, The Three-Minute Breathing Space). The foundations of mindfulness practice and its basic attitudes were presented via short videos (from 2'19" to 4'14") on YouTube.com, with each attitude presented by Jon Kabat-Zinn (Kabat-Zinn, 2015). Students had the opportunity to share their experiences and questions with others within the Facebook group. Sharing was repeatedly encouraged via reminders aimed at helping the participants get social support from the group. Participants also had the opportunity to communicate in writing with the lecture team regarding any questions or difficulties about formal and informal practice. Participation in the program was completely free.

## Measures

The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al. 2006, 2008) is a widely used tool that measures dispositional mindfulness. The questionnaire has five subscales: Describe, Observe, Act with Awareness, Nonjudging of Inner Experience, and Nonreactivity to Inner Experience. The items are rated from 1 = "never or very rarely true" to 5 = "very often or always true". Higher scores indicate higher mindfulness. All items from the Act with Awareness and Nonjudge subscales and half of the items in the Describe subscale are reverse-worded. The internal consistency of the subscales ranges between $C\alpha = 0.72 – 0.92$.

The Subjective Emotional Balance Questionnaire (SEBQ; Kozeny, 1993) assesses prevailing positive and negative emotional experiencing. The questionnaire has two subscales (Positive Emotional Experiences and Negative Emotional Experiences), with eighteen items each. The items are evaluated on a scale from 1 = "almost never" to 5 = "very often". The internal consistency was found to be $C\alpha = 0.93$ for both scales.

The Perceived Stress Reactivity Scale (PSRS; Schlotz et al., 2011) is a questionnaire assessing individual typical reactivity to everyday life stressors. The scale has twenty-three items (with

twelve items reverse-worded) and five subscales: Prolonged Reactivity (four items), Reactivity to Work Overload (five items), Reactivity to Social Conflict (five items), Reactivity to Failure (four items), and Reactivity to Social Evaluation (five items). The items are rated from 0 (low-stress reactivity) to 2 (high-stress reactivity). The internal consistency of the subscales ranges between Cα = 0.71 – 0.91.

The Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski & Kraaij, 2007) assesses a set of cognitive emotion regulation strategies. It has thirty-six items and nine subscales with four items in each subscale: Self-blame, Acceptance, Rumination, Positive refocusing, Refocus on Planning, Positive Reappraisal, Putting into Perspective, Catastrophizing, and Others-blame. The subscale Rumination was excluded from this study due to its low internal consistency. The items are rated from 1 = "almost never" to 5 = "almost always". The internal consistency of the subscales ranges between Cα = 0.68 – 0.83.

The Satisfaction with Life Scale (SWLS; Diener et al., 1985) measures overall satisfaction with life with five items rated from 1 = "strongly agree" to 7 "strongly disagree". The internal consistency ranges between Cα = 0.80 – 0.96.

The Brief Resilience Scale (BRS; Smith et al., 2008) measures the ability to recover from stressful situations. The BRS has six items rated from 1 = "absolutely agree" to 5 = "absolutely disagree". The internal consistency was reported to be between Cα = 0.80 – 0.91.

The Self-Compassion Scale-Short Form (SCS-SF; (Raes et al., 2011) measures individual compassion for oneself. The SCS-SF is a short form of the twenty-six item Self-Compassion Scale (SCS; Neff, 2003) and has a high correlation with the full SCS ($r \geq 0.97$). The SCS-SF has twelve items and six subscales with two items in each subscale: Self-Kindness, Self-Judgment, Common Humanity, Isolation, Mindfulness, and Over-identified. The items are rated from 1 = "never" to 5 = "always". The internal consistency was found to be Cα = 0.86.

Subjective Quality of Life Analysis (SQUALA; Zannotti & Pringuey, 1992) measures the quality of life defined as a difference between the importance and the satisfaction. The questionnaire investigates the subjective perspective of the respondent's life situation. The respondents evaluate their satisfaction in the areas of life they consider important. The tool has twenty-three areas mapping both internal and external factors affecting everyday life. The questionnaire has two parts: the first is about the importance and the second about satisfaction. The respondents assess both on a scale from 1 = "very satisfied" to 5 = "very disappointed".

The result is a comparison between the two parts. The internal consistency was found to be between Cα = 0.82 – 0.90 (Chrastina et al., 2014).

### *Data analysis*

All data analysis was conducted with IBM SPSS Version 21 (IBM Corp 2012). For the analysis, the participants were divided into three groups: program group consisted of participants who completed full program, program-dropout group consisted of participants who started, but did not finish the program, and control group consisted of participants on a waitlist who were not included in the program at all and only filled in the test batteries. First, initial differences in average scores of thirty-three continuous dependent variables between the program group, program-dropout group, and control group before the program were compared using MANOVA and Bonferroni post-hoc tests. Further, pre- and post-program differences in thirty-three continuous dependent variables were compared within the program group by paired t-tests. Bonferroni correction was applied, resulting in a significance threshold of $p = 0.002$. Finally, program and control groups were compared by independent sample t-tests with Bonferroni correction in the variables which had changed after the program within the program group, to indicate whether this change is specific for the program group.

Table 1 Program structure and content

| **Type of intervention** | **Intervention examples** | **Total[1]** | **Total original[2]** |
|---|---|---|---|
| Welcome message | Good morning. Today is the first day of your mindfulness journey. Please read today's pdf file, "The First Mindfulness Week" which you can find on the news feed right now. You will get a clear idea of what is waiting for you in the first week and where our shared path will take us. | 33[3] | 33 |
| Formal practice reminder | Have you had time yet today to practice the *mindful body and breathe* exercise? It is hard to find time and there is no need to feel guilty if you haven't done it yet. But try to find eight minutes today. | 26 | 24 |
| Informal practice reminder | Maybe you are having lunch, drinking coffee, going somewhere, or waiting for something. Try to be in fully aware contact with this activity. Without judgement, with patience, with curiosity and acceptance of everything that is happening. | 33 | 31 |
| Be in the present moment reminder | Take a moment to stop and look around. Just be fully aware of where you are and whether your mind is in this place. | 71 | 60 |
| Focus on breathing reminder | Take a moment to acknowledge your breath. Inhale and exhale, nothing more. Do not rush and do not try to change, just acknowledge it fully. | 53 | 31 |
| Focus on body sensations reminder | Take a few moments to realize what feelings you feel in your body. Be aware of where your clothes are touching your body. If you are standing, be aware of the feelings of your legs and feet. If you are sitting, note the sensations at the point where your body touches the chair. | 24 | 20 |
| Focus on sensory inputs reminder | Look around you. Take a moment to be aware of what you see, what you hear, what you smell, the taste in your mouth. | 17 | 5 |
| Observe thoughts and feelings reminder | Stop for a little while and notice from moment to moment what is happening, how your thoughts and feelings appear and how they disappear. | 29 | 25 |
| Basic attitudes reminder | Patience means to be open to every moment, to receive it in its fullness, and to know that things can only take place in their own time. Give this principle two minutes today. | 22 | 20 |
| Personal vision reminder | Maybe you are not following the instructions. Maybe the instructions are just frustrating and upsetting. Maybe you wonder what it's all about. Try to return to your vision before going to bed, remember why you are in the program and what is important to you. | 6 | 4 |
| Mindfulness metaphors | In the ocean, at a depth of three to six meters, only subtle waves and tranquility are felt, even when there is a great storm on the surface. It is similar when we focus on breathing in the belly. We | 9 | 9 |

| | | | |
|---|---|---|---|
| | perceive an area of the body that is far from the head, and thus far below the surface of our raging mind. | | |
| Mindfulness education | The mindfulness exercise begins with focusing attention on breathing and continues on to body sensations, feelings, thoughts, and ultimately comes the experience of self. Gradually, we react increasingly less reactively to everything that appears and gain a greater sense of freedom. Instead of running away from difficult emotions, we are increasingly able to cope with any reaction. | 59 | 56 |
| Time, sleep, work, and study stress | Sometimes it is difficult to sleep in the evening because we cannot get rid of some thoughts. The more we try, the worse it is. Letting things and thoughts be, letting them go at the right time is an important life skill. Remember the principle "let it go". | 11 | 11 |
| Compassion and gratitude reminder | Try to say to yourself: *May I be free from suffering. May I be as happy and healthy as it is possible for me to be. May I have ease of being. May I learn to not be stuck in the past. May I be able to accept everything that life brings to me.*<br>Whatever you eat today, try to acknowledge where the food comes from, the laws of nature and the people to whom we owe gratitude. | 10 | 9 |
| Self-compassion reminder | In this moment, let yourself be as you are. | 27 | 23 |
| Change in perspective on the self-reminder | Often, we are unhappy because we cling to a particular image of ourselves. But if everything is transient, no picture actually exists. So why bother with something that is not real? | 9 | 9 |
| Summary at the end of the day | The evening is a time of peace, a return from the outside world to the inner realm. It is also a time when we often admit many more things that are troublesome to us. Be sensitive and note how many past or future concerns there are. Try the *three-minute breathing space* exercise. Let yourself be led by Mark Williams or do it by yourself, if you know it now. Good night. | 17[4] | 17 |

[1]Total number of reminders; [2]Total number of original reminders that were not repeated; [3]This number does not match the total number of days in the entire program. It would otherwise be 48 days. Some welcome messages, however, included more than just greetings and so they were included in other type of intervention subgroups. [4]This number does not match the total number of days in the entire program. It would otherwise be 48 days. Some summaries at the end of the day, however, included more than just summary greetings and so they were also included in other type of intervention subgroups.

## Results

### *Adherence*

From the 239 subjects who participated in the program, 135 (56.5%) completed the program in the sense that they completed a post-program test battery (program group), leaving 104 (43.5%) subjects who probably dropped out during the program or simply did not complete the post-program test battery (program-dropout group). In the control group (students waitlisted for the *Self-Development for Medical Students* course), 73 subjects completed the post-program test battery (control group).

### *Differences between groups before the program*

Initial differences between the program group (*N*=135), program-dropout group (*N*=104), and control group (*N*=73) before the program were analyzed in demographic variables and target scales. Differences in sex frequencies (84% women in the program group, 76% women in the program-dropout group, and 75% women in control group) were analyzed using a chi-square test; no significant differences were found ($X^2$ (4) = 5.33, $p$ = 0.256). Differences in average scores of thirty-three continuous dependent variables (age, five FFMQ subscales and total score, two SEBQ subscales, five PSRS subscales and score, eight CERQ subscales, SWLS score, BRS score, six SCS-SF scores, and two SQUALA scores) were compared using MANOVA and post-hoc tests with Bonferroni correction. Significant group effects were found in the FFMQ subscales Act with Awareness ($F$ (2) = 8.873, $p < 0.001$, $\eta^2$ = 0.054) and Nonreactivity to Inner Experience ($F$ (2) = 4.129, $p$ = 0.017, $\eta^2$ = 0.026); and in the PSRS subscales Reactivity to Work Overload ($F$ (2) = 7.337, $p$ = 0.001, $\eta^2$ = 0.045) and Reactivity to Social Evaluation ($F$ (2) = 3.323, $p$ = 0.037, $\eta^2$ = 0.021). Descriptive statistics of the four scales are displayed in Table 2. Bonferroni post-hoc test revealed that the control group showed higher FFMQ subscales Act with Awareness and Nonreactivity to Inner Experience and lower PSRS subscales Reactivity to Work Overload and Reactivity to Social Evaluation than the program group. There were no significant differences between the program group and the program-dropout group. No significant difference was found between these two groups at the program start in simple self-efficacy, as measured through the question "How much do you believe that you will follow the program requirements for eight weeks?" The item was rated from 1 = "I do not believe I can do it" to 10 = "I believe I can do it": program group 7.41 ± 1.78; program-

dropout group 7.22 ± 1.99; t (236) = 0.783, p = 0.43. One significant difference was found between the control group and program-dropout group: higher scores of the FFMQ subscale Act with Awareness in the control group.

**Table 2** Descriptive statistics of variables in which statistical differences were found between the groups before the start of the program

| Dependent variable | Group | *M* | *SD* | *p* value of Bonferroni post-hoc tests | | |
|---|---|---|---|---|---|---|
| | | | | Program (N 135) | Dropout (N 104) | Control (N 73) |
| FFMQ Act Awareness | program | 2.80 | 0.70 | - | = 1.000 | < **0.001** |
| | program-dropout | 2.86 | 0.63 | - | - | **= 0.004** |
| | control | 3.19 | 0.67 | - | - | - |
| FFMQ Non-reactivity | program | 2.68 | 0.63 | - | = 0.729 | **= 0.013** |
| | program-dropout | 2.77 | 0.58 | - | - | = 0.250 |
| | control | 2.92 | 0.54 | - | - | - |
| PSRS Reactivity to work overload | program | 1.37 | 0.43 | - | = 0.336 | < **0.001** |
| | program-dropout | 1.28 | 0.45 | - | - | = 0.069 |
| | control | 1.13 | 0.44 | - | - | - |
| PSRS Reactivity to social evaluation | program | 1.33 | 0.42 | - | = 0.318 | **= 0.041** |
| | program-dropout | 1.24 | 0.45 | - | - | = 0.989 |
| | control | 1.18 | 0.40 | - | - | - |

*Note*. Higher scores indicate higher mindfulness in FFMQ subscales and higher perceived stress in PSRS.

### *Program effectivity analysis*

To assess the effects of the program, we first ran a series of thirty-two paired t-tests between scores before and after the program in the program group separately. We used Bonferroni correction resulting in a statistical threshold of p = 0.002. Descriptive statistics of the scores before and after the program for the program group in all scales together with the results of the paired t-tests are displayed in Table 3. Significant differences were found in all FFMQ subscales and in total FFMQ scores, with higher scores after the program; in both SEBQ subscales, with higher scores in the positive subscale and lower scores in the negative subscale after the

program; in all PSRS subscales and in its total score, with lower scores after the program; in the CERQ subscales Self-blame, Positive Reappraisal, and Catastrophization, with lower scores in Self-Blame and higher scores in Positive Reappraisal and Catastrophization after the program; in SWLS, with higher score after the program; in the SCS-SF subscales Self-Kindness, Isolation, Mindfulness, and Over-identified, with higher scores in the Self-Kindness and Mindfulness scales and lower scores in the Isolation and Over-identified scales after the program; and in the SQUALA importance scale, with lower scores after the program.

**Table 3** Descriptive statistics and paired t-test results for pre- and post-program scores within the program group

| Scale | Time | *M* | *SD* | *t* | *df* | *p* | *d* |
|---|---|---|---|---|---|---|---|
| FFMQ Describe | pre | 3.05 | 0.82 | -5.602 | 134 | < **0.001** | -0.364 |
| | post | 3.38 | 0.75 | | | | |
| FFMQ Observe | pre | 3.20 | 0.73 | -5.918 | 134 | < **0.001** | -0.593 |
| | post | 3.56 | 0.58 | | | | |
| FFMQ Act Aware | pre | 2.80 | 0.70 | -6.127 | 134 | < **0.001** | -0.554 |
| | post | 3.17 | 0.69 | | | | |
| FFMQ Nonjudge | pre | 3.09 | 0.85 | -7.051 | 134 | < **0.001** | -0.655 |
| | post | 3.54 | 0.81 | | | | |
| FFMQ Non-Reactivity | pre | 2.68 | 0.63 | -6.833 | 134 | < **0.001** | -0.562 |
| | post | 3.03 | 0.60 | | | | |
| FFMQ Total | pre | 2.97 | 0.49 | -8.928 | 134 | < **0.001** | -0.776 |
| | post | 3.34 | 0.49 | | | | |
| SEBQ Negative | pre | 2.48 | 0.66 | 3.699 | 134 | < **0.001** | 0.378 |
| | post | 2.26 | 0.68 | | | | |
| SEBQ Positive emotivity | pre | 3.41 | 0.68 | -3.322 | 134 | < **0.002** | -0.240 |
| | post | 3.58 | 0.73 | | | | |
| PSRS Prolonged Reactivity | pre | 1.03 | 0.41 | 5.741 | 133 | < **0.001** | 0.484 |
| | post | 0.82 | 0.44 | | | | |
| PSRS Reactivity to | pre | 1.37 | 0.43 | 7.661 | 134 | < **0.001** | 0.620 |
| | post | 1.10 | 0.43 | | | | |
| PSRS Reactivity to Social | pre | 1.35 | 0.42 | 6.218 | 134 | < **0.001** | 0.545 |
| | post | 1.14 | 0.44 | | | | |
| PSRS Reactivity to Failure | pre | 1.41 | 0.40 | 6.975 | 134 | < **0.001** | 0.614 |
| | post | 1.17 | 0.37 | | | | |
| PSRS Reactivity to Social | pre | 1.33 | 0.42 | 7.281 | 134 | < **0.001** | 0.614 |
| | post | 1.11 | 0.45 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PSRS Total | pre | 1.30 | 0.30 | 10.087 | 133 | < **0.001** | 0.880 |
| | post | 1.07 | 0.33 | | | | |
| CERQ Self-Blame | pre | 3.21 | 0.74 | 4.357 | 134 | < **0.001** | 0.377 |
| | post | 2.95 | 0.75 | | | | |
| CERQ Acceptance | pre | 3.41 | 0.70 | -3.224 | 134 | < **0.002** | -0.267 |
| | post | 3.60 | 0.73 | | | | |
| CERQ Positive refocusing | pre | 2.43 | 0.84 | -3.001 | 134 | = 0.003 | -0.275 |
| | post | 2.66 | 0.83 | | | | |
| CERQ Refocus on planning | pre | 3.07 | 0.65 | -0.512 | 134 | = 0.609 | -0.045 |
| | post | 3.10 | 0.69 | | | | |
| CERQ Positive reappraisal | pre | 3.31 | 1.00 | -4.280 | 134 | < **0.001** | -0.356 |
| | post | 3.60 | 0.93 | | | | |
| CERQ Putting into perspective | pre | 3.38 | 0.92 | -0.746 | 134 | = 0.457 | -0.061 |
| | post | 3.43 | 0.90 | | | | |
| CERQ Catastrophizing | pre | 2.17 | 0.78 | -3.166 | 134 | < **0.002** | -0.289 |
| | post | 2.39 | 0.61 | | | | |
| CERQ Others-blame | pre | 1.91 | 0.65 | -1.952 | 134 | = 0.053 | -0.182 |
| | post | 2.03 | 0.70 | | | | |
| SWLS | pre | 4.57 | 1.13 | -4.408 | 134 | < **0.001** | -0.357 |
| | post | 4.85 | 1.18 | | | | |
| BRS | pre | 2.86 | 0.92 | -3.067 | 134 | = 0.003 | -0.267 |
| | post | 3.06 | 0.93 | | | | |
| SCS-SF Self-Kindness | pre | 2.94 | 0.87 | -4.778 | 134 | < **0.001** | -0.388 |
| | post | 3.27 | 0.86 | | | | |
| SCS-SF Self-Judgment | pre | 2.77 | 1.11 | 2.593 | 134 | = 0.011 | 0.225 |
| | post | 2.54 | 1.06 | | | | |
| SCS-SF Common | pre | 2.84 | 0.78 | -1.716 | 134 | = 0.088 | -0.142 |
| | post | 2.96 | 0.84 | | | | |
| SCS-SF Isolation | pre | 3.51 | 0.83 | 7.688 | 134 | < **0.001** | 0.673 |
| | post | 2.94 | 0.90 | | | | |
| SCS-SF Mindfulness | pre | 3.34 | 0.86 | -3.468 | 134 | < **0.001** | -0.298 |
| | post | 3.58 | 0.76 | | | | |
| SCS-SF Over-identified | pre | 3.79 | 0.81 | 7.119 | 134 | < **0.001** | 0.629 |
| | post | 3.28 | 0.91 | | | | |
| SQUALA Satisfaction | pre | 2.07 | 0.33 | 0.345 | 134 | = 0.731 | 0.031 |
| | post | 2.06 | 0.43 | | | | |
| | pre | 2.47 | 0.43 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SQUALA | post | 2.26 | 0.53 | 5.895 | 134 | < **0.001** | 0.545 |

*Note*. Statistical threshold was set to $p = 0.002$ resulting from Bonferroni correction on the number of tests (0.05 / 32 and rounded).

Next, we computed the differences between pre- and post-program scores in the twenty-four dependent variables in which we found a significant effect of the program in the program group (Table 4). The differences were then compared between the program group and control group using independent sample t-tests to analyze whether the effects observed in the previous analysis were specific for the program group. Again, we used Bonferroni correction resulting in a statistical threshold of $p = 0.002$. Significant differences in pre- and post-program scores between the program and control groups were found in all FFMQ subscales and in its total score; in the SEBQ positive emotivity scale; in the PSRS Prolonged Reactivity, Reactivity to Work Overload, and Reactivity to Social Evaluation subscales and in its total score; in the CERQ Self-Blame and Positive Reappraisal scales; in the SCS-SF scales Self-Kindness, Isolation, and Over-identified; and in the SQUALA Importance scale.

**Table 4** Descriptive statistics for differences between pre- and post-program scores and results of independent sample t-tests between program and control groups

| Scale | Group | *M* | *SD* | *t* | *df* | *p* | *d* |
|---|---|---|---|---|---|---|---|
| FFMQ Describe | program | 0.33 | 0.70 | 4.297 | 206 | < **0.001** | 0.678 |
| | control | -0.08 | 0.51 | | | | |
| FFMQ Observe | program | 0.36 | 0.68 | 4.460 | 187.02 | < **0.001** | 0.585 |
| | control | -0.02 | 0.62 | | | | |
| FFMQ Act Aware | program | 0.37 | 0.70 | 5.698 | 206 | < **0.001** | 0.840 |
| | control | -0.18 | 0.61 | | | | |
| FFMQ Nonjudge | program | 0.45 | 0.73 | 4.721 | 189.336 | < **0.001** | 0.667 |
| | control | 0.03 | 0.53 | | | | |
| FFMQ Non-Reactivity | program | 0.35 | 0.59 | 5.585 | 206 | < **0.001** | 0.821 |
| | control | -0.13 | 0.58 | | | | |
| FFMQ Total | program | 0.37 | 0.48 | 7.581 | 185.59 | < **0.001** | 1.071 |
| | control | -0.08 | 0.36 | | | | |
| SEBQ Negative emotivity | program | -0.22 | 0.70 | -2.645 | 206 | = 0.009 | -0.378 |
| | control | 0.06 | 0.78 | | | | |
| SEBQ Positive emotivity | program | 0.17 | 0.60 | 3.287 | 206 | < **0.002** | 0.472 |
| | control | -0.13 | 0.67 | | | | |
| PSRS Prolonged Reactivity | program | -0.21 | 0.43 | -3.448 | 205 | < **0.002** | -0.484 |
| | control | 0.01 | 0.48 | | | | |
| PSRS Reactivity to Work | program | -0.27 | 0.40 | -7.207 | 206 | < **0.001** | -1.060 |
| | control | 0.17 | 0.43 | | | | |
| PSRS Reactivity to Social | program | -0.21 | 0.40 | -2.893 | 206 | = 0.004 | -0.427 |
| | control | -0.05 | 0.35 | | | | |
| PSRS Reactivity to Failure | program | -0.24 | 0.40 | -2.331 | 206 | = 0.021 | -0.329 |
| | control | -0.11 | 0.39 | | | | |
| PSRS Reactivity to Social | program | -0.22 | 0.35 | -4.984 | 206 | < **0.001** | -0.714 |
| | control | 0.03 | 0.35 | | | | |
| PSRS Total | program | -0.23 | 0.26 | -6.428 | 205 | < **0.001** | -0.962 |
| | control | 0.02 | 0.26 | | | | |
| CERQ Self-Blame | program | -0.27 | 0.71 | -3.770 | 134 | < **0.001** | -0.556 |
| | control | 0.13 | 0.73 | | | | |
| CERQ Acceptance | program | 0.20 | 0.71 | 2.491 | 206 | = 0.014 | 0.362 |
| | control | -0.05 | 0.67 | | | | |
| | program | 0.29 | 0.80 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CERQ Positive | control | -0.10 | 0.86 | 3.336 | 206 | < **0.002** | 0.470 |
| CERQ Catastrophizing | program | 0.22 | 0.80 | -.383 | 206 | = 0.702 | -0.051 |
| | control | 0.26 | 0.76 | | | | |
| SWLS | program | 0.28 | 0.73 | 2.361 | 206 | = 0.019 | 0.339 |
| | control | 0.00 | 0.91 | | | | |
| SCS-SF Self-Kindness | program | 0.33 | 0.80 | 3.653 | 206 | < **0.001** | 0.537 |
| | control | -0.10 | 0.80 | | | | |
| SCS-SF Isolation | program | -0.57 | 0.86 | -3.849 | 206 | < **0.001** | -0.570 |
| | control | -0.10 | 0.79 | | | | |
| SCS-SF Mindfulness | program | 0.23 | 0.78 | 2.954 | 206 | = 0.004 | 0.422 |
| | control | -0.11 | 0.83 | | | | |
| SCS-SF Over-identified | program | -0.51 | 0.83 | -3.611 | 206 | < **0.001** | -0.531 |
| | control | -0.08 | 0.79 | | | | |
| SQUALA Importance | program | -0.20 | 0.40 | -4.458 | 206 | < **0.001** | -0.658 |
| | control | 0.04 | 0.33 | | | | |

*Note*. Statistical threshold was set to $p = 0.002$ resulting from Bonferroni correction on the number of tests (0.05 / 24 and rounded). Presented differences were computed by subtraction of pre-program scores from post-program scores. Thus, a positive mean difference indicates higher scores after the program than before the program, and s negative mean difference indicates lower scores after the program than before the program.

Finally, we compared differences between the program and control groups after the program in the four variables in which the groups differed before the start of the program using independent t-tests with a statistical threshold of $p = 0.01$ (0.05 / 4 and rounded). Descriptive statistic and results of the t-tests are displayed in Table 5. Whereas differences between groups in the FFMQ subscale Act with Awareness and the PSRS subscale Reactivity to Social Evaluation disappeared, with students from the program group closer to controls, we found differences between the groups in the FFMQ Nonreactivity to Inner Experience subscale and the PSRS Reactivity to Work Overload subscale, with higher scores in the Nonreactivity to Inner Experience and lower scores in the Reactivity to Work Overload scale in the program group than in the control group.

**Table 5** Descriptive statistics and results of independent t-tests of differences between program and control group in dependent variables after program which exhibited the difference between groups before the program

| Dependent variable | Group | *M* | *SD* | *T* | *df* | *p* | *d* |
|---|---|---|---|---|---|---|---|
| FFMQ Act Aware | program | 3.17 | 0.69 | 1.532 | 206 | = 0.127 | 0.221 |
| | control | 3.01 | 0.76 | | | | |
| FFMQ Non-Reactivity | program | 3.03 | 0.60 | 2.863 | 206 | = 0.005 | 0.436 |
| | control | 2.79 | 0.50 | | | | |
| PSRS Reactivity to Work Overload | program | 1.10 | 0.43 | - 3.098 | 206 | = 0.002 | - 0.442 |
| | control | 1.29 | 0.43 | | | | |
| PSRS Reactivity to Social Evaluation | program | 1.11 | 0.45 | - 1.637 | 206 | = 0.103 | - 0.220 |
| | control | 1.21 | 0.46 | | | | |

## Discussion

The results of the presented pilot study revealed that participants who completed the online mindfulness-based program for mental health and well-being support have significantly reduced perceived stress, negative affectivity, and frequency of using some non-adaptive emotion regulation strategies, and increased reported mindfulness, self-compassion, positive affect experience, resilience, frequency of using adaptive emotion regulation strategies, and feelings of life satisfaction. Our hypothesis was confirmed in the significant decrease of attributed importance to the quality of life conditions. The study affirms that mindfulness interventions can be effectively delivered via social networks in medical students. In our study, we introduced an online original complex mindfulness program based on MBSR (Kabat-Zinn, 2013) and MBCT (Segal et al., 2002), combining a face-to-face approach (introductory lecture) with text, audio, video, and e-learning components integrated into a unique intensive reminder system using support psychotherapy principles.

### *Program effectivity analysis*

The results confirmed the hypotheses that the program would induce a subjectively assessed increase in basic facets of mindfulness, positive emotions, frequency of using adaptive emotion regulation strategies, satisfaction with life, self-compassion, and subjective quality of life. Moreover, resilience increased on borderline significance. The greatest effect of change (medium and large) in all components of mindfulness as defined by FFMQ confirmed good program targeting. The confirmation of the differences between the program and control groups validate the effect of the program itself. The effect sizes detected in our study are comparable with the mean results of other studies (Cavanagh et al., 2018; Krusche et al., 2012, 2013; Querstret et al., 2018). They also matched the results of a recently published standardized review of a meta-analysis of randomized controlled trials for MBSR and MBCT, which demonstrated a significant improvement in depressive symptoms (d =0.37), anxiety (d =0.49), stress (d =0.51), quality of life (d = 0.39), and physical functioning (d = 0.27; Gotink et al., 2015). The effect on perceived stress and reactivity is even greater in our study (d = 0.88). The number of observed effects and magnitude of effects sizes in other programs in medical students (Barnes et al., 2017; Rosenzweig et al., 2003; Warnecke et al., 2011) supports the hypothesis that our online mindfulness-based program for mental health support conducted in medical students can be similarly effective to versions with facilitator.

Emotional regulation is one proposed component through which mindfulness works (Alsubaie et al., 2017; Hölzel et al., 2011; López et al., 2018; Tang et al., 2015). Increased emotion regulation induced by mindfulness probably involves a mix of the many implicit and explicit regulation strategies and processes comprehensively described by Gross (2014). In this respect, our study brings new knowledge thanks to the examination of mindfulness program effectivity on specific emotion regulation strategies. Two major effects have been observed: medical students who underwent the program, in comparison with the control group, increased the use of positive reappraisal and decreased the use of self-blame. Moreover, they increased the use of acceptance, but the difference in acceptance change between the program and control groups did not survive correction for multiple comparisons. Further, we found increased catastrophizing which, however, appeared both in the program and control groups. The unexpected increase of catastrophizing could be hypothetically explained as a temporal side effect of the increased general awareness and emotional awareness associated with mindfulness training (Hölzel et al., 2011). Catastrophizing increasing after an MBSR program in female high school students was described in another study (Shahidi et al., 2017), but the authors did

not discuss it. In a psychometric model, Jermann et al. (2009) presented a negative association between mindfulness and catastrophizing. We could expect that this increase will fade with continuing mindfulness practice (Tang et al., 2015) or stay at the same level while modulated by acceptance and other mindfulness attitudes such as trust, letting go, and patience, which are expected to increase under the mindfulness training. The increase of acceptance could be considered as a protective factor. Mindfulness training develops the ability to be in contact with whatever appears in the present moment, even negative thoughts and expectations. It does not change the contents of the mind; it changes the attitude to the contents. The changes in the relations among the distinct and interacting mechanisms producing the benefits of mindfulness training are the next research frontier.

We confirmed the hypothesis that the importance attributed to the quality of life components would be lower at the end of the program, with an unchanged satisfaction with partial components of quality of life proposed in SQUALA. The decrease of importance, with a medium-sized effect, while maintaining unchanged components of life satisfaction represents a specific shift induced by the program, and it is a new result in this area. This result is also interesting in the light of increased overall feeling of life satisfaction measured by SWLS induced by the program. Mindfulness techniques, as part of the "third wave" of cognitive and behavioral therapies, help to target contexts and functions of psychological phenomena, not just their form (Hayes, 2016). Unlike other therapeutic strategies, such as cognitive behavioral therapy, MBIs do not emphasize changing the contents of mental events as much as changing the awareness of and relationship to them (Segal et al., 2002). Participants learn to disempower emotionally charged thoughts or attitudes by bringing to their experience a sense of "allowing" it to be just as it is, without a constant need for the situation to match their desired states (Segal et al., 2002). It could be suggested that by staying in the experience of a present moment in a non-reactive, accepting way and by witnessing the impermanence of mental phenomena, participants learn to strengthen their inner resources and trust the ever-changing conditions of everyday life, instead of constantly relying on external factors to make their life better. This could make them less overly dependent on these factors and therefore mark the factors as less important in terms of life satisfaction. We could hypothesize that a decrease of importance is a specific marker of mindfulness-induced change, and it is a mediator between mindfulness and its positive outcomes. This change could be related to the process of "decentering" (Fresco et al., 2007), defined as disengaging the self from the event, that is commonly reported as an important factor regarding mindfulness mechanisms (Lebois et al., 2015). For example,

decentering mediated a decrease in anxiety in an MBSR program with university students (Fresco et al., 2007). To verify this mediation model, a larger data sample is needed; this is the next goal for our research group.

It is a priority in mindfulness research to understand the mechanism/s by which mindfulness exerts its positive influence (Hölzel et al., 2011). The present findings indirectly support the notion, as did previous studies (e.g., Querstret et al., 2018; Spijkerman et al., 2016; Virgili, 2015), that formal and informal daily mindfulness meditation practices increase mental health. We found a significant increase in all mindfulness facets (d = 1.1). Reported mediation models reveal that each mindfulness component has a different impact on symptoms and well-being. Baer et al. (2006) found that Nonjudge had the highest correlations with psychological symptoms, neuroticism, thought suppression, difficulty regulating emotion, and experiential avoidance, compared to all other facets. Act-aware had the second highest correlation with all of these measures other than experiential avoidance. Nonjudge and Act-aware may be the most important mindfulness facets in predicting psychological symptoms, with Act-aware having particular relevance for depression. Nonjudge predicting lower levels of depression, anxiety, and stress was replicated repeatedly (Cash & Whittingham, 2010; Querstret et al., 2018). Our program was aimed to help students develop mindfulness practice and foster self-compassion. While mindfulness training was an explicit goal of the program, encouraging self-compassion was implicit, incorporated in the manner in which the reminders were presented (for details, see Table 1). In accordance with many studies (e.g. Baer et al., 2012; Finlay-Jones et al., 2018; Neff, 2003) self-compassion is probably the second mechanism that mediated the change of measured outcomes in our program. The effectiveness of online programs in fostering self-compassion has been documented (Krieger et al., 2016).

Although we did not find any significant differences between the program and dropout groups, statistical analysis revealed that the control group showed higher FFMQ Act with Awareness and Nonreactivity to Inner Experience subscales and lowered PSRS Reactivity to Work Overload and Reactivity to Social Evaluation subscales than the program group at the start of the program.

It is very difficult to interpret these results because people were not assigned randomly to the control group. Control group participants were primarily interested in the *Self-Development* course; although they were able to enter the *Mindfulness* program, they did not. *Self-Development for Medical Students* is an optional subject offered every semester. The interest

in the subject usually exceeds the teaching capacity. Students were chosen for the course randomly by lot. The rest of the applicants are waitlisted for the next semester. The advertisement at the Masaryk University web news portal read: “Join the mindfulness-based stress reduction program” so it probably appealed to students with higher rates of stress symptoms. It can be assumed that students with possible higher levels of mindfulness traits were not interested in such a program. Unfortunately, we do not have any information regarding their previous mindfulness experience.

However, important results are that the differences between the program and control groups observed before the program disappeared after the program completion, meaning that students who underwent the program had equaled the controls in variables in which they previously manifested decrease. More specifically, in case of FFMQ subscale Nonreactivity to Inner Experience and PSRS subscale Reactivity to Work Overload the students who underwent the program reached even higher scores than controls after the program. However, it is important to note that the relatively high baseline levels reported in this sample meant there was more capacity for change from baseline.

### *Adherence*

A primary condition of any intervention program is good participant adherence. We did not focus on adherence, but the presented study revealed some results contributing to this area of interest. Of the 239 subjects who participated in the program, 56.5% completed the program in that they completed the post-program test battery. This rate of attrition corresponds approximately to the findings of similar studies. Cavanagh et al. (2013) reported that 52.3% of web-based study participants completed questionnaires at pre- and post-intervention. The same research group documented 68% completed questionnaires at pre- and post-intervention in another study (Cavanagh et al. 2018). Forbes et al. (2018) presented similar results (53.3%). Howells et al. (2016) used a smartphone app to deliver mindfulness training and reported a 77% dropout rate. A dropout rate of 25% was described by Querstret et al. (2018) in their four-week mindfulness online program. Previous studies raised expectations that high mindfulness traits at the start of program would predispose the participants to adherence (Forbes et al., 2018), but our results differed. No significant difference between the program and dropout groups was found in the mindfulness traits measured by FFMQ. This confirms the investigation by Cavanagh et al. (2018) showing no significant differences between participants who completed

the study and those who dropped out in mindfulness baseline. The current study also found that adherent and non-adherent participants did not significantly differ in any of the remaining measured variables. Levels of perceived stress, use of emotion regulation strategies, and subjective emotional balance did not predict who would complete the questionnaires at the post-intervention stage. No difference was found in quantified self-efficacy in the sense of an individual's belief in his or her innate ability to achieve goals and complete the program.

In fact, we do not know if there is an association between adherence to the program and the motivation to complete a relatively time-consuming test battery. No difference between the groups at the program start indicates such an association and we were unable to clarify a relationship based on the present results. One explanation is that the program ends before the exam period and many students may have decided that they did not have time for it.

Adherence is a primary condition of any successful treatment or preventive program. One program is not likely to suit all the participants. From the transtheoretical approach in psychotherapy (Norcross et al., 2011), we know that people with some kind of suffering are a heterogeneous group in the sense of their readiness to change. The finding that the frequency and severity of obstacles are not significantly associated with adherence to an online program (Forbes et al., 2018) shows that the readiness to change could be an important hypothetical variable. Different modes of the program could be delivered according to the stage of change (Velicer et al., 2000). From this point of view, readiness to change is another variable that should be incorporated into the research on web-based program adherence. The advantage of mindfulness-based programs on an online platform is the huge population impact. Programs address many people in different stages of change. A significant subgroup of people could be expected to drop out because of their unpreparedness to change. However, this does not mean that they would not make any change, and it does not mean that they could not benefit from the program in a subsequent round. In this context, it is necessary to create new programs and seek new, more effective variants. However, finished interventions should be offered regularly by the stable structure of institutions providing health support. The aim is not to help everybody but to support those who are ready.

### *Limitations*

The pilot study design does not allow us to eliminate the possibility that the positive results of online mindfulness programs could be explained by the fact that everyone who did not benefit dropped out (Forbes et al., 2018). We did not use a randomized waitlist control design; participants in the control group were self-selected for credits and did not want to attend the program at all. Our pilot study did not include any follow-up control, so we are not able to evaluate the reported induced change over time. We also did not evaluate any possible mediation effects among variables. We have no evidence of how much added value the intensive reminder system via Facebook had. The effectiveness and attrition rates of our program are comparable with the results of other studies that did not use such an intensive reminder system (Cavanagh et al., 2018, 2013; Krusche et al., 2012, 2013; Querstret et al., 2018).

The results of this pilot study are promising. However, they must be seen as preliminary. Replication in a randomized controlled trial with clinical measures/diagnoses and a longer follow-up period is necessary.

## How does mindfulness practice work?

MBIs have quite broad outcome effects on many somatic, social, emotional, and behavioral problems. It has been shown that MBIs increase the quality of life and well-being. Compared to the extensive evidence base for the effectiveness of MBSR and MBCT, relatively few studies have tested the mechanisms of action which causally connect changes that occur during MBIs with psychological outcomes. In general, in the context of psychotherapy research, it is known that therapy "works," i.e., is responsible for change, but there is little knowledge of why or how it works (Kazdin, 2007). Similarly, it is well known that MBIs "work," i.e., are responsible for change, but there is little knowledge of why or how they works and how these effects come about. Randomized controlled trials (RCT) have repeatedly shown that treatment leads to more therapeutic change than no treatment. In this case, it is possible to say that treatment causes the change. However, these studies do not answer *why* the intervention led to change or *how* the change came about. In his key article in psychotherapy research, Kazdin (2007) defines important concepts to be distinguished in research: cause, mediator, mechanism, and moderator.

The **mediator** is a construct or component that shows significant statistical relations between intervention and treatment but may not explain the exact mechanisms through which change comes about. Something that mediates change may not necessarily explain the processes of how the change came about. Also, the mediator could be a proxy for one or more other variables or be a general construct that is not necessarily intended to explain the mechanisms of change (Kazdin, 2007). A mediator may be a guide that points to possible mechanisms but is not necessarily a mechanism.

The **mechanism** refers to a greater level of specificity than the term "mediator" and reflects the steps or processes through which therapy (or some independent variable) actually unfolds and produces the change (Kazdin, 2007). Mechanism explains how the intervention transforms into events that lead to the outcome. This is easily confused with the notion of mediation.

The **moderator** is a characteristic that modulates the direction or magnitude of the relationship between and independent and dependent variables (Kazdin, 2007). If the relationship between MBIs and stress reduction is different for men and women, sex is a moderator of the relation. Moderators are related to mediators and mechanisms because they suggest that different processes might be involved (e.g., for men and women, dispositional mindfulness).

The theoretical model of Kazdin (2007) describing the process of change between treatment and outcome is presented in Figure 14. A better understanding of which mechanisms lead to change is a necessary step on the path to tailor-made treatment.

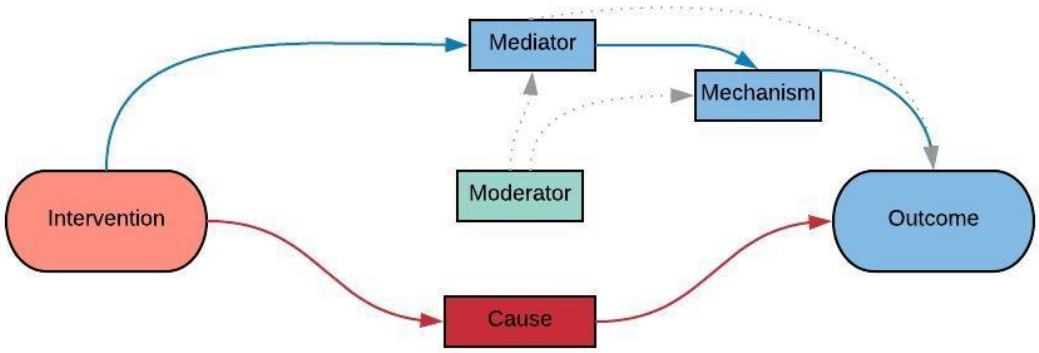


**Figure 14** The process of change between intervention and outcome (Kazdin, 2007)

The main implicit goal of MBI is to develop mindfulness skills that lead to non-judgmental and non-reactive acceptance of all experiences, which in turn results in positive psychological

outcomes (Kabat-Zinn, 1982; Segal et al., 2002). As in psychotherapy, it is necessary to answer the question "How does mindfulness work and through what mechanisms is its effect mediated?" Figure 15 represents the application of Kazdin's model on the mindfulness effect on problems with falling asleep.

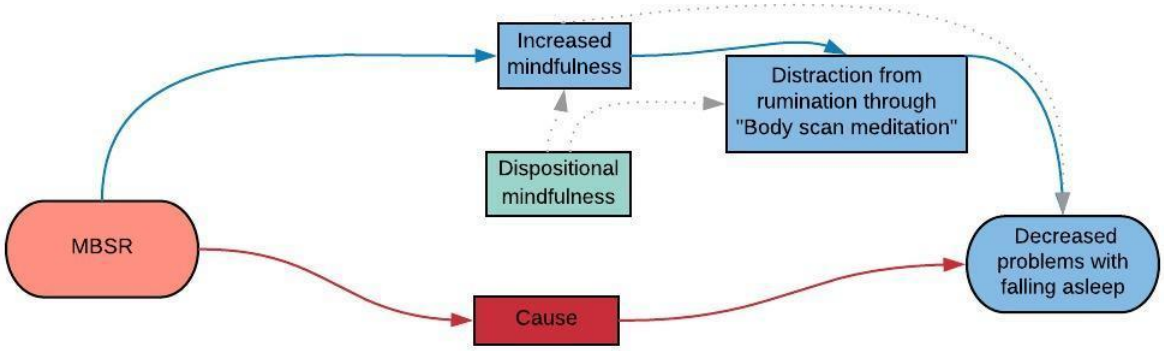


**Figure 15** The example of the process of change between MBSR and one of its outcomes

## Mindfulness and basic personality traits: presumed moderators of the mindfulness effect

Few studies in contemporary literature have assessed basic personality traits and their relationship to mindfulness. However, the description of this relationship is crucial for the better conceptualization of mindfulness and for better understanding of the interaction between personality and mindfulness practice. Thompson and Waltz (2007, p. 1876) questioned whether "everyday mindfulness may shape personality or personality may shape everyday mindfulness or whether both are shaped by other factors". The understanding of this interaction is crucial.

In her extensive meta-analysis, Giluk (2009) found the relationship between mindfulness and personality traits derived from the five-factor model of personality (Big Five; neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness (Barrick, Mount, & Judge, 2001) and positive and negative affects as basic dimensions of basic personality reactivity that reflects general personality affective levels (Watson & Clark, 1984). Her results revealed that while all the traits display appreciable relationships with mindfulness, the

strongest relationships are found with neuroticism (-0.58), conscientiousness (0.44), positive affect (0.41), and negative affect (-0.51).

Only a few studies have been carried out with the aim of describing the relationship between mindfulness and temperament dimensions (Crescentini & Capurso, 2015). Haimerl and Valentine (2001) used Cloninger's psychobiological model of temperament and character to describe basic dimensions of temperament (TCI; Cloninger et al., 1993). This model describes the neurobiological and genetic bases of personality (four temperamental traits: Novelty Seeking, Persistence, Reward Dependency, and Harm Avoidance) with their interaction with life experiences (character). Character consists of three dimensions measuring the maturity of the self at three levels: intrapersonal (Self-Directedness, mapped on concepts such as self-esteem and self-efficacy), interpersonal (Cooperativeness, expressing the capacity to be empathic, tolerant, and compassionate), and transpersonal (Self-Transcendence, measuring the tendency toward spirituality and creativeness). In their cross-sectional study, Haimerl and Valentine (2001) compared the TCI character profiles of three groups of Buddhist meditators with different lengths of meditation experience. They found that expert meditators obtained higher scores in all three aspects of the character profile than naive subjects, and they also scored higher than beginners on the cooperativeness trait. Moreover, beginners scored higher than naive individuals on the self-transcendence scale. No differences in temperament dimensions were found.

Campanella et al. (2014) investigate the effects of eight weeks of consistent practice of mindfulness meditation on the personality profiles measured with TCI (Cloninger, 1993). Their results suggest that eight weeks of mindfulness meditation training might be sufficient to modify the descriptions people give of themselves, especially with regards to the three dimensions related to self-concept in the sense of the three-character subscale (Self-Directedness, Cooperativeness, and Self-Transcendence). Again, no specific effect of the mindfulness training on any temperament scale was found.

In line with this direction of research, Wupperman et al. (2008) found that deficits in mindfulness predict borderline symptoms in a healthy population, independently of neuroticism.

## Mediators and mechanisms of mindfulness

From the literature and a clinical perspective, distinct and interacting mechanisms are at play in producing the benefits of mindfulness training. The common denominator in the background of behavioral and experiential changes induced by mindfulness could be probably called "enhanced self-regulation" (Hölzel et al., 2011; Tang et al., 2015). The components most often proposed and verified to describe the mechanisms through which mindfulness works are: attention regulation, body awareness, emotional awareness, emotion regulation, change in perspective on the self, and compassion and self-compassion (Alsubaie et al., 2017; Hölzel et al., 2011; López et al., 2018; Tang et al., 2015). Mediators and mechanisms beyond the mindfulness effect verified by studies are presented in Table 5. The review of all components proposed by other authors is in Table 6 and Figure 16. The large number of proposed mechanisms indicates the complexity of individual change induced with mindfulness training.

This chapter aims to describe what the components of mindfulness meditation are believed to be and how they mediate the relationship between MBI and its outcomes. The emotion regulation mechanisms are discussed in a separate chapter because the integration of emotional regulation and mindfulness is the main aim of this habilitation thesis. The original results of our research group are also presented and discussed.

**Table 6** Mediators and mechanisms beyond the mindfulness effect

| Authors | Mechanisms | Authors | Mechanisms |
|---|---|---|---|
| Baer et al., 2006 | Observing<br>Describing<br>Acting with awareness<br>Non-judging of inner experience<br>Nonreactivity to inner experience | Brown et al., 2007 | Insight<br>Exposure<br>Non-attachment<br>Enhanced mind-body functioning<br>Integrated functioning |
| Shapiro et al., 2006 | Intention<br>Attention<br>Attitude | Tang et al., 2015 | Attentional control<br>Emotion regulation<br>Self-awareness |
| Kabat-Zinn, 1990 | Acceptance<br>Non-judging<br>Patience<br>Beginners mind<br>Trust<br>Non-striving<br>Letting be | Vago and Silbersweig, 2012 | Self-awareness<br>Self-transcendence<br>Intention and motivation<br>Attention regulation<br>Emotion regulation<br>Extinction and reconsolidation<br>Prosociality, improving social cognition<br>Non-attachment and de-centering |
| Hölzel et al., 2011 | Attention regulation<br>Body awareness<br>Emotion regulation (reappraisal, exposure, extinction, reconsolidation)<br>Change in perspective on the self | Grabovac et al., 2011 | Acceptance and compassion<br>Concentration/attention regulation<br>Ethical practices<br>Insight into characteristics of mental objects<br>Attachment/aversion to feelings<br>Decreased mental proliferation |
| Neff, 2003 | Self-compassion | Baer, 2003 | Exposure<br>Cognitive change<br>Self-management<br>Relaxation<br>Acceptance |

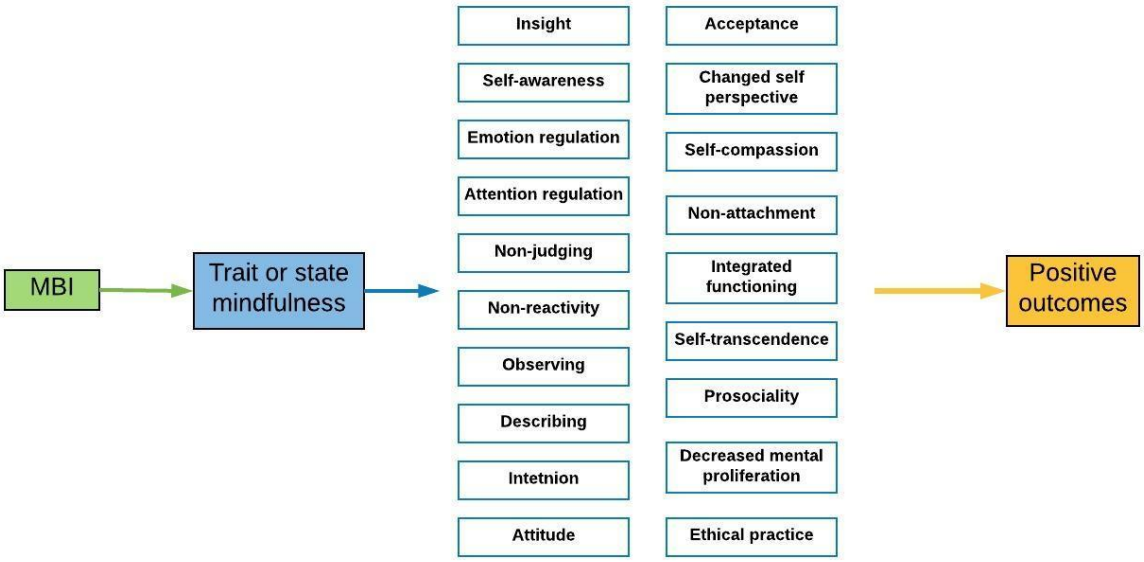


Figure 16 The review of all components proposed by other authors

### *Attention regulation*

Attention regulation is probably the essential component of the effects of mindfulness practice. It is described in detail in the "Self-regulation of attention" chapter.

### *Body and emotional awareness*

Emotional awareness can be defined as the extent to which one can identify and describe one's own emotions (Moon & Berenbaum, 2009). It is the ability to consciously perceive and be aware of emotional states as well as the ability to match emotional experiences with appropriate semantic or symbolic categories. Interoception refers to the sensing of internal bodily changes (Garfinkel et al., 2015). Conscious feelings originate from the perception of bodily sensations and their dynamic changes (Damasio, 1999). The ability to consciously perceive and be aware of the somatic components of affective states is the basis of the authentic experience of the self (Dolhanty & Greenberg, 2007); this ability is necessary for adaptive emotion regulation (Gross, 2014). The increase of emotional awareness usually represents the first step of psychotherapy at the most fundamental level. It is necessary to identify feelings and be aware of how the

feelings are associated with adaptive (e.g., chatting with a close friend) or nonadaptive behavior (e.g., overeating or self-injury).

In mindfulness practice, attention is focused on sensory experiences of breathing, sensory experiences related to emotions, or other bodily sensations. Meditators report that mindfulness practice leads to a higher physical and emotional awareness and emotional clarity (Cooper, Yap, & Batalha, 2018). In this context, mindfulness practice helps to keep practitioners in good contact with emotions and their physiological components. It is then possible to observe the whole phenomenon of emotion, how it arises, where and how it is experienced in the body, and with what thoughts, memories, and behavior it is associated. This exposure to emotions in a non-judgmental, accepting, and open manner initiates a greater awareness of which emotions are just the result of ignorance and which are authentic information about the present moment. Mindfulness training supports the ability to monitor emotions and acknowledge them as they are. Emotions are explored in this process with the aim of understanding how they work and how they influence thoughts and behavior. Good contact with emotions makes it possible to recognize the process of valuation at its start and thus to regulate it.

Buddhist learning states that basic emotions can be activated on the basis of ignorance. In Buddhist literature, ignorance, anger, and greed are referred as the “Three Poisons” (DeSilva, 2014). They are referred to in this way because they arise as a result of the mistaken experience of the separation of the perceiver, the perceived object, and the act of perception, which are understood to be inseparable (Chambers et al., 2009). They then give rise to higher-order emotions in the background of human suffering: desire, jealousy, anger, pride, and ignorance (DeSilva, 2014). During mindfulness practice, practitioners start to differentiate between primary, secondary, and instrumental emotions (Greenberg, 2004). Primary emotions are the first spontaneous responses to stimuli, such as fear in response to a threat. Secondary emotions are a response to primary emotions, usually if the primary emotion was unacceptable in some way. A secondary emotion often reflects a defense mechanism against the primary emotion due to an aversive meaning in the past. The secondary emotion often occurs first in therapy or meditation. Instrumental emotions are those that have been learned and reinforced through interpersonal experience (Greenberg, 2004). Through non-judgmental acceptance and openness, it is possible to move beyond the secondary and instrumental emotions to the primary emotions. Greater emotional awareness is associated with higher self-reported impulse control (Lane, 2000), greater openness to feelings (Lane et al., 1990), and a higher level of well-being

(Ciarrochi et al., 2003). Lower levels of emotional awareness were found in patients with borderline personality disorder (BPD; Levine, 1997), posttraumatic stress disorder (PTSD; e.g., Frewen et al., 2008), obesity, anorexia nervosa and bulimia nervosa (e.g., Bydlowski et al., 2005; Bernatova & Svetlak, 2017), and various psychosomatic diseases (Subic-Wrana, et al., 2005). It seems that emotional awareness represents an important ability necessary for adaptive emotion regulation, well-being, and mental and somatic health (Lane, 2008).

In the context of this thesis, it is important to mention that physical and emotional awareness are components that have been proposed to describe the mechanisms through which mindfulness has its positive outcomes on health (Alsubaie et al., 2017; Hölzel et al., 2011; López et al., 2018; Tang et al., 2015).

Although experienced meditators and even participants of MBSR or MBCT eight-week programs report an increased level of body awareness, few studies have presented empirical evidence to verify these claims (Hölzel et al., 2011). There are many self-reported measures of the level of body awareness in the literature and research (Mehling et al., 2009). However, this construct has not yet been sufficiently explored. Body awareness is also represented in items of the Five Facet Mindfulness Questionnaire, in the subscale Observe, which covers the awareness of body sensations (e.g., Item 1: "When I'm walking, I deliberately notice the sensations of my body moving"), hearing, smelling, seeing, interoception, thoughts, and emotions (e.g., Item 11: "I notice how foods and drinks affect my thoughts, bodily sensations, and emotions"). Increases in the scores on this scale were induced with our mindfulness-based stress reduction program. The same change in this scale was described in another study (Carmody & Baer, 2008).

Studies using the heartbeat detection task as a standard measure of interoceptive awareness found no evidence that meditators perform higher than people with no meditation experience (Khalsa et al., 2008; Nielsen & Kaszniak, 2006). Results are mixed and contradictory; another study shows that expert meditators have significantly better introspective accuracy than novices and that meditation experience also significantly predicted individual introspective accuracy. These results suggest that long-term meditators provide more accurate introspective reports than novices (Fox et al., 2012).

The indirect results support the hypothesis that the mindfulness that raises physical and emotional awareness can be derived from neuroscience research. The neural structures associated with physical and emotional awareness, such as the insular cortex, are repeatedly

found to be activated during meditation. Studies have shown higher activation following mindfulness training (e.g., Tang et al., 2009; Farb et al., 2013). Greater cortical thickness in experienced meditators was documented in this area (Lazar et al., 2005). These results can be interpreted to mean that enhanced insula activity in meditators represents the amplified awareness of present-moment experience (Tang et al., 2015).

### *Change in perspective on the self*

The change in perspective of the self is another often-mentioned mechanism through which mindfulness could and probably does have a positive effect on mental health. This process has been termed "reperceiving" or "decentering" (Carmody et al., 2009; Fresco et al., 2007). Grabovac et al. (2011) also include the metacognitive awareness concept, which they propose has a central role in the current models of change mechanisms. Shapiro et al. (2006) introduced the concept of "reperceiving," defined as a "meta mechanism" of the mindfulness effect.

The term "metacognitive awareness" is often used interchangeably with the term metacognition. This concept is not new for Western psychology. The therapeutic use of this concept was mentioned in the 1950s by Carl Rogers, who wrote "the thoughts and emotions that we take to be so real and are so worried about do not exist in the way that we imagine them…they do exist, but we can know them in a way that is different from identifying with them" (Rogers, 1959, as cited in Grabovac et al., 2011, p. 161). Metacognitive awareness is also a key concept in CBT and MBCT (Segal et al., 2002). An analysis of meditation diaries of participants in an MBSR program reported by Kerr, Josyula, and Littenberg (2011) described this observing attitude as the "observer perspective." This change in perspective of the self is often subjectively experienced as a feeling of freedom, liberation, and happiness.

Teasdale et al. (1995, p. 285) defined metacognitive awareness as the process by which "negative thoughts and feelings are seen as passing events in the mind rather than as inherent aspects of self or as necessarily valid reflections of reality."

Mindfulness is unique in promoting meta-awareness of emotion regulation strategies (Farb et al., 2014). Mindfulness serves as a meta-strategy; it cultivates awareness of regulatory habits. When we are aware of options and freedom of choice, then it is possible to choose more flexibly between regulatory responses rather than automatically defaulting to strategies. This does not

mean that the other techniques do not work. It suggests that mindfulness may enhance regulation by increasing flexibility in regulatory strategy selection. By cultivating an attitude of acceptance and curiosity in response to events, mindfulness provides an opportunity to tailor regulatory responses to address both personal coping capacity and changing situational demands. It provides freedom of choice and the time to choose an appropriate reaction.

Whereas more advanced and longer practice of the meditation is required to experience disidentification from the static sense of self, a de-identification from some parts of mental content is often experienced even in the earliest stages of meditation practice (Hölzel et al., 2011). However, it is difficult to operationalize the perspective on the self, and the empirical research in this area thus far is still in the early stages.

The change of this process is most often measured qualitatively. There are also some self-reported measurements such as the Experiences Questionnaire (Fresco et al., 2009) and the Toronto mindfulness scale (Lau et al., 2006), both of which explicitly monitor decentering. Decentering scores have been shown to be higher in meditators than those without meditation practice, and decentering subscale scores increase with meditation experience (Davis, Lau, & Cairns, 2009). Changes in decentering are associated with decreased symptoms and intensity of stress (Lau et al., 2006). The decentering subscales of the two questionnaires significantly correlate with the other measures of mindfulness, including MAAS, FMI, CAMS, MQ, KIMS, and FFMQ (for details, see Park et al., 2013; Lau et al., 2006).

The contemplative neuroscience research has revealed some results which could be considered as neural correlates of decentering. Dispositional mindfulness is often found to be associated with decreased connectivity within the midline regions, including the PCC and mPFC during resting state functional connectivity fMRI (Way et al., 2010). The medial parts of the brain are part of the DMN, which is related to mind-wandering and self-referential processing (Qin and Northoff, 2011). The DMN represents regions that are active when the brain is not engaged in a task-induced activity (Gusnard et al., 2001). Based on the whole range of experimental results, DMN activity and its connectivity with other parts of the brain leading to decreased involvement of the habitual mode of self-reference might be affected in some way by mindfulness meditation practice (Jang et al., 2010).

Farb et al. (2007) demonstrated a strong coupling between the right insula (viscero-somatic neural images of the body state) and the mPFC (regions supporting cognitive-affective

representations of the self) in novices that was uncoupled in the participants who were experienced in mindfulness. These results suggest a fundamental neural dissociation between two distinct forms of self-awareness (open monitoring vs. narrative perspective) that are habitually integrated but can be dissociated through mindfulness training. These results support the notion that mindfulness practice can lead to emotional non-response to experience because of the disconnection of perception from self-referential thoughts. This change following MBI is consistent with the notion that mindfulness training allows for a distinct experiential mode in which thoughts, feelings, and bodily sensations are viewed less as being good or bad or integral to the "self" and treated more as transient mental events that can be simply observed (Williams et al., 2007, as cited in Farb et al., 2007, p. 320).

### *Compassion and self-compassion*

Christin Neff (2003), the leading researcher in the field of self-compassion and promoter of its application into psychotherapy, explains that "compassion involves being touched by the suffering of others, opening one's awareness to others' pain and not avoiding or disconnecting from it, so that feelings of kindness toward others and the desire to alleviate their suffering emerge. It also involves offering nonjudgmental understanding to those who fail or do wrong, so that their actions and behaviors are seen in the context of shared human fallibility. Self-compassion, therefore, involves being touched by and open to one's suffering, not avoiding or disconnecting from it, generating the desire to alleviate one's suffering and to heal oneself with kindness. Self-compassion also involves offering nonjudgmental understanding to one's pain, inadequacies, and failures, so that one's experience is seen as part of the larger human experience." The concept of compassion and self-compassion is a crucial part of Buddhist philosophy, and it is almost a new concept for Western psychology. Western psychological research has focused more on concepts such as self-esteem or self-efficacy (for review, see Neff, 2003).

Self-compassion can be operationalized in three components: self-kindness versus self-judgment, common humanity versus isolation, and mindfulness versus overidentification. Self-kindness is an attitude of being warm and understanding toward ourselves when we suffer, fail, or feel inadequate, rather than flagellating ourselves with self-criticism. Common humanity represents the attitude to ourselves and the awareness that human destiny is often difficult, and that we are not alone in our suffering. To be aware of and in contact with our whole experience

(pleasant and unpleasant) without suppression or avoidance is necessary for self-compassion. To be able to be self-kind we need to accept who we are. Being mindful of our suffering is the way to self-compassion (Germer & Neff, 2013). Self-kindness and thus self-compassion is a crucial attitude to oneself in mindfulness practice. Without it, mindfulness training would be the training in frustration instead of a spiritual path to "enlightenment" or to acceptance of "full catastrophe living" (Kabat-Zinn, 2013).

Self-compassion is associated with numerous psychological variables supporting mental health such as optimism, happiness, curiosity, openness to new experience, and emotional intelligence (e.g., Neff, Rude, & Kirkpatrick, 2007). In their meta-analysis, MacBeth and Gumley (2012) documented a significant relationship with a large effect between compassion and psychopathology. They support the concept that compassion is an important explanatory variable in understanding mental health and resilience. Although many people fear that self-compassion will weaken their motivation and performance, research repeatedly shows that self-compassion actually enhances motivation (Gilbert et al., 2011) and has no negative impact on performance; in fact, people with higher levels of self-compassion are less afraid of failure (Neff, Hsieh, & Dejitterat, 2005) and more likely to try again when they do fail (Neely et al., 2009). Moreover, self-compassion has been found to be negatively related to maladaptive perfectionism (Neff, 2003). A mediation analysis by Keng et al. (2012) revealed that an increase in self-compassion mediates the effects of MBSR on worry and fear of emotion.

Self-compassion is considered a key mechanism in the background of MBI effectivity (e.g., Neff, 2003; Kabat-Zinn, 2013; Segal et al., 2012). One study, for instance, showed an increase in self-reported self-compassion in healthcare professionals who took an MBSR program (Shapiro et al., 2005; 2007). Self-compassion has also been revealed as a mediator between MBIs and treatment outcome measures (see Table 4). Similarly, Kuyken et al. (2010) found that increases in mindfulness and self-compassion after MBCT participation mediated the link between MBCT and depressive symptoms at the fifteen-month follow-up visit. Neff and Germer (2013) developed a program to teach self-compassion skills called Mindful Self-Compassion.

Compassion for others also represents a crucial foundation of Buddhist teaching. It is evident that mindfulness practice also leads to the development of prosocial behavior, such as mentalizing, empathy, and experience sharing. Meditators also show higher activation of the prosociality neural circuitry than non-meditators (Vago & Silbersweig, 2012).

### *Emotion regulation*

A growing body of literature suggests that the psychological effects of mindfulness have been mainly through its facilitation of adaptive emotion regulation (e.g., Tang et al., 2015; Hölzel et al., 2011). The main question of this thesis is what concrete emotion regulation strategies are developed, improved, and maintained under MBI. This theme will be addressed in the final chapter of the thesis. Partial results from one study of our research group are also presented.

## Mindfulness and its predicted components: the mental health construction[16]

To address the question of what mindfulness relates to, we conducted a correlational study on the healthy subject who participated in our on-line program. Only research sample characteristic, methods, data analysis, and results are presented with the aim of contributing our own results. Predicted mechanism of mindfulness is presented and discussed above.

## Methods

### *Participants*

The sample included 432 Czech undergraduate students of Masaryk University (332 were women (77%), and 100 were men (23%); the average age of the respondents was 23.01±3.75; the range was from 18 to 56). Students can be divided into three groups according to their study subject (45.3% medical students, 38.1% students of humanities, and 22.6% natural sciences). The samples were made up of students who completed a course at our department (*Self-development group for medical students* or *Mindfulness-based stress reduction on-line* program). The data were collected under the supervision of a research assistant; participants completed a paper-and-pencil test battery comprising eight questionnaires presented in a fixed

[16] Linhartova, P., Svetlak, M., Sirucek, J., Knejzlikova, T., Kosa, B., Sumec, R., Hornickova, V., Jarolinova, K., Lucanska, K., Slezackova, A., Kasparek, T. (prepared for submission to Mindfulness). Mindfulness and its predicted components: the mental health construction

order. The assessment took approximately 60 minutes. The university ethics committee approved the study, and all participants gave their written informed consent.

### *Measures*

The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006, 2008) is a widely used tool measuring dispositional mindfulness. The questionnaire has five subscales: Describe, Observe, Act with Awareness, Nonjudging of Inner Experience, and Nonreactivity to Inner Experience. The items are rated from 1 = "never or very rarely true" to 5 = "very often or always true." Higher scores indicate higher mindfulness. All items from the Act with Awareness and Nonjudge subscales and half of the items in the Describe subscale are reverse-worded. The internal consistency of the subscales ranges between $C\alpha = 0.72 – 0.92$.

The Subjective Emotional Balance Questionnaire (SEBQ; Kozeny, 1993) assesses prevailing positive and negative emotional experiencing. The questionnaire has two subscales (Positive Emotional Experiences and Negative Emotional Experiences), with eighteen items each. The items are evaluated on a scale from 1 = "almost never" to 5 = "very often". The internal consistency was found to be $C\alpha = 0.93$ for both scales.

The Perceived Stress Reactivity Scale (PSRS; Schlotz et al., 2011) is a questionnaire assessing typical individual reactivity to everyday life stressors. The scale has twenty-three items (with twelve items reverse-worded) and five subscales: Prolonged Reactivity (four items), Reactivity to Work Overload (five items), Reactivity to Social Conflict (five items), Reactivity to Failure (four items), and Reactivity to Social Evaluation (five items). The items are rated from 0 (low-stress reactivity) to 2 (high-stress reactivity). The internal consistency of the subscales ranges between $C\alpha = 0.71 – 0.91$.

The Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski & Kraaij, 2007) assesses a set of cognitive emotion regulation strategies. It has thirty-six items and nine subscales with four items in each subscale: Self-blame, Acceptance, Rumination, Positive Refocusing, Refocus on Planning, Positive Reappraisal, Putting into Perspective, Catastrophizing, and Others-blame. The subscale Rumination was excluded from this study due to its low internal consistency. The items are rated from 1 = "almost never" to 5 = "almost always." The internal consistency of the subscales ranges between $C\alpha = 0.68 – 0.83$.

The Satisfaction with Life Scale (SWLS; Diener et al., 1985) measures overall satisfaction with life with five items rated from 1 = "strongly agree" to 7 "strongly disagree." The internal consistency ranges between Cα = 0.80 – 0.96.

The Brief Resilience Scale (BRS; Smith et al., 2008) measures the ability to recover from stressful situations. The BRS has six items rated from 1 = "absolutely agree" to 5 = "absolutely disagree". The internal consistency was reported to be between Cα = 0.80 – 0.91.

The Self-Compassion Scale-Short Form (SCS-SF; (Raes et al. 2011) measures individual compassion for oneself. The SCS-SF is a short form of the twenty-six item Self-Compassion Scale (SCS; Neff 2003) and has a high correlation with the full SCS ($r \geq 0.97$). The SCS-SF has twelve items and six subscales with two items in each subscale: Self-Kindness, Self-Judgment, Common Humanity, Isolation, Mindfulness, and Over-identified. The items are rated from 1 = "never" to 5 = "always". The internal consistency was found to be Cα = 0.86.

### *Data analysis*

All CFA models were estimated using the *lavaan* package (Rosseel, 2012) in *R* (v. 3.4.0). Robust maximum likelihood (RML) based on a full-information matrix (FIML) was used as the estimation method. In the first step, a thorough factor structure analysis of the Mindfulness scale was performed to determine the best model. In the second step, factor structure analysis of the rest of the scales was performed[17]. If possible, models using item parcels instead of individual items as observed variables were preferred to reduce the total number of parameters to estimate in the overall model. After applying the finding from the first two steps, an overall CFA model including all investigated scales was performed and the relationships between the concepts were examined. All figures were created using Lucidchart (Lucid software Inc., 2018).

## Results

### *CFA model of mindfulness and related processes*

Latent factor models verified separately for the individual scales entered the overall CFA model of mindfulness and related processes as presented above. Thus, the model consisted of four

[17] For clarity, factor structure analyses of mindfulness and related measures are not presented

lower-order and one higher-order mindfulness factors, two factors of the Emotional Experiencing scale, five lower-order and one higher-order factor of the Perceived Stress Reactivity scale, two factors of the Emotion Regulation questionnaire, eight factors of the Cognitive Emotion Regulation questionnaire, one Resilience factor, one Satisfaction factor, and six Self-compassion factors. The proposed model reached a good fit ($X^2$ = 2788.51, df = 1719, $X^2/2$ = 1.62, CFI = 0.92, TLI = 0.91, RMSEA = 0.04, SRMR = 0.05). Figure 17 displays associations between the mindfulness higher-order latent factor and all other latent factors in the model. Moderate-to-high positive correlations were found between mindfulness and the Positive experiencing subscale from EEQ, the Reappraisal subscale from ERQ, the Positive Refocusing, Refocus on Planning, Positive Reappraisal, and Putting into Perspective subscales from CERQ, the Resilience scale, Satisfaction scale, and the Self-kindness, Common Humanity, and Mindfulness subscales from SC. Moderate-to-high negative correlations were found between mindfulness and the Negative Experiencing subscale from EEQ, the Stress scale and the Self-blame and Catastrophizing subscales from CERQ, and the Self-judgement, Isolation and Over-identified subscales from SC. No significant association was found between mindfulness and the Suppression subscale from ERQ, or the Acceptance and Other-blame subscales from CERQ.

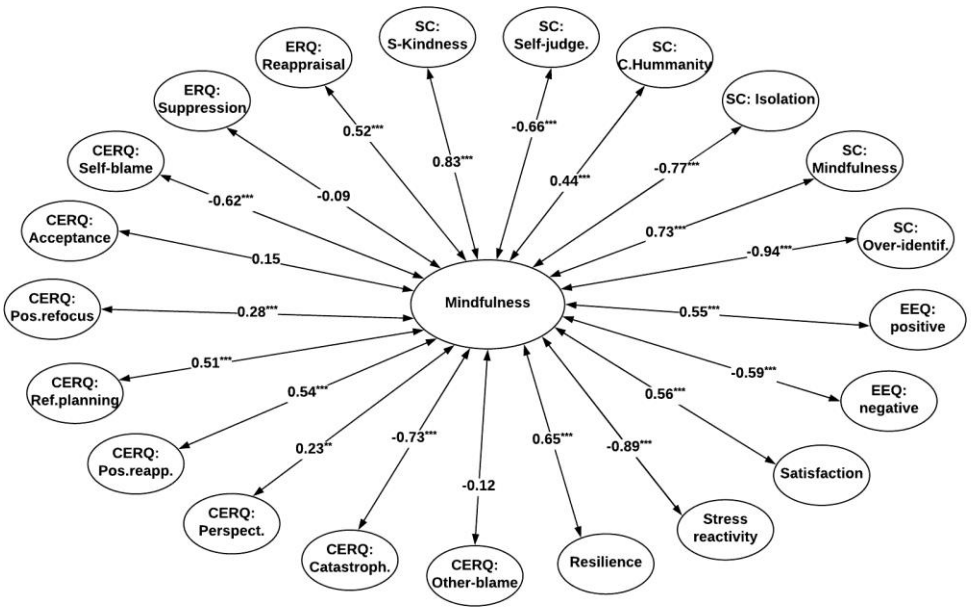


**Figure 17** Graphical representation of associations between mindfulness higher-order latent factor and other latent factors included in the model of mindfulness related processes

*Note.* All coefficients are presented standardized. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

## Discussion

The results are in line with the expected mechanisms and mediators of the mindfulness effect proposed and cited above. This supports the close positive associations between mindfulness and self-compassion, resilience, and positive emotivity and the close negative associations with stress reactivity and negative emotivity. Our results also confirm the general assumption that mindfulness is related to adaptive emotion regulation strategies such as Positive Refocusing, Refocus on Planning, Positive Reappraisal, Reappraisal, and Putting into Perspective. On the other hand, as was expected, our analysis revealed a negative association between mindfulness and non-adaptive emotion regulation strategies such as Self-blame and Catastrophizing. No expected association between mindfulness and Acceptance and Suppression was found. We are not able to explain this result. Maybe the selected subscales are not sensitive to concrete emotion regulation strategies.

# Mindfulness and emotion regulation

## The answer the question one

Enhanced emotion regulation has been suggested to underlie many of the beneficial effects of mindfulness meditation (e.g., Tang et al., 2015). For example, just as we found in our study, Feldman et al. (2007) found a significant correlation between self-reported mindfulness and self-reported use of adaptive emotion regulation strategies. However, it is not clear through which emotion regulation strategies mindfulness practice leads to positive outcomes. There is also currently no consensus on how mindfulness could be classified on the continuum between top-down vs. bottom-up and explicit vs. implicit emotion regulation strategies (Chambers et al., 2009; Chiesa et al., 2013). Further, there is not consensus among clinicians and researchers of whether the mindfulness is a unique emotion regulation strategy that could be called "mindful emotion regulation." It is unclear how much MBI differs in its psychological and neurobiological mechanisms from common Western psychological approaches such as psychotherapy (Chiesa et al., 2010). To clarify this ambiguity, at least in the field of emotional regulation, mindfulness practice will be compared with emotion regulation concepts. It will be put into the context of:

1) emotion regulation time dynamic
2) the direction of emotion regulation (top-down vs. bottom-up)
3) classification of emotion regulation (type of strategy, coping)
4) neurophysiological correlates of emotion regulation

## Emotions from the Buddhist perspective

In general, the main function of survival circuits is to maintain homeostasis. On the most general level, the activation of these circuits is manifested as approach or avoidance behavior. Activation of these neural circuits leads to triggering "action programs." Damasio and Carvalho (2013) define these programs as a set of natural physiological actions triggered by changes in the internal or external environments and aimed at maintaining or restoring homeostatic balance. Emotions are action programs largely triggered by external stimuli (perceived or recalled). Damasio writes that "feelings provide a subjective experiential window into the processes of life regulation. Feelings allow a glimpse into ongoing homeostatic regulation, ranging from basic processes such as metabolism to complex social emotions". This theory

explains how emotion originates at the physiological level with the aim of preserving life and providing the organism/ human a basic compass in reality. Although emotions can occur without self-awareness (action programs, implicit reactions), the capacity for self-awareness and self-relevant thought predisposes people to have many emotions that are not associated with the process of life regulation (discussed in chapter "The nature of emotions: from survival circuits to emotions") but are instead the result of the ability to think consciously. Leary and Gohar (2014, p. 377) describe how people's emotions are affected when they 1) compare themselves to their personal standards, 2) think about themselves in the past and future, 3) evaluate their personal characteristics, and 4) think about how they are perceived by other people.

Mindfulness involves classifying any emotion that results from the basic misinterpretation of reality outlined above as "disturbing." Through the increasing performance of meta-awareness, it is possible to become the witnesses and the observers of the appraisal process, and to be able to reflect what has been previously reflexively adopted or conditioned. Through mindfulness practice, it becomes possible to differentiate between the adaptive appraisal of reality (feelings) and habitual and automatic appraisals that are the results of misinterpretations of reality. For instance, we can feel frustration and aggression in a traffic jam because of the idea that we are extraordinary and important. The aggression is thus the result of a misinterpretation of reality[18]. The emotion regulation could be activated as a cognitive reappraisal ("I have time to listen to my favorite song on the radio") or emotional suppression ("I will stop the expression of aggression in order to look like a positive person, which matches my self-concept"). In mindfulness training, we observe our aggression with acceptance, in a non-judgmental manner, and with the trust that just as it appeared, it also disappears. Through the process of observation, practitioners usually find that aggression and frustration are the result of misinterpretation ("I am too entitled to be stuck in a traffic jam"). The regulation of disruptive emotions takes place through inside and understanding to the disruptive emotion development process. The fundamental point is that emotion regulation cannot be understood conceptually; it must be instead experienced directly (Chambers et al., 2009). The embodiment of mindfulness is one of the most important competencies of mindfulness teachers/trainers in MBI training (Williams, Crane & Soulsby, 2007). However, this should also apply to psychotherapists.

[18] Of course, in the case of defending the family from a poisonous snake, aggression is completely appropriate.

## The Buddhist psychological model

Mindfulness practice transforms the very foundations of how we perceive our experience. Even though regulation of suffering (negative feelings) was the primary goal of the Buddha's spiritual search and spiritual path, and it is the primary motive of most people at the start of the practice, emotion regulation is not the primary goal of mindfulness training. The path to enhanced emotion regulation affects deeper levels of self-regulation.

The Buddhist psychological model (BPM) designed by Grabovac et al. (2011) and based on the original Buddhist texts called the *Abhidhamma Pitaka* (Mendis, 2006) explains the mentioned change very clearly.

According to the BPM, attentional resources are limited: an individual can only be aware of one object at a time. From this point of view, experience is a continual stream of consciousness composed of a series of sense impressions and mental events arising and passing away. The film movement, frame by frame, is a useful metaphor for the moment by moment awareness process.

In agreement with the core evaluation process described in the chapter "The core valuation of the world: 'good for me' versus 'bad for me' state," any object in awareness has some feeling tone, which falls into one of three categories: pleasant, unpleasant, or neutral. The integration[19] successively includes homeostatic, environmental, hedonic, motivational, social, and cognitive activity to produce a "global emotional moment" that represents the sentient self at one moment of time (Craig, 2009). The authors' term "feeling tone," as used in their BPM, does not refer to complex emotions, such as fear, joy, or anger. It is rather the immediate and spontaneous affective experience of this awareness of a physical sensation or mental event (Mendis, 2006). Each object has its valence. This value sign often goes unnoticed and can serve as the key trigger to a chain reaction of thoughts (including emotions) and actions that can lead to suffering. The habitual response to the feelings associated with objects is to approach the pleasant ones and avoid the unpleasant ones, and usually to ignore the neutral ones. The Buddhist terms for these reactions are attachment and aversion, respectively (Grabovac et al.,

[19] The posterior-anterior functional gradient in the insula with posterior regions associated with primary representations of sensations from the body and anterior regions associated with interoceptive awareness of the body and in motivational and affective states is described (Critchley et al., 2004).

2011). These habitual reactions rapidly following the initial sense impression are manifested as mental events (thought, memory, emotion) and subsequent behavior. The integral premise of the BPM is that attachment and aversion arise in reaction to the feeling state itself rather than to the object. This premise is in line with the everyday experience that everything is judged, no matter what is real. The actual feeling tone determining whether the feeling will be pleasant, unpleasant, or neutral depends more on past individual experiences, culture, and other influences. For example, we may see a slice of cheese, and that may be associated with some feeling tone. The tone of experience determines how we habitually react with thoughts, emotions, and actions. Our reaction does not, in fact, say anything about the cheese. This process is called "mental proliferation" in BPM. It is described in Figure 18. It originates as a series of mental events that have been triggered by an initial mental event or sense impression. The mental event that follows the initial feeling is also associated with another feeling. In this context, many subsequent mental events (emotions, feelings) have little to do with the sense impression that started the process and thus with the "real" world. It is possible to realize that through the process of mental proliferation it is possible to lose contact with the present moment and the real world even while having the notion of living in it. Mindfulness training is the approach for returning to the "here and now." According to the BPM, "not being aware of how this pattern of attachment and aversion can lead to mental proliferation helps to keep the entire process habitual."

According to the BPM, there are three main mindfulness practice goals: 1) perceive impressions and mental events as transient (arising and passing away), 2) realize that suffering is the result of habitual reactions (i.e., attachment and aversion) to the feelings of a sense impression or mental event, and a lack of awareness of this process, and 3) perceive impressions and mental events as not containing or constituting any lasting, separate entity that could be called a self. It could be concluded that all sensory and mental events share the three universal characteristics of impermanence, suffering, and not-self. Suffering, including clinical symptoms, is a result of the habitual attachment/aversion reaction to transient feelings and mental proliferation in their background. Symptom reduction (in the clinical sense) is not the explicit aim of Buddhist practices; symptom reduction or disappearance through the mindfulness practice can be explained as a result of the disruption of habitual reactions and mental proliferation. Vago and Silbersweig (2012) call this "biased self-processing." The authors of the BPM explain that "improvement in wellbeing occurs when sensory and mental events are allowed to naturally arise and fall away, without subsequent cognitive processing arising from either attachment or

aversion. Sense impressions and mental events are still experienced as pleasant, unpleasant, or neutral; however, if there is no attachment, aversion, and thus no mental proliferation, adventitious suffering is not experienced." Within this framework, Vago and Silbersweig (2012) say that "mindfulness is described to reduce such biases through specific forms of mental training that develop meta-awareness of self (self-awareness), an ability to effectively manage or alter one's responses and impulses (self-regulation), and the development of a positive relationship between self and other that transcends self-focused needs and increases prosocial characteristics (self-transcendence)."

Insight plays the central role in the model. It refers to a direct, non-conceptual understanding (Dorjee, 2010) reached through the repeated awareness and experience of the three characteristics (impermanence, suffering, and not-self) in the process of meditation. During mindfulness practice, we begin to understand these characteristics on a nonverbal, experiential level. More than understanding, it is living in the present moment. Poetically, it can be compared to taking off dark glasses. More scientifically, it is a real change of paradigm through which the world is perceived and interpreted.

Mindfulness practice leads to processing experiences through plain exploration regardless of the valence of the stimuli/events. This kind of exploration creates an opportunity for insight into mental habits. It reduces automatic efforts to control feelings and experiences. It is more than an education in how the minds work: the knowledge is obtained through direct observation. The knowledge is experienced; it is not just information that is provided.

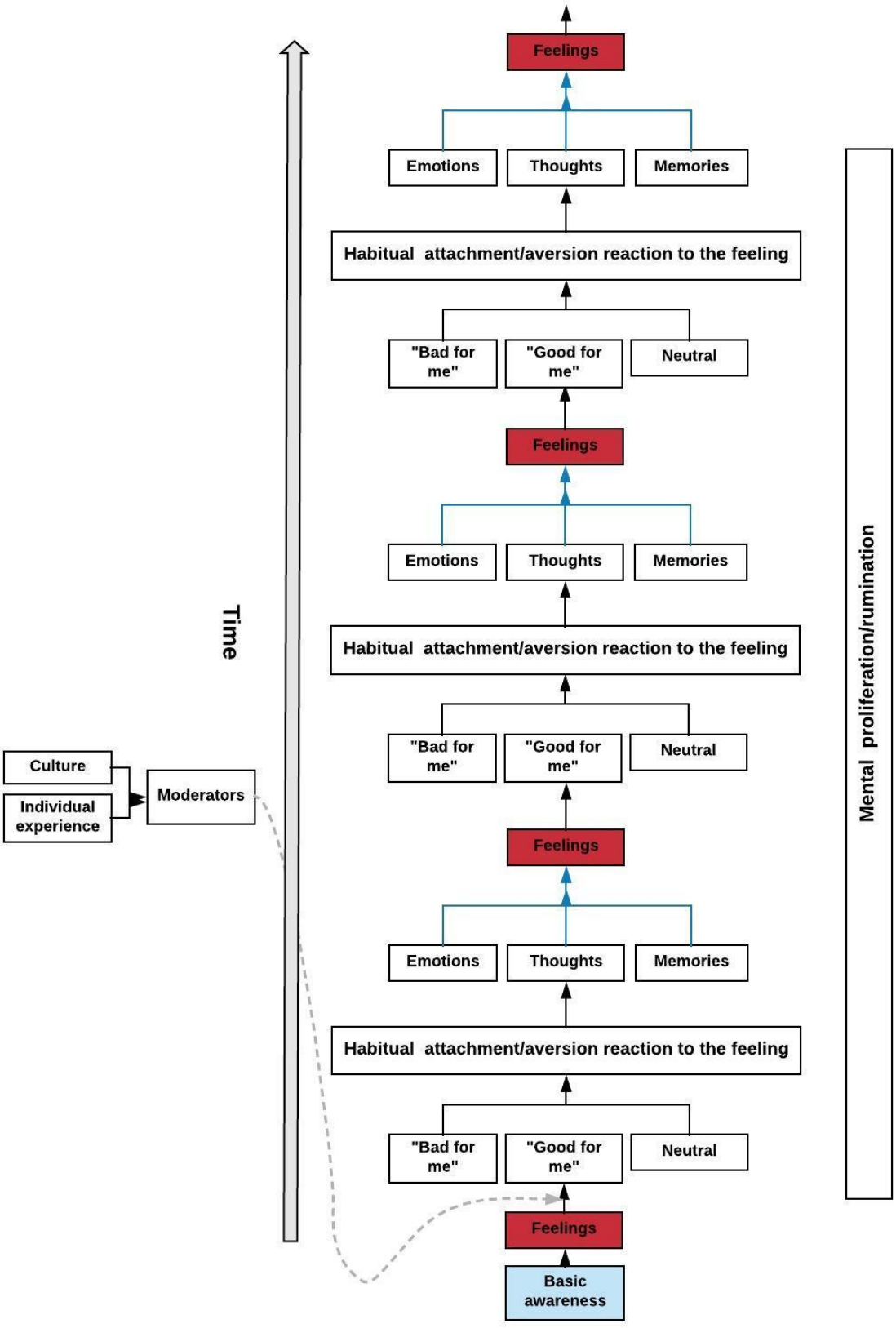


**Figure 18** The mental proliferation process in time (redesigned by Grabovac et al., 2011)

The BPM shows that enhanced emotion regulation, one of the beneficial effects of mindfulness meditation, is a result of a deep change of the world view. It is a change of the paradigm through which the world is perceived and interpreted. Suffering, experiencing through negative emotions (e.g., fear, anxiety, sadness), is reduced through the insight into the very essence of living. Even though mindfulness cannot be described as a whole as an emotion regulation and coping strategy, this description serves to clarify the mindfulness concept.

## Mindfulness and its time dynamics in emotion regulation: Gross's processual model

In the process model of emotion regulation designed by Gross (2002), mindfulness could be situated at the stage of attention deployment (Farb et al., 2014, p. 550). Attentional deployment represents the process of directing attention within a given situation to influence emotions (Gross, 2014). One of the most common representatives of this emotion regulation strategy family is distraction. Distraction is when attention is focused on a concrete object (usually the breath or another body sensation) in the FA mode of mindfulness regulation.

In one of our studies (Svetlak, Theiner, & Kubicova, 2018) we tested the hypothesis that a simple mindfulness exercise leads to a change of actual emotional state and a greater sense of control over thoughts. Our study was performed on hospitalized children (N = 20; mean age 14.2 ± 1.3; the total amount of all mindfulness exercises was 119). A self-reported scale was used for measuring the emotional state. Two standardized exercises from Eline Snel's book *Sitting Still Like a Frog* were used. Results indicate that mindfulness meditation leads to decreased negative affect in adolescents (actual feeling, bad vs good, before 4.9±2.68, after 5.2±2.53, $p<0.02$; negative emotions, before 6.8±2.0, after 6.2±2.46, $p<0.001$; negative somatic sensations, before 6.6±2.1, after 6.1±2.2 $p<0.02$). No effect of meditation on control over thoughts and self-esteem was found. Significant correlation was found between subjective success and change of actual feeling ($R=0.27$, $p<0.01$), self-esteem ($R=0.26$, $p<0.01$) and control over thoughts ($R=0.49$, $p<0.01$). Our results indicate that simple mindfulness practices can help children deal with negative emotions and that the mediator of this effect is probably distraction (attention focused on breath and body sensations).

Unlike distraction, mindfulness is performed with acceptance rather than withdrawal from any emotional experience (Kabat-Zinn, 2014). The open monitoring mode of mindfulness practice does not involve choosing any aspect of the continuously changing experience with the aim of

influencing emotions, as in attentional deployment[20]. Instead of it, attention is paid to everything in a non-judgmental and accepting manner. Immediate emotional responses are not regulated, but accepted as they are. They are observed with interest and curiosity; as they appear, the emotional responses themselves become objects of observation. In this context, mindfulness is opposed to expressive suppression (Chambers et al., 2009).

Through raising awareness, mindfulness makes it possible to better understand how and by what situations are selected and modulated. For instance, we can realize how we organize our world according to our need to be honored. This awareness can change our habitual organization of experience, opening us to new situations and then changing the experience itself. This notion is supported with findings that the better detection of one's bodily signals facilitates the selection and implementation of antecedent-focused as well as response-focused emotion regulation strategies (Kever et al., 2015). For instance, experiential avoidance of unpleasant emotions has been demonstrated to cause psychological harm (Hayes, 2003). The mindfulness process makes it possible to observe habitual and novel appraisals and responses. This altered perception of the situation permits the generation of new responses rather than mapping experience into a preexisting conceptual field (Farb et al., 2014, p. 551). Mindfulness is able to change conditions (rigid views and assumptions) of suffering (Teasdale & Chaskalson, 2011). The final goal of Buddhism that is fulfilled through mindfulness practice is to achieve enlightenment. This could be described as a permanent, radical change in perception that stops the automatic process of identification that turns certain aspects of sensate and mental experience into a separate self (Grabovac et al., 2011).

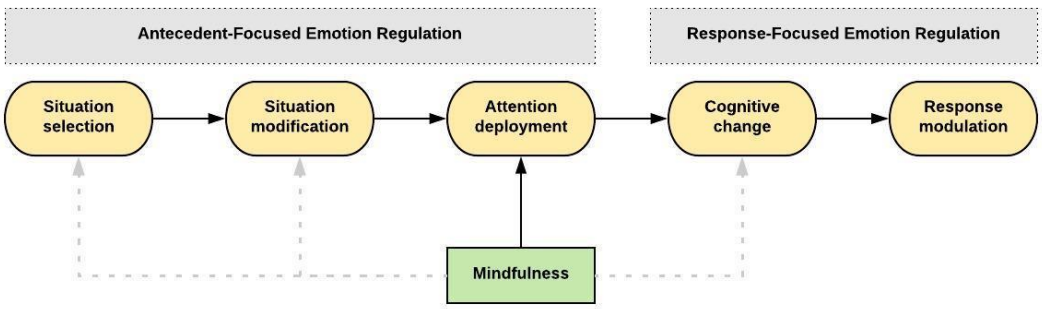


**Figure 19** Process model of emotion regulation: mindfulness practice targets

[20] It is close to the phenomenological reduction process of the incoming data called horizontalization in the phenomenology of Edmund Husserl.

In growing and deepening mindfulness practice, the effect gradually expands to other stages of the emotion regulation process. Mindfulness is thus antecedent-focused emotion regulation and response-focused emotion regulation as well. However, it directly excludes response modulation in the sense of suppression.

While the majority of emotion regulation strategies target emotions that are being experienced with the aim of regulating them towards a "good for me" state, mindfulness changes the perception and valuation of the world. The habitual core valuations are changed, and the subsequent emotions are changed due to this process.

Mindfulness is paradoxical and the instruction to focus directly on negative emotions goes against the inherent tendency to avoid unpleasant stimuli. This process is close to exposure therapy. The non-judgmental, accepting, curious, and open attitude to experience facilitate the process of extinction: original emotions are diminished or they lose original arousal and valence through repeated exposure. Through this process, we regulate emotions at the situation selection and situation modification stage. The non-judgmental attention practice can be internalized as a default baseline of perception. This basic setting can be achieved only through the regular formal practice of mindfulness meditation.

## Is mindfulness a top-down or bottom-up regulation?

Chiesa et al. (2013) suggested that a better understanding of whether mindfulness involves a top-down or bottom-up emotion regulation strategy could have important clinical implications. Psychotherapy frequently relies upon top-down regulation, such as cognitive reappraisal, to regulate unpleasant emotions (e.g., Roffman et al., 2005). Many bottom-up strategies are involved in the psychotherapy process, but they are implicit and beyond the control of study designs (for example, the calm voice of the therapist, safe room, time limits, grading, pacing, etc.). If mindfulness training is primarily a bottom-up process, MBI represents an explicit form of implicit therapeutic processes. The integration of classical psychotherapy and MBI is Buddhist psychotherapy (DeSilva, 2014).

Mindfulness could be described as a top-down emotion regulation strategy because it uses positive cognitive reappraisal and thus involves regulation of prefrontal cortex areas on emotion-generative brain regions (e.g., Garland et al., 2010; Quirk & Beer, 2006). Top-down

mindfulness-based emotion regulation strategies correspond to affect labeling, mindful detachment, meta-awareness, and cognitive reappraisal, among others, for which cognition and thought processes are the primary targets of the strategy.

Other authors suggest that mindfulness is a bottom-up strategy because of findings that the modulation of emotion-generative brain regions is possible without cognitively reappraising emotionally salient stimuli (e.g., Chambers et al., 2009). This kind of emotion regulation strategy has been termed bottom-up because it is characterized by a directly reduced reactivity of "lower" emotion-generative brain regions without the active recruitment of "higher" brain regions, such as the prefrontal cortex (Chiesa et al., 2013). Mindfulness has been described as "the awareness that arises from paying attention on purpose, in the present moment and non-judgmentally to things as they are" (Williams, 2007, p. 47). It is immediately clear that this conception distinguishes mindfulness from regulatory efforts to improve the hedonic tone of experience, such as using cognitive reappraisal to make stimuli less aversive (Farb et al., 2014, p. 549).

For example, Westbrook et al. (2013) asked smokers to watch specific craving-inducing images during fMRI, using "mindful attention" vs. "passive viewing" as craving regulation strategies. The mindful attention was found to be associated with subjectively reported craving and also with decreased activation in the subgenual ACC (sg-ACC), and reduced functional connectivity between this same region and bilateral anterior insula (AI) and ventral striatum (VS). Interestingly, at the same time, no activation of the PFC as the main structure for top-down emotion regulation was detected. This is surprising because we would expect that following the instructions to use mindful attention would require the working memory capacity associated with dlPFC activity, at least for the inexperienced subject. The authors consider these findings to support the notion that mindfulness emotion regulation is more bottom-up than top-down regulation.

In their review, Chiesa et al. (2013) report various studies supporting both top-down and bottom-up modes of mindfulness regulation. They suggest that different neural correlates of mindfulness practice, corresponding to different emotion regulation strategies, could vary as a function of 1) of the amount of meditation practice (e.g., long-term vs. short-term mindfulness experience), 2) study design (investigation of mindfulness vs. rest), 3) type of experimental task (e.g., the use of emotional, verbal stimuli vs. the use of painful stimuli), and 4) specific definition on mindfulness (OM vs. FA).

It seems that results could be interpreted that bottom-up emotion regulation strategy is observed in long-term meditators and top-down emotion regulation strategy in novice practitioners (Tang et al., 2015). This is in accordance with the results of Brefczynski-Lewis et al. (2007), who reported an inverted U-shape relation between frontal activity and meditator expertise. These results show that more trained subjects showed less frontal activity. This suggests the disengagement of attentional control within meditation training. This neural process pattern (less activity of frontal cortex lateral areas within meditation practice) may also show a meditation session dynamic in which frontal regions are activated at the beginning of a meditation to allow the other structures to maintain the meditative state, as was suggested by Travis and Wallace (1999) and Newberg and Iverson (2003).

In this context, mindfulness practice at the start can be understood as model-based emotion regulation (Figure 7; Etkin et al., 2015). The first stages of mindfulness practice are associated with an internal model with the aim of guiding experience and behavior. It can actually be an explicit emotion regulation. For example, we may reappraise a present experience to neutralize negative emotion by understanding emotions and thoughts as mental events without significant meanings. It is necessary to have continual reminders in the first months of practice. Unlike the model-free regulation, frontoparietal regions such as the vlPFC, dlPFC, PC, pre-SMA, and SMA are recruited (Buhle et al., 2013). It requires an intact working memory capacity to construct and make use of internal models and intact attention. For instance, Allen et al. (2012) reported that after six-week mindfulness training participants displayed greater dorsolateral prefrontal cortex responses during executive processing (an affective Stroop task), consistent with increased recruitment of top-down mechanisms to resolve the conflict.

However, with increasing practice, the model-based regulation (mindfulness) becomes more automatic with fewer demands on will and effort. It could be imagined that advanced mindfulness practice is also based on model-free emotion regulation, without involving dPFC areas activity (Figure 7). The best example of this model is fear conditioning and fear extinction. Through learning (classical and operational conditioning), an implicit emotion regulation model is reached which helps move from a “bad for me” state to a “good for me” state. Many studies have repeatedly documented that vACC–vmPFC activation is a general neural correlate of fear extinction when fear is inhibited (Lissek et al., 2014). In the context of bottom-up regulation, mindfulness could be seen as exposure therapy. Mindfulness practice supports being in full contact with experience with openness, acceptance, and non-judgment. This means exposure to

everything that appears in the present moment. The progressive and repeated exposure to experience without avoidance represents the basis of extinction and thus to bottom-up emotion regulation. From a neurobiological perspective, mindfulness practice leads to the development of implicit emotion regulation. Repeated effortful ("top-down") mindfulness practice can then be transformed by the creation of new patterns of implicit meaning.

Mindfulness emotion regulation is gradually integrated into the automatic mode of emotion regulation. Access to the conscious and willful base mindfulness regulation continues with some additional automation in regulation. For this reason, it can be difficult to find the rest state in studies of experienced meditators. The rest state is actually habitual mindful emotion regulation (Tang et al., 2015). These changes in fundamental reactivity to experience are probably mediated through the process of neuroplasticity. This means that experiential factors (mindfulness practice) shape the neural circuits underlying emotion generation and regulation (Davidson & Mcewen, 2012). A number of studies seem to suggest that mindfulness meditation induces changes in brain structures and functions. It is possible that mindfulness affects the brain structure by inducing dendritic branching, synaptogenesis, myelinogenesis, or even adult neurogenesis. It is also likely that mindfulness training positively affects autonomic regulation and immune activity, which may lead to neuronal preservation, restoration, and inhibition of apoptosis (Tang et al., 2015). The influence of mindfulness practice on the enzyme telomerase activity in immune cells has been repeatedly described (e.g., Daubenmier et al., 2012; Lengacher et al., 2014; Schutte & Malouff, 2014).

While regulation is an explicit aim of emotion regulation, mindfulness practice does not actually focus on emotion regulation. Paradoxically, the opened, non-judgmental acceptance and curious attitude to experience is in direct contradiction to regulation. From this point of view, the "regulation" (implicit) is rather a by-product of mindfulness practice than its explicit goal. Chambers et al. (2009, p. 569) describe mindfulness as "systematic retraining of awareness and nonreactivity, leading to defusion from whatever is experienced, and allowing the individual to more consciously choose those thoughts, emotions, and sensations they will identify with rather than habitually reacting to them." It seems that mindfulness is a bottom-up regulation in its conceptual origins.

This paradox also shows the importance of motivation to train in mindfulness. The desire to reduce stress creates a predisposition to be constantly in control, a top-down mode of regulation. In contrast, the desire to live mindfully as a valuable attitude to life and world creates openness

to whatever comes, and changes in emotional reactivity are simply incidental. Shapiro and Schwartz (2000) point out that "when Western psychology attempted to extract the essence of mindfulness practice from its original religious/cultural roots, we lost, to some extent, the aspect of intention, which for Buddhism was enlightenment and compassion for all beings. It seems valuable to explicitly bring this aspect back into our model mindfulness." The differences in meditation instructions and individual attitudes employed by different teachers and traditions could be related to significantly different neurobiological findings.

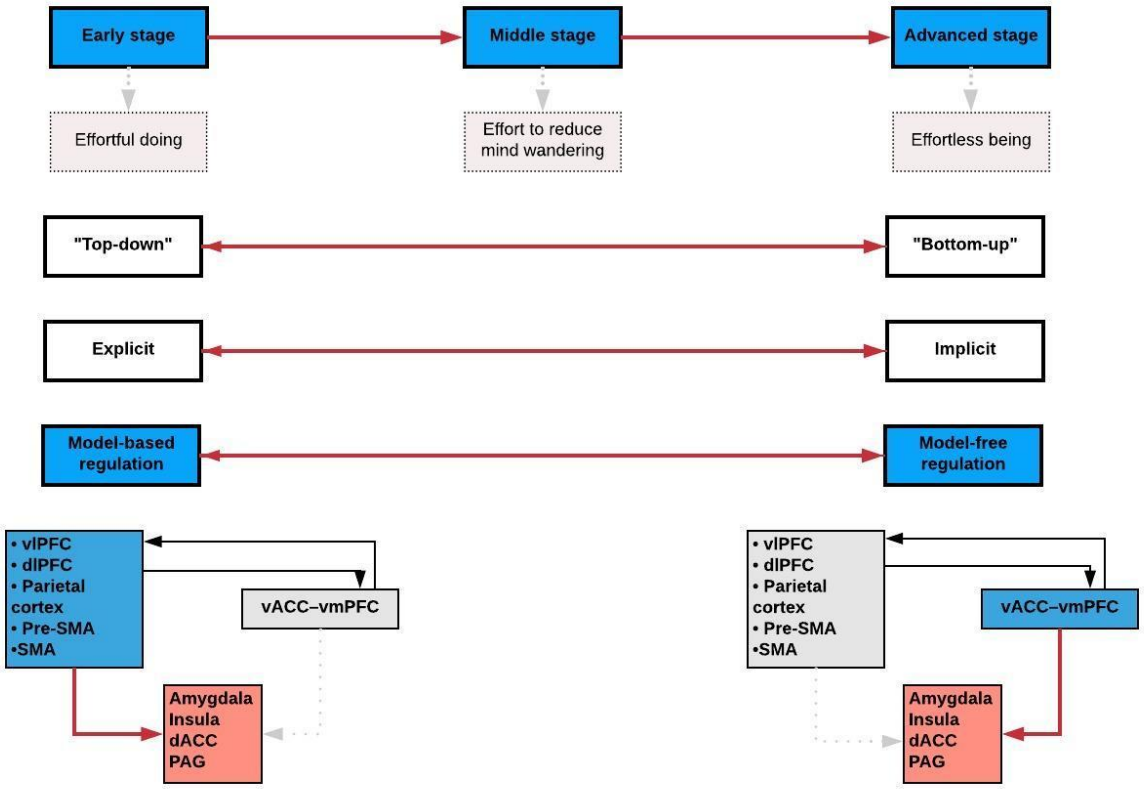


**Figure 20** Polarities of mindfulness concept and their relationship to the length of the practice (derived from Etkin et al., 2015; Tang et al., 2015)

# How does mindfulness practice regulate emotions: could be mindfulness practice classified as an emotion regulation or coping strategy?

## The answer the question two

This chapter aims to classify mindfulness as concrete emotion regulation and coping strategy. The total comparison of concrete emotion regulation and coping strategies (Classification of emotion regulation) and mindfulness practice is given in Table 7. As in the previous chapter, a simple comparison shows that mindfulness can be described through many emotion regulation and coping strategies.

According to the classification of affect regulation strategies bu Parkinson and Totterdell (1999) mindfulness is in direct contradiction to cognitive and behavioral disengagement in the higher group diversion ("avoid thinking about the problem" and "avoid problematic situations"). Mindfulness, as it is developed in MBI, instead uses distraction on the cognitive and behavioral level. On the cognitive level, it relocates resources through the occupation of attention. At the basic level of MBI programs, people learn to focus their attention on objects such the breath or the body. Under stress or aversive affects, people usually find that this kind of distraction can lead to relief. People can be aware of only one object at a time. On the behavioral level, practitioners sit in a meditation position or practice mindful yoga, thereby doing something relaxing or performing demanding activity. In this context, Grabovac et al. (2011) speak of a certain risk in relation to attention regulation strategies such as using distraction. Attention regulation strategies are effective, useful, and popular with patients (e.g., three-minute breathing space in MBCT). A potential risk is that people may unintentionally strengthen their aversive reactions to unpleasant feelings; for example, during an aversive reaction, patients may preferentially redirect their attention to the breath to achieve immediate symptom reduction via attention regulation rather than deepening fundamental mindfulness principles such as examining the transience, suffering, and not-self characteristics of the feelings.

Mindfulness can be classified in the higher-order group "Engagement" at the cognitive and behavioral level. On the cognitive level, the initial attitude that emotion is the only mental event is actually cognitive reframing or a change of meaning. Mindfulness can be understood as cognitive reappraisal at a process level rather than a content level (Chambers et al., 2009). In this context, the meaning of all experience (thoughts, emotions, sensations) is cognitively reappraised at the start of mindfulness practice. Behavioral engagement is the result of the

cognitive change in experience processing: the acceptance and insight into the origins of human suffering support adaptive behavior. However, behavioral paradigms with high ecological validity that would verify this are still missing. Even though the first objective methods of dispositional mindfulness evaluation are beginning to emerge (e.g. breath-counting test; Levinson et al., 2014), with the promised results (Wong et al., 2018), the subjective self-reported scales are currently the most widely used method of evaluating mindfulness.

Coping is closely related to emotion regulation; in fact, they overlap. In the context of survival circuits and the process of core evaluation, the experience of stress is mediated through the experience of aversive affect triggered and perpetuated with the event (any perceived object). The critical antecedent of the psychobiological stress response is the appraisal of what the stressful event is and what it is not. Consciously experienced feelings are actually setup points in the process of maintaining bio-psycho-spiritual homeostasis. On the basis of these feelings, the outer source of aversive stimuli/stressors may be changed (the behavioral component of coping), or the experience may be changed through coping strategies and emotion regulation. The general aim is to reach a "good for me" state. It is supposed that coping can regulate behavior, emotion, or attention (Skinner & Edge, 1998).

According to the classification of coping categories suggested by Skinner et al. (2003) as described in Table 4, mindfulness could be described as a coping strategy in many aspects (see Table …..).

### *Is mindfulness approach or avoidance coping?*

Mindfulness is unambiguously approach coping. To accept reality, whatever it is, represents the essence of mindfulness approach. Mindfulness practice supports being in contact with whatever appears in an open, accepting, curious, and non-judgmental manner. Avoidance is in direct contradiction to mindfulness practice.

### *Is mindfulness emotion-focused coping or problem-focused coping?*

In the context of the second Noble Truth, mindfulness practice targets both sides of the coping category "emotion-focused coping versus problem-focused coping." While problem-focused coping is aimed at managing or altering the problem causing the distress (stressful job or relationship, diagnosis, place) in the original Western conception, the cause of the distress in the Eastern conception or in mindfulness practice is ignorance and attachment to things and experience. The key message of the second Noble Truth is that experience itself is not the problem—the problem is our relationship to the experience—our need to have it be a particular way (Teasdale & Chaskalson, 2011).

### *Is mindfulness a cognitive reappraisal?*

Cognitive reappraisal differs fundamentally from mindfulness in that thoughts and emotions are just mental events that do not require a response or even cognitive reappraisal. Cognitive-Behavioral Therapy (CBT) works with emotion and thoughts as merely appraisals rather than facts, but ultimately the notion remains that appraisals can be changed to be more acceptable and less distressing (Chambers et al., 2009). In contrast to this, mindfulness does not change the value of mental events in any aspect. MBIs develop a capacity to simply allow these mental events to come and go.

In fact, mindfulness is a sort of cognitive reappraisal. The initial attitude that emotion is only mental events is cognitive reframing or change of meaning. Mindfulness can be understood as cognitive reappraisal at a process level rather than a content level (Chambers et al., 2009). In this context, the meaning of all experience (thoughts, emotions, sensations) is cognitively reappraised at the start of mindfulness practice. In initial training, it is necessary to be reminded of this repeatedly. Therefore, the dlPFC is more activated in the early stage of mindfulness training associated with effortful doing (Tang et al., 2015). This new cognitive reappraisal in working memory is necessary in every moment at the start of mindfulness practice. Early Buddhist teachings define mindfulness as a mental faculty (Pāli *indriya*, Sanskrit *indriya*, Chinese 根, Tibetan *dbang po*). In this context, mindfulness is "remembering" in one of its aspects (Anālayo, 2019). It consists of remembering to be aware and pay attention to the present moment. In this process or practice, the practitioner is reminded: "Remember: be aware!"

(Siegel et al., 2009). This shows a close, constant connection between the function of memory and attention (Vago & Silbersweig, 2012).

### *Is mindfulness alloplastic vs. autoplastic coping*

Alloplastic coping is directed toward changing the environment and autoplastic coping is directed toward changing the self (Perrez & Reicherts, 1992). Mindfulness practice primarily changes the approach to reality itself. Practitioners start to realize how experience is formed, gradually recognizing habitual patterns in the continuous judgment of everything as pleasurable, unpleasurable, and neutral, and gradually finding that all sensory and mental events are seen to share the three characteristics of impermanence, suffering, and notself (Grabovac et al., 2011). Through the insight that there is no such thing as a permanent, unchanging self, the observer and thus the perceived world are changed. Mindfulness is thus autoplastic coping. From the field and system theory, the change of the perceiver changes the other parts of the environmental field. Mindfulness practice gradually leads to the change of the environment (including relationships) and thus it is also a kind of alloplastic coping strategy.

### *Is mindfulness behavioral or cognitive coping?*

In their review, Thayer, Newman, and McClain (1994) concluded that one of the best general strategies to change a bad mood is a combination of relaxation, stress management, cognitive activity, and exercise techniques. Mindfulness practice, as described in the context of MBSR and MBCT, could be seen as combination of behavioral and cognitive coping. On the behavioral level (exercise), practitioners sit in a meditation position or practice mindful yoga. Group members of MBSR and MBCT are asked to practice yoga and meditation for approximately forty-five minutes a day as homework (45min/day; averages reported of 246 min/week). Participants are encouraged to keep a diary to describe their practice and reflections and insights. Formal meditation practices include focused attention on breathing, body scans, and open monitoring of sounds, thoughts, feelings, and bodily sensations. Participants are also introduced to psychosocial education. Mindfulness practice involves some aspect of relaxation (Hölzel et al., 2011).

### *Is mindfulness proactive coping?*

Mindfulness could be categorized as proactive coping. It is defined as efforts "undertaken in advance of a potentially stressful event to prevent it or modify its form before it occurs" (Aspinwall & Taylor, 1997, p. 417). Mindfulness is an everyday practice regardless of whether the practitioner is suffering; it is practiced every day because of commitment and trust. The higher stress reactivity and shorter stress recovery time are just by-products of day-to-day practice. That is why many mindfulness teachers emphasize the importance of commitment, personal vision, attitude, and intention for the mindfulness practice (Kabat-Zinn, 2013; Shapiro, 2006).

## Is mindfulness exposure therapy?

The similarity between exposure therapy and mindfulness is noticeable. Mindfulness practice supports being in full contact with experience with openness, acceptance, and non-judgment. This means exposure to everything that appears in the present moment. In principle, it is the same strategy as in exposure therapy.

Exposure therapy is a primary method of behavioral therapy for reducing fear and anxiety. Patients are exposed to fear-provoking stimuli and prevent their usual response with the aim of helping them experience their fear without the avoidance response that fears usually reinforce. This new experience supports the process of extinction. Instead of the fear response, patients acquire a sense of safety in the presence of the formerly feared stimuli. In general, extinction cannot be reached because of the behavioral and cognitive avoidance of fear- and anxiety-inducing situations (Borkovec & Costello, 1993). The essential extinction mechanisms are the experience of relaxation during exposure to fear-inducing stimuli (Wolpe, 1958). Mindfulness is similar to exposure therapy and supports extinction in two ways:

1. It changes the attitude to experience. Everything is just a transitory event in the stream of experience. It is possible to observe it without having to respond. Original avoidance is transformed to approach through attitudes such as acceptance, openness, non-judgment, trust, patience, curiosity (Kabat-Zinn, 2013).

2. Mindfulness practice also involves some aspect of relaxation (Hölzel et al., 2011). For example, experienced mindfulness meditators have shown a faster decrease in skin

conductance in response to aversive stimuli (Goleman & Schwartz, 1976). Zeidan et al. (2010) showed that even brief meditation training has beneficial effects on cardiovascular variables such as heart rate (its decrease). The influence of mindfulness on decreased blood pressure (de la Fuente, Franco, & Salvator, 2010), decreased cortisol levels (Carlson et al., 2007), decreased breathing rate (Lazar et al., 2005) and decreased skin conductance response (Austin, 2006) were also described. In their systematic review, Kaur and Singh (2018) documented that meditation is closely related to psychophysiological parameters associated with relaxation.

Taken together, mindfulness practice helps stay exposed to experience, whatever it is, in the kind of processing which supports the relaxation state. This is also true for psychotherapy. As Hunt (1998) concludes in his article: "The only way out is through." Practitioners repeatedly and progressively expose themselves to emotions without avoiding them. It is a necessary experience to know that nothing will happen and it is also necessary for the exploration of the fundamental patterns of the functioning of the mind. Interestingly, in our research,[21] we found a significant increase with a large effect in the Non-reactivity subscale of FFMQ.

A network of brain regions that are crucial for the extinction of conditioned fear responses and the retention of extinction are discussed in detail in the chapter "Habituation and extinction." The key structure of this network is the ventromedial prefrontal cortex (vmPFC) because it is necessary for a successful recall of the extinction. The other structures associated with extinction are the hippocampus (Milad et al., 2007), which is essential for context safety signaling, and the amygdalae, which has a crucial role during the acquisition and expression of conditioned fear (LeDoux, 2000). The structure of this network is down-regulated by the vmPFC and the hippocampus (Ochsner, 2012).

Interestingly, there is increasing evidence that the effect of mindfulness training has a similar neuronal background as exposure therapy. The overlap of brain regions involved and the processual similarity between both methods suggest that mindfulness training might enhance the ability to extinguish conditioned fear by affecting the brain network associated with safety

[21] Svetlak, M., Linhartova, P., Knejzlikova, T., Kosa, B., Sumec, R., Hornickova, V., Jarolinova, K., Lucanska, K., Slezackova, A., Kasparek, T. (submited to Applied Psychology: Health and Well-Being). Mindful in Medical School, Thanks to Facebook: Online Mindfulness-Based Mental Health Support Program with Intensive Reminder System

signaling (Tang et al., 2015). For example, Hölzel et al. (2008) found that cumulative hours of meditation training were positively correlated with gray matter concentration in the vmPFC in experienced meditators. Goldin and Gross (2010) also described that people with social anxiety disorders had reduced amygdala activation following eight weeks of mindfulness practice. These findings suggest that mindfulness meditation supports the process of extinction and it is similar to exposure therapy in some aspects.

## Do mindfulness and psychotherapy have similar goals?

In a unique article, Jeffery Martin (1997) proposed mindfulness as a core psychotherapy process or even as a common factor of psychotherapy. Horowitz (2002) shared a similar opinion. Mulder et al. (2017) wrote a review describing a common factor model for psychotherapy in which mindfulness is implicitly included. In their transtheoretical analysis of psychotherapy approaches, Prochaska and Norcross (2003) show that many psychotherapeutic approaches differ in their content, but they work with the same processes of change. In other words, the theory of psychopathology suggests *what* needs to be changed. The theory of the processes of change tells *how* the change occurs. From a clinical and psychotherapeutic perspective point of view, many implicit and explicit aims are very similar to the ones derived from mindfulness practice.

Van der Velden et al. (2015) describe some processes/mechanisms of change which are shared by mindfulness training and CBT. Similarities between mindfulness and psychoanalysis are analyzed and described by Mark Epstein (1995). At the most general level, all psychotherapy approaches support patients being able to recognize the automatic and habitual dysfunctional cognitive processes that are important in the etiology of their suffering; these approaches thus probably also enhance the capacity to be mindful in some aspects.

1) We support patients being able to recognize the automatic and habitual dysfunctional cognitive processes.

2) We help them to increase their emotional awareness to be able to recognize their nonadaptive reactions and their origins in time.

3) We teach them to develop a meta-awareness to be able to observe their thoughts and feelings as temporary and automatic events in the mind instead of as facts or true descriptions.

4) We help them to develop the ability to relate to their current experience in a wider, decentered perspective as a transient mental event rather than reflections of the self or as necessarily accurate reflections on reality. We often remind them that current thoughts are more memories of historical interpretation than messages about their current value. In the psychotherapeutic approaches to shame, we often teach them to be aware that shame is the way they felt in the past in a concrete situation with a concrete person; it is not objective information about them in the present moment.

5) We help them to shift their attention from what happened in the past to the person to whom it happened. We support them gaining insight into how they construct their experience in the present moment (Epstein, 1995, p. 133).

6) We teach them to be able to stay with their experience without avoidance or withdrawal, to have an opportunity to explore the experience in a new context and with new attitudes (Epstein, 1995, p. 133). From this point of view, mindfulness training helps patients to develop essential self-functions necessary for successful psychotherapy (Kepner, 1995, p. 42). The development of self-functions such as modulation of stimulation, bodily awareness, and so on is a fundamental step in the treatment of many mental disorders (e.g., GAD, eating disorders) and especially for the treatment of adult survivors of childhood abuse and for patients with personality disorders with lower levels of personality organization, such as narcissistic and borderline personality disorder (Linehan, 1993).

It is not still clear how much MBIs differ in their psychological and neurobiological mechanisms from the mechanisms observed in common Western psychological approaches, such as psychotherapy (Chiesa et al., 2010). It seems that psychotherapy and mindfulness are complementary to one another, and one follows the other. To be successful in psychotherapy, it is necessary to learn some basic aspect of mindfulness (Martin, 1997). To overcome some aversive states which often appear during mindfulness practice, we need support from

psychotherapy especially with unintegrated traumatic experience (Epstein, 1995) and during the development of basic self-functions (Kepner, 1995). Unlike psychotherapy, the aims of MBIs are usually clear. The general and explicit goal is to increase mindfulness throughout daily life. It is paradoxical sometimes for people with concrete problems such as anxiety or a chronic headache.

**Table 7** Specific emotion regulation strategies and strategy subtypes and their relation to mindfulness

| | Emotion regulation and coping | Mindfulness | | Emotion regulation and coping | Mindfulness |
|---|---|---|---|---|---|
| Habituation | ■ | ■ | Responses that function for the management of stress[3] | ■ | ■ |
| Extinction | ■ | ■ | Approach[3] | ■ | ■ |
| Cognitive reappraisal | ■ | ■ | Avoidance[3] | ■ | |
| Expressive suppression | ■ | | Disengagement[3] | ■ | ■ |
| Thought suppression | ■ | | Engagement[3] | ■ | ■ |
| Active mood management[1] | ■ | ■ | Control: "Proactive take-charge approach"[3] | ■ | ■ |
| Seeking pleasurable activities and distraction[1] | ■ | ■ | Escape[3] | ■ | |
| Passive mood management[1] | ■ | | Primary relinquishment of control coping[3] | ■ | |
| Social support, ventilation, and gratification[1] | ■ | | Secondary relinquishment of control coping[3] | ■ | |
| Direct tension reduction[1] | ■ | | Relinquishment of control[3] | ■ | ■ |
| Withdrawal-avoidance[1] | ■ | | Assimilation[3] | ■ | ■ |
| Activity: physical, social, cognitive[1] | ■ | ■ | Accommodation[3] | ■ | ■ |
| Caffeine, food, and passive stimulation[1] | ■ | | Alloplastic coping[3] | ■ | |
| Reduced activity and rest[1] | ■ | | Autoplastic coping[3] | ■ | ■ |
| Emotional expression, food, and drugs[1] | ■ | | Volitional, effortful, controlled coping[3] | ■ | ■ |
| Muscle release, cognitive control, and stress management[1] | ■ | ■ | Involuntary, automatic coping[3] | ■ | |
| Pleasant distraction[1] | ■ | ■ | Behavioral coping[3] | ■ | ■ |
| Cognitive and behavioral disengagement[2] | ■ | | Cognitive coping[3] | ■ | ■ |
| Cognitive and behavioral distraction[2] | ■ | ■ | Social[3] | ■ | |
| Cognitive and behavioral engagement[2] | ■ | ■ | Solitary[3] | ■ | ■ |
| Emotion-focused coping[3] | ■ | ■ | Proactive coping[3] | ■ | ■ |
| Problem-focused coping[3] | ■ | ■ | Direct coping[3] | ■ | ■ |
| Appraisal-focused coping[3] | ■ | ■ | Indirect coping[3] | ■ | |
| Responses that modify the situation[3] | ■ | | Concentrate–mixed[4] | ■ | ■ |
| Responses that function to control the meaning[3] | ■ | | Reappraise emotional response[4] | ■ | ■ |
| Active positive distraction[4] | ■ | | Reappraise emotional stimulus[4] | ■ | ■ |
| Passive positive distraction[4] | ■ | | Reappraise via perspective taking[4] | ■ | ■ |
| Active neutral distraction[4] | ■ | ■ | Reappraisal–mixed[4] | ■ | ■ |
| Passive neutral distraction[4] | ■ | ■ | Suppress the expression of emotion[4] | ■ | |
| Concentrate on feelings[4] | ■ | ■ | Suppress the experience of emotion[4] | ■ | |
| Concentrate on causes and implications[4] | ■ | ■ | Suppress thoughts of the emotion-eliciting event[4] | ■ | |
| | ■ | ■ | Suppression–mixed[4] | ■ | |

[1]Thayer, Newman, and McClain, 1994; [2]Parkinson and Totterdell, 1999; [3]Skinner et al., 2003; [4]Webb et al., 2012

## The neural bases of emotion regulation and mindfulness: where do they overlap?

Another way to conceptualize and define mindfulness is a simple comparison of its described neural correlates with the neural correlates associated with the emotion regulation process. At the most general level, emotion regulation is mediated through interactions between the prefrontal, parietal, and cingulate systems that control and inhibit the subcortical systems such as the amygdalae or the ventral striatum that are involved in emotion generation and affective appraisal (Ochsner, 2012). Concretely, the ventromedial prefrontal cortex (vmPFC), dorsomedial prefrontal cortex (dmPFC), dorsolateral prefrontal cortex (dlPFC), and ventrolateral prefrontal cortex (vlPFC), inferior parietal cortex (IPC), and the anterior cingulate cortex (ACC) are often discussed as the common brain regions supporting emotion regulation (e.g., Dörfel et al., 2014; Ochsner et al., 2012). Table 8 focuses on the structures that are activated in different conditions such as meditation or emotional regulation.

The simple comparison shows that emotion regulation and mindfulness share the same brain systems involved in emotion control. The comparison also reveals that at a neural level mindfulness practice has an impact on more neural structures and functional circuits than emotion regulation. This evidence could support the hypothesis that mindfulness has a unique underlying neurocognitive mechanism. This comparison also documents the relation between the length of the mindfulness practice and the involvement of neural structures, as discussed in the chapter “Is mindfulness a top-down or bottom-up regulation?”

**Table 8** Comparison of neural structures involved in emotion regulation processes and mindfulness practice

| ↑/↓ | Explicit emotion regulation | Implicit emotion regulation | Mindfulness – Dispositional | Mindfulness – Non-experts | Mindfulness – Experts |
|---|---|---|---|---|---|
| dmPFC ↑ | | | | | ↓ |
| dlPFC ↑ | | | | | ↓ |
| dlPFC ↓ | | | | | |
| vlPFC ↑ | | | | | ↓ |
| vmPFC ↑ | | | | | |
| mPFC ↑ | | | | | ↓ |
| mPFC ↓ | | | | | |
| IPC ↑ | | | | | |
| PPC ↑ | | | | | ↓ |
| dACC ↑ | | | | | ↓ |
| PCC | | | | | |
| SMA | | | | | |
| Left and right amygdalae ↓ | | | | | |
| Ventral striatum ↓ | | | | | |
| OFC ↑ | | | | | ↓ |
| Insula ↓ | | | | | |
| Insula ↑ | | | | | |
| Thalamus ↑ | | | | | |
| Somatosensory cortex ↑ | | | | | |
| Hippocampus ↑ | | | | | |
| Corpus callosum ↑ | | | | | |
| Entorhinal cortex ↑ | | | | | |
| Left caudate body ↑ | | | | | |

Notes: dACC – dorsal anterior cingulate cortex; dlPFC – dorsolateral prefrontal cortex; dmPFC – dorsomedial prefrontal cortex; IPC – inferior parietal cortex; PCC – posterior cingulate cortex; SMA – supplementary motor area; vmPFC – ventromedial prefrontal cortex; vlPFC – ventrolateral prefrontal cortex; mPFC – medial prefrontal cortex

# Mindful emotion regulation

## The answer the question three

The aim of this thesis is to propose a basic framework for a better understanding of emotion regulation changes induced with mindfulness practice and to find whether "mindful emotion regulation" exists as a unique emotion regulation strategy and, if so, how it differs and overlaps with described implicit/explicit and top-down and bottom-up emotion regulation strategies.

The uniqueness of emotion regulation induced with mindfulness practice is based on a paradox. It does not focus primarily on emotion regulation. The enhanced emotion regulation that has been suggested as underlying many of the beneficial effects of mindfulness meditation (e.g., Tang et al., 2015) is not an explicit goal of mindfulness practice. In fact, the regulation of emotions is a result of a deep change in the practitioner's view of the world. More scientifically, it is a real change of the paradigm through which the world and experiences are perceived and interpreted[22]. Suffering and experiencing through negative emotions (e.g., fear, anxiety, sadness) are reduced through insight into the very essence of living (the three universal characteristics: impermanence, suffering, and not-self). In other word, attitudes are changed to reality.

In this context, it could be supposed that emotion regulation is induced through the change of implicit attitudes to emotion. Formal and informal practice support the development of fundamental attitudes to reality such as openness, curiosity, acceptance, non-judging, patience, beginner's mind, trust, non-striving, letting be, compassion, and self-compassion. Everyday practice changes the explicit top-down and will-driven attitudes to more implicit and automatic ones. This notion is in agreement with neuroscience results documenting the shift from top-down to bottom-up regulation induced by mindfulness practice. In the context of affective priming research results (e.g., Schneider & Shiffrin, 1977; reviewed by Fazio, 2001) it is evident that attitudes, goals, and beliefs automatically influence what is perceived, how it is interpreted, and how it is evaluated. Although there is not enough experimental evidence in the literature supporting this notion, Bergeron, Almgren-Doré, and Dandeneau (2016) show that implicit mindfulness attitudes, regardless of the participant's level of trait mindfulness, induce a greater decline in cortisol during the early recovery stage compared to those in the control

[22] From the Buddhist perspective, no practical distinction is made between awareness of perceptions (through senses) and cognitions (i.e., mental events). They are processed in the same manner during mindfulness practice (Grabovac et al., 2011).

condition. In the context of emotion regulation, the influence of attitudes on cognitive reappraisal activation was also documented (Williams et al., 2009). The influence of implicit theories about emotions on emotion regulation has also been documented (Tamir et al., 2007). Mindfulness (Buddhist teaching) could be thus seen as an implicit theory about emotions in some aspects.

Changes induced by mindfulness practice can be described as emotion regulation and coping strategies at some level, but these concepts are not able to describe the whole of mindfulness practice. It can be understood as cognitive reappraisal at a process level rather than a content level (Chambers et al., 2009), through which the initial attitude that thoughts, emotions, and sensations are only mental events is reframed, changing the meaning of experiences as a whole.

Mindfulness could be understood as complex emotion regulation training with a unique underlying neurocognitive mechanism encompassing many emotional regulation strategies from top-down and bottom-up groups. Mindfulness is a unique approach that integrates various emotional regulation strategies into one interconnected whole. It changes the explicit strategies of emotion regulation into implicit ones through formal and informal practice. Some concrete emotion regulation strategies (e.g., cognitive reappraisal) help regulate emotions only in an emotional situation; the mindfulness approach leads to the continual regulation of experiences as they occur. In mindfulness practice, practitioners regulate experience (not just emotions) to be more realistic and thus less painful. From this point of view, emotion regulation is just a by-product of the deeper and more complex transformation induced by mindfulness.

Mindfulness practice activates, develops, and supports a variety of emotion regulation processes. These include top-down processes involving attention focusing, voluntary cognitive control, conscious monitoring, and explicit regulatory functions; and bottom-up processes, which are affect driven, based on emotion functions that modulate arousal, valence, and the encoding of subjective value regarding the triggering stimuli (Guendelman et al., 2017).

Mindfulness practice helps to distinguish between feelings that provide a “real” subjective experiential window into the processes of life regulation (e.g., anxiety that helps avoid a dangerous person) and those feelings that are the result of the habitual attachment/aversion reaction to transient feelings and the mental proliferation in their background (e.g., sadness at the beginning of a vacation that it will end). Although emotions can occur without self-awareness (action programs, implicit reactions), our capacity for self-awareness and self-

relevant thought predispose us to have many emotions that are not associated with the process of life regulation (discussed in the chapter "The nature of emotions: from survival circuits to emotions") but are the result of our ability to think consciously about ourselves. Leary and Gohar (2014, p. 377) state that people's emotions are affected when they 1) compare themselves to their personal standards, 2) think about themselves in the past and future, 3) evaluate their characteristics, and 4) think about how they are perceived by other people. Mindfulness practice helps practitioners to see experiences clearly in their "default mode."

While the research of emotion regulation is very often based on the very simple and pregnant paradigm of one strategy compared to a control condition, mindfulness practice and its effects are very complex, and it is hard to compare it with a concrete emotion regulation strategy. It is probably more suitable to view particular results from emotion regulation studies as jigsaw pieces from which the final picture of mindfulness is assembled. Lutz et al. (2015) stated that mindfulness meditation should be conceived as "a family of complex emotional and attentional regulatory strategies developed for various ends." Moreover, emotions are a multifaceted phenomenon that is regulated on different levels according to the different individual goals at different periods of life (Koole, 2009), mindfulness training, or individual psychotherapy. Emotion regulation can be the reason people start to practice mindfulness; it is also often the reason that clinicians recommend mindfulness training, but emotion regulation is not the goal of mindfulness. To regulate emotions is inconsistent with the very fundamentals of mindfulness, such as openness, acceptance, and curiosity. Mindfulness practice leads to processing experience through plain exploration, regardless of the valence of the stimuli. This kind of exploration creates an opportunity for insight into mental habits and reduces automatic efforts to control feelings and experiences. Mindfulness is more than an education in how the mind works; this knowledge is obtained through direct observation. Knowledge is not just information; it is experienced and lived. The embodiment of mindfulness is one of the most important competences of mindfulness teachers/trainers in MBI training (Williams, Crane, & Soulsby, 2007). This should also apply to psychotherapists.

There is no agreement among authors whether "mindful emotion regulation" is a necessary concept. Most authors do not refer to it explicitly. There is no clear and single definition of mindful emotion regulation in the literature. Guendelman et al., (2017) conclude that it is a unique emotion regulation strategy that results from encountering diverse emotional states from a mindful mental state that includes awareness and acceptance. Chambers, et al. (2009) wrote:

"Mindful emotion regulation represents the capacity to remain mindfully aware at all times, irrespective of the apparent valence or magnitude of any emotion that is experienced. It does not entail the suppression of the emotional experience, nor any specific attempts to reappraise or alter it in any way."

## Conclusion

It has been almost forty years since the founding of MBSR. There is no doubt that MBIs are effective in improving mental health in healthy people and in those with various psychiatric or somatic conditions. It is evident that MBIs and follow-up programs integrating mindfulness and psychotherapy address changes of human experience on a fundamental level: the ability to regulate emotions and thoughts. Since people most often seek help from mental health professionals because of emotional dysregulation, MBIs should be one of the basic methods of choice in mental health care.

Mindfulness practice mediated through MBIs is unique in promoting meta-awareness of emotion regulation strategies (Farb et al., 2014). Mindfulness serves as a meta-strategy that leads to the shift from the contents of consciousness to the process of consciousness itself. Through the increasing performance of meta-awareness, mindfulness helps practitioners to be the witnesses and the observers of the appraisal process (cognitive biases), and it supports the ability to see what has been previously reflexively adopted or conditioned (self-awareness). Through the insight into the impermanence of experience, mindfulness reduces the urgency to react to impulses continually emerging in the mind (self-regulation). The uniqueness of mindfulness is also in its support of the development of a positive relationship between the self and other that transcends self-focused needs and increases prosocial characteristics (self-transcendence). More than a concept or a scientific construct, mindfulness is a non-conceptual phenomenological attentional process (Vago & Silbersweig, 2012) that represents the universal principle or process of change that is also common in psychotherapy (Martin, 1997; Murray & Rucklidge, 2017). At the level of emotion regulation research, MBIs support the development of adaptive emotion regulation and coping strategies and reduce the nonadaptive ones.

Daily mindfulness in formal and informal practice and the associated deepening insight into how emotions arise lead practitioners to a state where many emotions disappear and thus, no

longer require regulation. Mindfulness practice induces a deep transformation of the way of being. Enhanced emotion regulation is only one piece of this transformation.

There is currently no research to compare the differences between the long-term effect of mindfulness practice and individual psychotherapy, in which the structure/character of the personality is also transformed.

## Future challenges

Mindfulness is much more than just another method in the biomedical model context. It not only relieves symptoms; it returns the practitioner to the mind's factory settings, supporting health through its unique nature (Kabat-Zinn, 2013). I do not share the enthusiastic belief that mindfulness is the cure for everything and everybody. I think that it offers a new approach to health and disease, but it is still necessary to ask the same questions as for any treatment approach: *For whom is this the best form of treatment? For what kind of suffering? In what period of life? In what life context?* I find it important to be able to answer these questions in order to protect our patients and the public from being harmed, cheated, disappointed, or dissatisfied. Answering these questions will help practitioners to find an appropriate position for the mindfulness approach in medicine and psychotherapy, unimpaired by misunderstanding. This is the first challenge for any mental health expert. For this reason, MBIs should be indicated and guided only by experienced physicians and psychologists.

If we agree that mindfulness is an effective approach, our second challenge should be to search for effective ways to deliver this method/approach to our patients and to teach it our colleagues and students. Healthcare professionals are almost never trained in how to teach their patients and colleagues. The problem in medicine is not that there are not enough effective methods. The problem is that we are often unable to introduce these methods well and motivate our patients or we do not live according to our own recommendations. I agree with Christiane Wolf (2015), the author of the book *The Clinician's Guide to Teaching Mindfulness*, that the most important quality a mindfulness facilitator brings into the classroom is the embodiment of mindfulness and compassion. This comes partly out of a person's character and partly from their life experience. However, mostly—in this setting—it comes out of a regular, dedicated personal mindfulness practice. Kabat-Zinn (2013) says that the teacher is the intervention. That observation is also known from psychotherapy.

The third and final challenge from my point of view is somewhat paradoxical. We should protect mindfulness from a strictly biomedical research approach. Evidence is needed, and it is necessary for many outcomes, but everybody knows that a cup of coffee is always more than caffeine tablet.

# References


Allen, M., Bromley, A., Kuyken, W., & Sonnenberg, S. J. (2009). Participants' experiences of mindfulness-based cognitive therapy: It changed me in just about every way pos pible. *Behavioural and Cognitive Psychotherapy, 37*(4), 413-430. doi:10.1017/S135246580999004X

Allen, M., Dietz, M., Blair, K. S., van Beek, M., Rees, G., Vestergaard-Poulsen, P., . . . Roepstorff, A. (2012). Cognitive-affective neural plasticity following active-controlled mindfulness intervention. *Journal of Neuroscience, 32*(44), 15601-15610. doi:10.1523/JNEUROSCI.2957-12.2012

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, *30*(2), 217–237. https://doi.org/10.1016/j.cpr.2009.11.004

Aldao, A., & Nolen-Hoeksema, S. (2010). Specificity of cognitive emotion regulation strategies: A transdiagnostic examination. *Behaviour Research and Therapy*, *48*(10), 974-983. doi: 10.1016/j.brat.2010.06.002

Alsubaie, M., Abbott, R., Dunn, B., Dickens, C., Keil, T. F., Henley, W., et al. (2017). Mechanisms of action in mindfulness-based cognitive therapy (MBCT) and mindfulness-based stress reduction (MBSR) in people with physical and/or psychological conditions: A systematic review. *Clinical Psychology Review*, 55, 74–91. https://doi.org/10.1016/j.cpr.2017.04.008

Altschuler, A., Rosenbaum, E., Gordon, P., Canales, S., & Avins, A. L. (2012). Audio recordings of mindfulness-based stress reduction training to improve cancer patients' mood and quality of life - a pilot feasibility study. *Supportive Care in Cancer*, 20(6), 1291–1297. https://doi.org/10.1007/s00520-011-1216-7

Andersson, G., & Cuijpers, P. (2009). Internet-based and other computerized psychological treatments for adult depression: a meta-analysis. *Cognitive Behaviour Therapy*, 38(4), 196–205. https://doi.org/10.1080/16506070903318960

Andersson, G., & Titov, N. (2014). Advantages and limitations of Internet-based interventions for common mental disorders. *World Psychiatry*, 13(1), 4–11. https://doi.org/10.1002/wps.20083

Anālayo, B. (2019). Adding historical depth to definitions of mindfulness. *Current Opinion in Psychology, 28*, 11-14. doi:10.1016/j.copsyc.2018.09.013

Antoine, P., Congard, A., Andreotti, E., Dauvier, B., Illy, J., & Poinsot, R. (2018). A mindfulness-based intervention: Differential effects on affective and processual evolution. *Applied Psychology: Health and Well-being, 10*(3), 368-390. doi:10.1111/aphw.12137

Aspinwall, L. G., & Taylor, S. E. (1992). Modeling cognitive adaptation: A longitudinal investigation of the impact of individual differences and coping on college adjustment and performance. *Journal of Personality and Social Psychology, 63*(6), 989-1003. http://dx.doi.org/10.1037/0022-3514.63.6.989

Austin, J.H. (2006). *Zen-brain reflections*. Cambridge, MA: MIT Press.

Ayers, S., & de Visser, R. (2011*). Psychology for medicine (p. 55)*. London: Sage

Baer, R. A., Lykins, E. L. B., & Peters, J. R. (2012). Mindfulness and self-compassion as predictors of psychological wellbeing in long-term meditators and matched nonmeditators. *Journal of Positive Psychology*, 7(3), 230–238. https://doi.org/10.1080/17439760.2012.674548

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27–45. https://doi.org/10.1177/1073191105283504

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment*, 11(3), 191–206.

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., et al. (2008). Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment*, 15(3), 329–342. https://doi.org/10.1177/1073191107313003

Baer, R. (2014). *Mindfulness-based treatment approaches: clinician's guide to evidence base and applications*. Second edition. Waltham, MA: Elsevier Academic Press.

Bach, P., & Hayes, S. C. (2002). The use of acceptance and commitment therapy to prevent the rehospitalization of psychotic patients: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 70*(5), 1129-1139. doi:10.1037/0022-006X.70.5.1129

Bargh, J. A., & Williams, L. E. (2007). The nonconscious regulation of emotion. In J. Gross (Ed.), *Handbook of emotion regulation (2nd ed.)* (pp. 429– 445). New York: Guilford Press.

Bardacke, N. (2012). *Mindful birthing: Training the mind, body, and heart for childbirth and beyond*. New York: Harper One.

Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and performance at the beginning of the new millennium: What do we know and where do we go next? *International Journal of Selection and Assessment, 9*(1-2), 9-29. doi: 10.1111/1468-2389.00160

Barnes, N., Hattan, P., Black, D. S., & Schuman-Olivier, Z. (2017). An Examination of Mindfulness-Based Programs in US Medical Schools. *Mindfulness*, 8(2), 489–494. https://doi.org/10.1007/s12671-016-0623-8

Baumeister, R. F., Dale, K., & Sommer, K. L. (1998). Freudian Defense Mechanisms and Empirical Findings in Modern Social Psychology: Reaction Formation, Projection, Displacement, Undoing, Isolation, Sublimation, and Denial. *Journal of Personality*, *66*(6), 1081–1124. https://doi.org/10.1111/1467-6494.00043

Beck, A. T. (1976). *Cognitive therapy and the emotional disorders*. New York: International Universities Press.

Benda, J. (2007). Mindfulness in psychological research and in clinical practice. [Všímavost v psychologickém výzkumu a v klinické praxi] *Ceskoslovenska Psychologie, 51*(2), 129-140.

Bergeron, C. M., Almgren-Doré, I., & Dandeneau, S. (2016). "Letting go" (implicitly): Priming mindfulness mitigates the effects of a moderate social stressor. *Frontiers in Psychology, 7*(JUN) doi:10.3389/fpsyg.2016.00872

Bernatova, T., & Svetlak, M. (2017). Emotional and interoceptive awareness and its relationship to restriction in young women with eating disorders and healthy controls: A cascade from emotional to behavioral dysregulation. *Activitas Nervosa Superior, 59*(2), 78-86. doi:10.1007/s41470-017-0006-z

Bernátová, T., & Světlák, M. (2017). Emotion regulation during looking in the mirror in patients with eating disorders. *European Psychiatry*, *41*, S431–S432. https://doi.org/10.1016/J.EURPSY.2017.01.415

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*(3), 230-241. doi:10.1093/clipsy/bph077

Bob, P., Roman, R., Svetlak, M., Kukleta, M., Chladek, J., & Brazdil, M. (2014). Preictal dynamics of eeg complexity in intracranially recorded epileptic seizure: A case report. *Medicine (United States), 93*(23) doi:10.1097/MD.0000000000000151

Book for better living. Mindfulness Meditation Downloads Web (2012). Resource document. https://www.booksforbetterliving.com/mindfulness-meditation-downloads/. Accessed 25 June 2018.

Borkovec, T. D., & Costello, E. (1993). Efficacy of applied relaxation and cognitive-behavioral therapy in the treatment of generalized anxiety disorder. *Journal of Consulting and Clinical Psychology, 61*(4), 611-619. http://dx.doi.org/10.1037/0022-006X.61.4.611

Botvinick, M. M., Cohen, J. D., & Carter, C. S. (2004). Conflict monitoring and anterior cingulate cortex: An update. *Trends in Cognitive Sciences, 8*(12), 539-546. doi:10.1016/j.tics.2004.10.003

Bowen, S., Chawla, N., & Marlatt, G. A. (2011). *Mindfulness-based relapse prevention for addictive behaviors: A clinician's guide*. New York: Guilford Press.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*(4), 822-848. doi:10.1037/0022-3514.84.4.822

Brefczynski-Lewis, J. A., Lutz, A., Schaefer, H. S., Levinson, D. B., & Davidson, R. J. (2007). Neural correlates of attentional expertise in long-term meditation practitioners. *Proceedings of the National Academy of Sciences of the United States of America, 104*(27), 11483-11488. doi:10.1073/pnas.0606552104

Breuer, J. & Freud, S. (1957). *Studies on Hysteria*. Oxford: Basic Books.

Brown, R. J. (2004). Psychological mechanisms of medically unexplained symptoms: An integrative conceptual model. *Psychological Bulletin, 130*(5), 793-812. doi:10.1037/0033-2909.130.5.793

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, 18(4), 211–237. http://dx.doi.org/10.1080/10478400701598298

Brown, K.W., & Cordon, S.L. (2009). *Toward a phenomenology of mindfulness: Subjective experience and emotional correlates*. In F. Didonna (Ed.), Clinical handbook of mindfulness (pp. 59–81). New York: Springer.

Brown K. W., Weinstein N., & Creswell J. D. (2012). Trait mindfulness modulates neuroendocrine and affective responses to social evaluative threat. *Psychoneuroendocrinology* 37 2037–2041. 10.1016/j.psyneuen.2012.04.003

Buhle, J. T., Silvers, J. A., Wage, T. D., Lopez, R., Onyemekwu, C., Kober, H., . . . Ochsner, K. N. (2014). Cognitive reappraisal of emotion: A meta-analysis of human neuroimaging studies. *Cerebral Cortex, 24*(11), 2981-2990. doi:10.1093/cercor/bht154

Bushman, B. J., Baumeister, R. F., & Phillips, C. M. (2001). Do people aggress to improve their mood? catharsis beliefs, affect regulation opportunity, and aggressive responding. *Journal of Personality and Social Psychology, 81*(1), 17-32.

Bushman, B. J. (2002). Does venting anger feed or extinguish the flame? catharsis, rumination, distraction, anger, and aggressive responding. *Personality and Social Psychology Bulletin, 28*(6), 724-731. doi:10.1177/0146167202289002

Buchheld, N., Grossman, P., & Walach, H. (2001). Measuring mindfulness in insight meditation (Vipassana) and meditationbased psychotherapy: The development of the Freiburg Mindfulness Inventory (FMI). *Journal of Meditation and Meditation Research*, 1(1), 11–34.

Bydlowski, S. Corcos, M., Jeammet, P., Paterniti, S., Berthoz, S., Luarier, C. et al. (2005). Emotion-processing deficits in eating disorders. *International Journal of Eating Disorders*, 37, 321–329. DOI: 10.1002/eat.20132

Campanella, F., Crescentini, C., Urgesi, C., & Fabbro, F. (2014). Mindfulness-oriented meditation improves self-related character scales in healthy individuals. *Comprehensive Psychiatry, 55*(5), 1269-1278. doi:10.1016/j.comppsych.2014.03.009

Carmody, J., Baer, R. A., Lykins, E. L. B., & Olendzki, N. (2009). An empirical study of the mechanisms of mindfulness in a mindfulness-based stress reduction program. *Journal of Clinical Psychology, 65*(6), 613-626. doi:10.1002/jclp.20579

Carmody, J., & Baer, R. A. (2009). How long does a mindfulness-based stress reduction program need to be? A review of class contact hours and effect sizes for psychological distress. *Journal of Clinical Psychology, 65*(6), 627-638. doi:10.1002/jclp.20555

Carlson, L. E., Speca, M., Faris, P., & Patel, K. D. (2007). One year pre-post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of mindfulness-based stress reduction (MBSR) in breast and prostate cancer outpatients. *Brain, Behavior, and Immunity, 21*(8), 1038-1049. doi:10.1016/j.bbi.2007.04.002

Carver, C. S., & Scheier, M. F. (1998). On the self-regulation of behavior. New York: Cambridge University Press.

Cash, M., & Whittingham, K. (2010). What Facets of Mindfulness Contribute to Psychological Well-being and Depressive, Anxious, and Stress-related Symptomatology? *Mindfulness*, 1(3), 177–182. https://doi.org/10.1007/s12671-010-0023-4

Cavanagh, K., Churchard, A., O'Hanlon, P., Mundy, T., Votolato, P., Jones, F., et al. (2018). A Randomised Controlled Trial of a Brief Online Mindfulness-Based Intervention in a Non-clinical Population: Replication and Extension. *Mindfulness*, 9(4), 1191-1205. https://doi.org/10.1007/s12671-017-0856-1

Cavanagh, K., Strauss, C., Cicconi, F., Griffiths, N., Wyper, A., & Jones, F. (2013). A randomised controlled trial of a brief online mindfulness-based intervention. *Behaviour Research and Therapy*, 51(9), 573–578. https://doi.org/10.1016/j.brat.2013.06.003

Chadwick, P., Hember, M., Symes, J., Peters, E., Kuipers, E., & Dagnan, D. (2008). Responding mindfully to

unpleasant thoughts and images: Reliability and validity of the Southampton Mindfulness questionnaire (SMQ). *The British Journal of Clinical Psychology/the British Psychological Society*, 47, 451–455.

Chambers, R., Gullone, E., & Allen, N. B. (2009). Mindful emotion regulation : An integrative review. *Clinical Psychology Review*, 29(6), 560–572. https://doi.org/10.1016/j.cpr.2009.06.005

Chang, V. T., Overall, N. C., Madden, H., & Low, R. S. T. (2018). Expressive suppression tendencies, projection bias in memory of negative emotions, and well-being. *Emotion, 18*(7), 925-941. doi:10.1037/emo0000405

Chiesa, A., Serretti, A., & Jakobsen, J. C. (2013). Mindfulness: Top-down or bottom-up emotion regulation strategy? *Clinical Psychology Review, 33*(1), 82-96. doi:10.1016/j.cpr.2012.10.006

Chiesa, A., Anselmi, R., & Serretti, A. (2014). Psychological mechanisms of mindfulnessbased interventions: What do we know? *Holistic Nursing Practice*, 28(2), 124–148. http://dx.doi.org/10.1097/HNP.0000000000000017.

Chiesa, A., Brambilla, P., & Serretti, A. (2010). Functional neural correlates of mindfulness meditations in comparison with psychotherapy, pharmacotherapy and placebo effect: is there a link? *Acta Neuropsychiatrica, 22*(3), 104-117. doi:10.1111/j.1601-5215.2010.00460.x

Chrastina, J., Ivanová, K., Krejčířová, O., & Ježorská, Š. (2014). Results of subjective quality of life research using SQUALA standardized questionnairre. *Profese online*, 7(1), 1-8.

Ciarrochi, J., Caputi, P., & Mayer, J. D. (2003). The distinctiveness and utility of a measure of trait emotional awareness. *Personality and Individual Differences, 34*(8), 1477-1490. doi:10.1016/S0191-8869(02)00129-0

Cloninger, C. R. ,Svrakic, D. M. & Przybeck, T. R. (1993). A psychobiological model of temperament and character. *Archives of .General Psychiatry* 50, 975–990. doi: 10.1001/archpsyc.1993.01820240059008

Coleman, D., Davidson, R.J. (2017). *Altered traits : science reveals how meditation changes your mind, brain, and body*. New York: Penguin Random House

Cooper, D., Yap, K., & Batalha, L. (2018). Mindfulness-based interventions and their effects on emotional clarity: A systematic review and meta-analysis. *Journal of Affective Disorders, 235*, 265-276. doi:10.1016/j.jad.2018.04.018

Costa, P.T., Jr., & McCrae, R.R. (1992). *Revised NEO Personality Inventory (NEO PI-R)and NEO Five-Factor Inventory (NEO-FFI): Professional manual*. Odessa, FL: Psychological Assessment Resources.

Craig, A. D. (2009). How do you feel - now? the anterior insula and human awareness. *Nature Reviews Neuroscience*, 10(1), 59-70. doi:10.1038/nrn2555

Craig, A. D. (2002). How do you feel? interoception: The sense of the physiological condition of the body. *Nature Reviews Neuroscience*, 3(8), 655-666. doi:10.1038/nrn894

Cramer, P. (1998). Coping and defense mechanisms: What's the difference? *Journal of Personality*, *66*(6), 919–946. https://doi.org/10.1111/1467-6494.00037

Crane, R. S., & Kuyken, W. (2012). The implementation of mindfulness-based cognitive therapy: Learning from the UK health service experience. *Mindfulness, 4*, 246–254. doi:10.1007/s12671-012-0121-6

Crescentini, C., & Capurso, V. (2015). Mindfulness meditation and explicit and implicit indicators of personality and self-concept changes. *Frontiers in Psychology, 6*(JAN) doi:10.3389/fpsyg.2015.00044

Creswell, J. D., Way, B. M., Eisenberger, N. I., & Lieberman, M. D. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine, 69*(6), 560-565. doi:10.1097/PSY.0b013e3180f6171f

Critchley, H. D., Wiens, S., Rotshtein, P., Öhman, A., & Dolan, R. J. (2004). Neural systems supporting interoceptive awareness. *Nature Neuroscience, 7*(2), 189-195. doi:10.1038/nn1176

Damasio, A. (1999). *The feeling of what happens: Body and emotion in the making of consciousness*. Fort Worth, TX, US: Harcourt College Publishers.

Damasio, A. (2003). *Looking for Spinoza: Joy, Sorrow, and the Feeling Brain.* Orlando: Harcourt.

Damasio, A., & Carvalho, G. B. (2013). The nature of feelings: Evolutionary and neurobiological origins. *Nature Reviews Neuroscience*, *14*(2), 143–152. https://doi.org/10.1038/nrn3403

Dahlin, M., Joneborg, N., & Runeson, B. (2005). Stress and depression among medical students: a cross-sectional study. *Medical Education*, 39(6), 594–604. https://doi.org/10.1111/j.1365-2929.2005.02176.x

Daubenmier, J., Lin, J., Blackburn, E., Hecht, F. M., Kristeller, J., Maninger, N., . . . Epel, E. (2012). Changes in stress, eating, and metabolic factors are related to changes in telomerase activity in a randomized mindfulness intervention pilot study. *Psychoneuroendocrinology, 37*(7), 917-928. doi: 10.1016/j.psyneuen.2011.10.008

Davidson, R. J., & Mcewen, B. S. (2012). Social influences on neuroplasticity: Stress and interventions to promote well-being. *Nature Neuroscience, 15*(5), 689-695. doi:10.1038/nn.3093

Davis, M. C., & Zautra, A. J. (2013). An online mindfulness intervention targeting socioemotional regulation in fibromyalgia: results of a randomized controlled trial. *Annals of Behavioral Medicine*, 46(3), 273–284. https://doi.org/10.1007/s12160-013-9513-7

Davis, J. I., Gross, J. J., & Ochsner, K. N. (2011). Psychological distance and emotional experience: What you see is what you get. *Emotion, 11*(2), 438-444. doi:10.1037/a0021783

Davis, K. M., Lau, M. A., & Cairns, D. R. (2009). Development and preliminary validation of a trait version of the toronto mindfulness scale. *Journal of Cognitive Psychotherapy, 23*(3), 185-195. doi:10.1891/0889-8391.23.3.185

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, 49(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Didonna, F. (2009). *Clinical handbook of mindfulness*. New York, NY: Springer.

de la Fuente, M., Franco, C., & Salvador, M. (2010). Reduction of blood pressure in a group of hypertensive teachers through a program of mindfulness meditation. [Reducción de la presión arterial en un grupo de docentes hipertensos mediante un programa de entrenamiento en conciencia plena (mindfulness)] *Behavioral Psychology/ Psicologia Conductual, 18*(3), 533-552.

de Silva, P. (2003). *Mindfulness-based cognitive therapy for depression: a new approach to preventing relapse*. *Behaviour Research and Therapy* (Vol. 41). New York: The Guilford Press. https://doi.org/10.1016/S0005-7967(02)00146-8

de Silva, P. (2014). *An Introduction to Buddhist Psychology and Counselling Pathways of Mindfulness-Based Therapies (5th edition).* New York: Palgrave Macmillan

Dolhanty, J., & Greenberg, L. S. (2009). Emotion-focused therapy in a case of anorexia nervosa. *Clinical Psychology and Psychotherapy, 16*(4), 366-382. doi:10.1002/cpp.624

Dobkin, P. L., & Hutchinson, T. A. (2013). Teaching mindfulness in medical school: Where are we now and where are we going? *Medical Education*, 47(8), 768–779. https://doi.org/10.1111/medu.12200

Dowd, H., Hogan, M. J., McGuire, B. E., Davis, M. C., Sarma, K. M., Fish, R. A., et al. (2015). Comparison of an Online Mindfulness-based Cognitive Therapy Intervention With Online Pain Management Psychoeducation: A Randomized Controlled Study. *The Clinical Journal of Pain*, 31(6), 517–527. https://doi.org/10.1097/AJP.0000000000000201

Dorjee, D. (2010). Kinds and dimensions of mindfulness: Why it is important to distinguish them. *Mindfulness, 1*(3), 152-160. doi:10.1007/s12671-010-0016-3

Dörfel, D., Lamke, J. -., Hummel, F., Wagner, U., Erk, S., & Walter, H. (2014). Common and differential neural networks of emotion regulation by detachment, reinterpretation, distraction, and expressive suppression: A comparative fMRI investigation. *NeuroImage, 101*, 298-309. doi:10.1016/j.neuroimage.2014.06.051

Duquette, P. (2017). Increasing our insular world view: Interoception and psychopathology for psychotherapists. *Frontiers in Neuroscience, 11*(MAR) doi:10.3389/fnins.2017.00135

Dyrbye, L. N., Thomas, M. R., Massie, F. S., Power, D. V, Eacker, A., Harper, W., et al. (2008). Academia and clinic. Burnout and suicidal ideation among U.S. medical students. *Annals Of Internal Medicine*, 149(5), 334–341. https://doi.org/10.7326/0003-4819-149-5-200809020-00008

Dyrbye, L. N., Thomas, M. R., & Shanafelt, T. D. (2006). Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. *Academic Medicine : Journal of the Association of American Medical Colleges*, 81(4), 354–373. https://doi.org/10.1097/00001888-200604000-00009

Dyrbye, L., & Shanafelt, T. (2016). A narrative review on burnout experienced by medical students and residents. *Medical Education*, 50(1), 132–149. https://doi.org/10.1111/medu.12927

Egner, T., Etkin, A., Gale, S., & Hirsch, J. (2008). Dissociable neural systems resolve conflict from emotional versus nonemotional distracters. *Cerebral Cortex, 18*(6), 1475-1484. doi:10.1093/cercor/bhm179

Ehring, T., & Watkins, E. R. (2008). Repetitive negative thinking as a transdiagnostic process. *International Journal of Cognitive Therapy, 1*(3), 192-205. doi:10.1521/ijct.2008.1.3.192

Ekman, P. (2007). *Emotions revealed: Recognizing faces and feelings to improve communication and emotional life*. New York: Henry Holt.

Elliot, A. J. (Ed.). (2008). *Handbook of approach and avoidance motivation*. New York, NY, US: Psychology Press.

Epstein, M. (1988). The Deconstruction of the Self: Ego and Egolessness in Buddhist Insight Meditation. *The Journal of Transpersonal Psychology*, 20(1), 61-69.

Epstein, M. (1995). *Thoughts without a thinker: Psychotherapy from a Buddhist perspective*. New York: Basic Books.

Epstein, R.M. (2017). *Attending, Medicine, Mindfulness, and Humanity*. New York: Scribner.

Erber, R., & Erber, M. W. (2000). The self-regulation of moods: Second thoughts on the importance of happiness in everyday life. *Psychological Inquiry, 11*(3), 142-148. doi:10.1207/S15327965PLI1103_02

Etkin, A., Büchel, C., & Gross, J. J. (2015). The neural bases of emotion regulation. *Nature Reviews Neuroscience, 16*(11), 693–700. https://doi.org/10.1038/nrn4044

Etkin, A., Büchel, C., & Gross, J. J. (2015). The neural bases of emotion regulation. *Nature Reviews Neuroscience, 16*(11), 693-700. doi:10.1038/nrn4044

Etkin, A., Egner, T., & Kalisch, R. (2011). Emotional processing in anterior cingulate and medial prefrontal cortex. *Trends in Cognitive Sciences, 15*(2), 85-93. doi:10.1016/j.tics.2010.11.004

Escobar, J. I., Waitzkin, H., Silver, R. C., Gara, M., & Holman, A. (1998). Abridged somatization: A study in primary care. *Psychosomatic Medicine, 60*(4), 466-472. doi:10.1097/00006842-199807000-00012

Evans, S., Ferrando, S., Findler, M., Stowell, C., Smart, C., & Haglin, D. (2008). Mindfulness-based cognitive therapy for generalized anxiety disorder. *Journal of Anxiety Disorders, 22*, 716–721.

Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: A "transdiagnostic" theory and treatment. *Behaviour Research and Therapy, 41*(5), 509-528. doi:10.1016/S0005-7967(02)00088-8

Fan, J., McCandliss, B. D., Sommer, T., Raz, A., & Posner, M. I. (2002). Testing the efficiency and independence of attentional networks. *Journal of Cognitive Neuroscience, 14*(3), 340-347. doi:10.1162/089892902317361886

Farb, N. A. S., Segal, Z. V, Mayberg, H., Bean, J., Mckeon, D., Fatima, Z., & Anderson, A. K. (2007). Attending to the present : mindfulness meditation reveals distinct neural modes of self-reference, 313–322. https://doi.org/10.1093/scan/nsm030

Farb, N. A. S., Segal, Z. V., & Anderson, A. K. (2013). Mindfulness meditation training alters cortical representations of interoceptive attention. *Social Cognitive and Affective Neuroscience, 8*(1), 15-26. doi:10.1093/scan/nss066

Farb, N.A.S., Anderson, A.K., Irving, J.A. & Segal, Z.V. (2014). Mindfulness Interventions and Emotion Regulation. In Gross, J. (Ed.). *Handbook of emotion regulation (2nd ed.).* New York: Guilford Press.

Fazio, R. H. (2001). On the automatic activation of associated evaluations: An overview. *Cognition and Emotion, 15*(2), 115-141. doi:10.1080/02699930125908

Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology, 50*(2), 229-238. doi:10.1037/0022-3514.50.2.229

Feldman, G., Hayes, A., Kumar, S., Greeson, J., & Laurenceau, J. -. (2007). Mindfulness and emotion regulation: The development and initial validation of the cognitive and affective mindfulness scale-revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment, 29*(3), 177-190. doi:10.1007/s10862-006-9035-8Finlay-

Jones, A., Xie, Q., Huang, X., Ma, X., & Guo, X. (2018). A Pilot Study of the 8-Week Mindful Self-Compassion Training Program in a Chinese Community Sample. *Mindfulness*, 9(3), 993–1002. https://doi.org/10.1007/s12671-017-0838-3

Fish, J., Brimson, J., & Lynch, S. (2016). Mindfulness Interventions Delivered by Technology Without Facilitator Involvement: What Research Exists and What Are the Clinical Outcomes? *Mindfulness*, 7(5), 1011–1023. https://doi.org/10.1007/s12671-016-0548-2

Fonagy, P., Gergely, G., Jurist, E. & Target, M. (2002). *Affect Regulation, Mentalizationand the Development of the Self*. New York: Other Press.

Forbes, L., Gutierrez, D., & Johnson, S. K. (2018). Investigating Adherence to an Online Introductory Mindfulness Program. *Mindfulness*, 9(1), 271–282. https://doi.org/10.1007/s12671-017-0772-4

Fox, K. C. R., Zakarauskas, P., Dixon, M., Ellamil, M., Thompson, E., & Christoff, K. (2012). Meditation experience predicts introspective accuracy. *PLoS ONE, 7*(9) doi:10.1371/journal.pone.0045370

Fox, K. C. R., Nijeboer, S., Dixon, M. L., Floman, J. L., Ellamil, M., Rumak, S. P., Christoff, K. (2014). Is meditation associated with altered brain structure? A systematic review and meta-analysis of morphometric neuroimaging in meditation practitioners. *Neuroscience and Biobehavioral Reviews*, *43*, 48–73. https://doi.org/10.1016/j.neubiorev.2014.03.016

Fox, K. C. R., Spreng, R. N., Ellamil, M., Andrews-Hanna, J. R., & Christoff, K. (2015). The wandering brain: Meta-analysis of functional neuroimaging studies of mind-wandering and related spontaneous thought processes. *NeuroImage, 111*, 611-621. doi:10.1016/j.neuroimage.2015.02.039

Fox, K. C. R., Dixon, M. L., Nijeboer, S., Girn, M., Floman, J. L., Lifshitz, M., . . . Christoff, K. (2016). Functional neuroanatomy of meditation: A review and meta-analysis of 78 functional neuroimaging investigations. *Neuroscience and Biobehavioral Reviews, 65*, 208-228. doi:10.1016/j.neubiorev.2016.03.021

Frankl, V.E. (1963). *Man's search for meaning: an introduction to logotherapy*. Oxford, England: Washington Square Press.

Fredrickson, B. L., Cohn, M. A., Coffey, K. A., Pek, J., & Finkel, S. M. (2008). Open hearts build lives: Positive emotions, induced through loving-kindness meditation, build consequential personal resources. *Journal of Personality and Social Psychology, 95*(5), 1045-1062. doi:10.1037/a0013262

Fresco, D. M., Moore, M. T., van Dulmen, M. H., Segal, Z. V, Ma, S. H., Teasdale, J. D., et al. (2007). Initial psychometric properties of the experiences questionnaire: validation of a self-report measure of decentering. *Behavior Therapy*, 38(3), 234–246. https://doi.org/10.1016/j.beth.2006.08.003

Frewen, P., Lane, R. D., Neufeld, R. W. J., Densmore, M., Stevens, T., & Lanius, R. (2008). Neural correlates of levels of emotional awareness during trauma script-imagery in posttraumatic stress disorder. *Psychosomatic Medicine, 70*(1), 27-31. doi:10.1097/PSY.0b013e31815f66d4

Freud, A. (1936). *The ego and the mechanisms of defense*. New York: International Universities Press

Frijda, N. H. (1987). *The emotions (Studies in emotion and social interaction).* New York, NY, US: Cambridge University Press

Frýba, M. (2003). Umění žít šťastně: Buddhova Abhidhamma v praxi meditace a zvládání života. Praha: Argo.

Garfinkel, S. N., Seth, A. K., Barrett, A. B., Suzuki, K., & Critchley, H. D. (2015). Knowing your own heart: Distinguishing interoceptive accuracy from interoceptive awareness. *Biological Psychology, 104*, 65-74. doi:10.1016/j.biopsycho.2014.11.004

Garland, E. L. (2007). The meaning of mindfulness: A second-order cybernetics of stress, metacognition, and coping. *Complementary Health Practice Review, 12*(1), 15-30. doi:10.1177/1533210107301740

Garland, E., Gaylord, S., & Park, J. (2009). The role of mindfulness in positive reappraisal. *Explore: The Journal of Science and Healing, 5*(1), 37-44. doi: 10.1016/j.explore.2008.10.001

Garnefski, N., & Kraaij, V. (2007). The cognitive emotion regulation questionnaire. *European Journal of Psychological Assessment*. 23, 141–149. doi: 10.1027/1015-5759.23.3.141

Gellatly, R., & Beck, A. T. (2016). Catastrophic thinking: A transdiagnostic process across psychiatric disorders. *Cognitive Therapy and Research, 40*(4), 441-452. doi:10.1007/s10608-016-9763-3

Germer, C. K., & Neff, K. D. (2013). Self-compassion in clinical practice. *Journal of Clinical Psychology, 69*(8), 856-867. doi:10.1002/jclp.22021

Gilbert, P., McEwan, K., Matos, M., & Rivis, A. (2011). Fears of compassion: Development of three self-report measures. *Psychology and Psychotherapy: Theory Research and Practice*, 84(3), 239–255. doi: 10.1348/147608310X52651

Giluk, T. L. (2009). Mindfulness, big five personality, and affect: A meta-analysis. *Personality and Individual Differences, 47*(8), 805-811. doi:10.1016/j.paid.2009.06.026

Goldberg, S. B., Tucker, R. P., Greene, P. A., Davidson, R. J., Wampold, B. E., Kearney, D. J., & Simpson, T. L. (2018). Mindfulness-based interventions for psychiatric disorders: A systematic review and meta-analysis. *Clinical Psychology Review, 59*, 52-60. doi:10.1016/j.cpr.2017.10.011

Goldin, P. R., & Gross, J. J. (2010). Effects of mindfulness-based stress reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion, 10*(1), 83-91. doi:10.1037/a0018441

Goleman, D. J., & Schwartz, G. E. (1976). Meditation as an intervention in stress reactivity. *Journal of Consulting and Clinical Psychology, 44*(3), 456-466. doi:10.1037/0022-006X.44.3.456

Gotink, R. A., Chu, P., Busschbach, J. J., Benson, H., Fricchione, G. L., & Hunink, M. G. (2015). Standardised mindfulness-based interventions in healthcare: an overview of systematic reviews and meta-analyses of RCTs. *PLoS ONE*, 10(4), 1–17. https://doi.org/10.1371/journal.pone.0124344

Grabovac, A. D., Lau,M. A., &Willett, B. R. (2011). Mechanisms ofmindfulness: A Buddhist psychological model. *Mindfulness*, 2(3), 154–166. http://dx.doi.org/10.1007/s12671-011-0054-5

Grant, J. A., Courtemanche, J., & Rainville, P. (2011). A non-elaborative mental stance and decoupling of executive and pain-related cortices predicts low pain sensitivity in zen meditators. *Pain, 152*(1), 150-156. doi:10.1016/j.pain.2010.10.006

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment, 26*(1), 41-54. doi:10.1023/B:JOBA.0000007455.08539.94

Greenberg, L. S. (2002). *Emotion-focused therapy: Coaching clients to work through their feelings*. Washington, D.C.: APA.

Gross, J. J. (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. Journal of Personality and Social Psychology, 74(1), 224-237. doi:10.1037/0022-3514.74.1.224

Gross, J. J. (Ed.). (2014). *Handbook of emotion regulation (2nd ed.).* New York: Guilford Press.

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review*, *37*, 1–12. https://doi.org/10.1016/j.cpr.2015.01.006

Guendelman, S., Medeiros, S., & Rampes, H. (2017). Mindfulness and emotion regulation: Insights from neurobiological, psychological, and clinical studies. *Frontiers in Psychology, 8*(MAR) doi:10.3389/fpsyg.2017.00220

Gaudiano, B. A., & Herbert, J. D. (2006). Acute treatment of inpatients with psychotic symptoms using acceptance and commitment therapy: Pilot results. *Behaviour Research and Therapy, 44*(3), 415-437. doi:10.1016/j.brat.2005.02.007

Gusnard, D. A., Akbudak, E., Shulman, G. L., & Raichle, M. E. (2001). Medial prefrontal cortex and self-referential mental activity: Relation to a default mode of brain function. *Proceedings of the National Academy of Sciences of the United States of America, 98*(7), 4259-4264. doi:10.1073/pnas.071043098

Gyurak, A., Gross, J. J., & Etkin, A. (2011). Explicit and implicit emotion regulation: A dual-process framework. *Cognition and Emotion, 25*(3), 400-412. doi:10.1080/02699931.2010.544160

Gyurak, A., & Etkin, A. (2014). A Neurobiological Model of Implicit and Explicit Emotion Regulation. In J. Gross (Ed.), *Handbook of emotion regulation (2nd ed.)* (pp. 76-90). New York: Guilford Press.

Haimerl, C. J. & Valentine, E. R. (2001).The effect of contemplative practice on intrapersonal, interpersonal, and transpersonal dimensions of the self-concept. *Journal of Transpersonal psychology*, 33, 37–52. doi: 10.1080/1357628021000012723

Haller, H., Cramer, H., Lauche, R., & Dobos, G. (2015). Somatoform disorders and medically unexplained symptoms in primary care-A systematic review and metaanalysis of prevalence. [Somatoforme störungen und medizinisch unerklärbare symptome in der primärversorgung: Systematischer review und metaanalyse der prävalenzen] *Deutsches Arzteblatt International, 112*(16), 279-287. doi:10.3238/arztebl.2015.0279

Hare, T. A., Tottenham, N., Galvan, A., Voss, H. U., Glover, G. H., & Casey, B. J. (2008). Biological substrates of emotional reactivity and regulation in adolescence during an emotional go-nogo task. *Biological Psychiatry, 63*(10), 927-934. doi:10.1016/j.biopsych.2008.03.015

Hayes, S. C., & Wilson, K. G. (1994). Acceptance and Commitment Therapy: Altering the Verbal Support for Experiential Avoidance. *The Behavior Analyst*, 17(2), 289–303. https://doi.org/10.1007/BF03392677

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). Acceptance and commitment therapy: An experiential approach to behavior change. New York: Guilford Press.

Hayes, S. C. (2016). Acceptance and Commitment Therapy, Relational Frame Theory, and the Third Wave of Behavioral and Cognitive Therapies – Republished Article. *Behavior Therapy*, 47(6), 869-885. doi:10.1016/j.beth.2016.11.006

Hayes, S. C., & Wilson, K. G. (2003). Mindfulness: Method and process. *Clinical Psychology: Science and Practice, 10*(2), 161-165. doi:10.1093/clipsy/bpg018

Heilbronner, S. R., & Hayden, B. Y. (2016). *Dorsal anterior cingulate cortex: A bottom-up view.* Annual Review of Neuroscience, 39, 149-170. doi:10.1146/annurev-neuro-070815-013952

Hesser, H., Gustafsson, T., Lundén, C., Henrikson, O., Fattahi, K., Johnsson, E., et al. (2012). A randomized controlled trial of Internet-delivered cognitive behavior therapy and acceptance and commitment therapy in the treatment of tinnitus. *Journal of Consulting and Clinical Psychology*, 80(4), 649–661. https://doi.org/https://dx.doi.org/10.1037/a0027021

Hölzel, B.K., Ott, U., Gard, T., Hempel, H., Weygandt, M., . . . Vaitl, D. (2008). Investigation of mindfulness meditation practitioners with voxel-based morphometry. *Social Cognitive and Affective Neuroscience, 3*(1), 55-61. doi:10.1093/scan/nsm038

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science*, 6(6), 537–559. https://doi.org/10.1177/1745691611419671

Horowitz, M. J. (2002). Self- and relational observation. *Journal of Psychotherapy Integration, 12*(2), 115-127. doi:10.1037/1053-0479.12.2.115

Howells, A., Ivtzan, I., & Eiroa-Orosa, F. J. (2016). Putting the 'app' in Happiness: A Randomised Controlled Trial of a Smartphone-Based Mindfulness Intervention to Enhance Wellbeing. *Journal of Happiness Studies*, 17(1), 163–185. https://doi.org/10.1007/s10902-014-9589-1

Hunt, M. G. (1998). The only way out is through: Emotional processing and recovery after a depressing life event. *Behaviour Research and Therapy, 36*(4), 361-384. doi:10.1016/S0005-7967(98)00017-5

IBM Corp (2010). *IBM SPSS Statistics for Windows, Version 19.0.* Armonk, NY: IBM Corp.

Ishak, W., Nikravesh, R., Lederer, S., Perry, R., Ogunyemi, D., & Bernstein, C. (2013). Burnout in medical students: A systematic review. *Clinical Teacher*, 10(4), 242–245. https://doi.org/10.1111/tct.12014

Jang, J. H., Jung, W. H., Kang, D. -., Byun, M. S., Kwon, S. J., Choi, C. -., & Kwon, J. S. (2011). Increased default mode network connectivity associated with meditation. *Neuroscience Letters, 487*(3), 358-362. doi:10.1016/j.neulet.2010.10.056

Jermann, F., Billieux, J., Larøi, F., d'Argembeau, A., Bondolfi, G., Zermatten, A., et al. (2009). Mindful Attention Awareness Scale (MAAS): Psychometric Properties of the French Translation and Exploration of Its Relations With Emotion Regulation Strategies. *Psychological Assessment,* 21(4), 506–514. https://doi.org/10.1037/a0017032

Jiang, J., Summerfield, C., & Egner, T. (2013). Attention sharpens the distinction between expected and unexpected percepts in the visual brain. *Journal of Neuroscience, 33*(47), 18438-18447. doi:10.1523/JNEUROSCI.3308-13.2013

John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality, 72*(6), 1301-1333. doi:10.1111/j.1467-6494.2004.00298.x

Johnson, S. L. (2005). Mania and dysregulation in goal pursuit: A review. *Clinical Psychology Review, 25*(2), 241-262. doi:10.1016/j.cpr.2004.11.002

Jones, Ch. R., Kirkland, T., & Cunningham, W. (2014). Attitudes, Evaluation, and Emotion Regulation. In Gross, J. J. (Ed.), *Handbook of emotion regulation (2nd ed.).* New York: Guilford Press.

Joormann, J., & Siemer, M. (2004). Memory Accessibility, Mood Regulation, and Dysphoria: Difficulties in Repairing Sad Mood With Happy Memories? *Journal of Abnormal Psychology, 113*(2), 179-188. http://dx.doi.org/10.1037/0021-843X.113.2.179

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry,4*(1), 33–47.

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness*. New York: Delacorte.

Kabat-Zinn, J. (1994). *Wherever you go, there you are: Mindfulness meditation in everyday life*. New York: Hyperion.

Kabat-Zinn, J. (2013). *Full Catastrophe Living (Revised Edition): Using the Wisdom of Your Body and Mind to Face Stress, Pain and Illness*. New York: Bantam Books.

Kabat-Zinn, J. (2015). Mindfulness: 9 attitudes. Resource document. Youtube.com. https://www.youtube.com/watch?v=2n7FOBFMvXg&t=1323s. Accessed 25 June 2018.

Kanske, P., Heissler, J., Schönfelder, S., Bongers, A., & Wessa, M. (2011). How to regulate emotion? neural networks for reappraisal and distraction. *Cerebral Cortex, 21*(6), 1379-1388. doi:10.1093/cercor/bhq216

Kaplan, K. H., Goldenberg, D. L., & Galvin-Nadeau, M. (1993). The impact of a meditation-based stress reduction program on fibromyalgia. *General Hospital Psychiatry, 15*(5), 284-289. doi:10.1016/0163-8343(93)90020-O

Kashdan, T. B., Zvolensky, M. J., & McLeish, A. C. (2008). Anxiety sensitivity and affect regulatory strategies: Individual and interactive risk factors for anxiety-related symptoms. *Journal of Anxiety Disorders, 22*(3), 429-440. doi:10.1016/j.janxdis.2007.03.011

Kaur, A., & Singh, M. (2018). A systemic review of meditation and psychophysiology. *Indian Journal of Public Health Research and Development, 9*(2), 212-219. doi:10.5958/0976-5506.2018.00121.3

Kazdin, A. E. (2007). Mediators and Mechanisms of Change in Psychotherapy Research. *Annual Review of Clinical Psychology*, *3*(1), 1–27. https://doi.org/10.1146/annurev.clinpsy.3.022806.091432

Kerr, C. E., Josyula, K., & Littenberg, R. (2011). Developing an observing attitude: An analysis of meditation diaries in an MBSR clinical trial. *Clinical Psychology and Psychotherapy, 18*(1), 80-93. doi:10.1002/cpp.700

Kever, A., Pollatos, O., Vermeulen, N., & Grynberg, D. (2015). Interoceptive sensitivity facilitates both

antecedent- and response-focused emotion regulation strategies. *Personality and Individual Differences*, *87*, 20–23. https://doi.org/10.1016/j.paid.2015.07.014

Keng, S. L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: a review of empirical studies. *Clinical Psychology Review*, 31(6), 1041–1056. https://doi.org/10.1016/j.cpr.2011.04.006

Keng, S. -., Smoski, M. J., Robins, C. J., Ekblad, A. G., & Brantley, J. G. (2012). Mechanisms of change in mindfulness-based stress reduction: Self-compassion and mindfulness as mediators of intervention outcomes. *Journal of Cognitive Psychotherapy, 26*(3), 270-280. doi:10.1891/0889-8391.26.3.270

Kepner, J. (1995). *Healing tasks: psychotherapy with adult survivors of childhood abuse*. San Francisco: A Gestalt Institute of Cleveland publication.

Khalsa, S. S., Rudrauf, D., Damasio, A. R., Davidson, R. J., Lutz, A., & Tranel, D. (2008). Interoceptive awareness in experienced meditators. *Psychophysiology, 45*(4), 671-677. doi:10.1111/j.1469-8986.2008.00666.x

Khoury, B., Lecomte, T., Fortin, G., Masse, M., Therien, P., Bouchard, V., . . . Hofmann, S. G. (2013). Mindfulness-based therapy: A comprehensive meta-analysis. *Clinical Psychology Review, 33*(6), 763-771. doi:10.1016/j.cpr.2013.05.005

Kingston, T., Dooley, B., Bates, A., Lawlor, E., & Malone, K. (2007). Mindfulness-based cognitive therapy for residual depressive symptoms. *Psychology and Psychotherapy: Theory, Research and Practice, 80*(2), 193-203. doi:10.1348/147608306X116016

Kohn, N., Eickhoff, S. B., Scheller, M., Laird, A. R., Fox, P. T., & Habel, U. (2014). Neural network of cognitive emotion regulation - an ALE meta-analysis and MACM analysis. *NeuroImage, 87*, 345-355. doi:10.1016/j.neuroimage.2013.11.001

Koole, S. (2009). The psychology of emotion regulation: An integrative review. *Cognition and Emotion*, *23*(1), 4–41. https://doi.org/10.1080/02699930802619031

Kozeny, J. (1993). Subjective emotional balance questionnaire (DEP 36): exploratory and confirmatory analysis. *Czech and Slovak Psychology*, 37(6), 523 – 533.

Krieger, T., Martig, D. S., van den Brink, E., & Berger, T. (2016). Working on self-compassion online: A proof of concept and feasibility study. *Internet Interventions*, 6, 64–70. https://doi.org/10.1016/j.invent.2016.10.001

Kristeller, J., Wolever, R. Q., & Sheets, V. (2014). Mindfulness-based eating awareness training (MB-EAT) for binge eating: A randomized clinical trial. *Mindfulness, 5*(3), 282-297. doi:10.1007/s12671-012-0179-1

Kristeller, J. L., & Hallett, C. B. (1999). An exploratory study of a meditation-based intervention for binge eating disorder. *Journal of Health Psychology, 4*(3), 357-363. doi:10.1177/135910539900400305

Krusche, A., Cyhlarova, E., King, S., & Williams, J. M. (2012). Mindfulness online: a preliminary evaluation of the feasibility of a web-based mindfulness course and the impact on stress. *BMJ Open*, 2(3), 1–5. https://doi.org/10.1136/bmjopen-2011-000803

Krusche, A., Cyhlarova, E., & Williams, J. M. (2013). Mindfulness online: an evaluation of the feasibility of a web-based mindfulness course for stress, anxiety and depression. *BMJ Open*, 3(11), 1–10. https://doi.org/10.1136/bmjopen-2013-003498

Kubo, A., Altschuler, A., Kurtovich, E., Hendlish, S., Laurent, C. A., Kolevska, T., et al. (2018). A Pilot Mobile-Based Mindfulness Intervention for Cancer Patients and Their Informal Caregivers. *Mindfulness*, https://doi.org/10.1007/s12671-018-0931-2

Kumaran, D., & Maguire, E. A. (2006). An unexpected sequence of events: Mismatch detection in the human hippocampus. *PLoS Biology, 4*(12), 2372-2382. doi:10.1371/journal.pbio.0040424

Kuyken, W., & Evans, A. (2014). Mindfulness-Based Cognitive Therapy for Recurrent Depression. In Baer, R. (Ed.). *Mindfulness-based treatment approaches: clinician's guide to evidence base and applications*. Second edition. Waltham, MA: Elsevier Academic Press.

Kuyken, W., Watkins, E., Holden, E., White, K., Taylor, R. S., Byford, S., . . . Dalgleish, T. (2010). How does mindfulness-based cognitive therapy work? *Behaviour Research and Therapy, 48*(11), 1105-1112. doi:10.1016/j.brat.2010.08.003

Lane, R. D., & Schwartz, G. E. (1987). Levels of emotional awareness: A cognitive-developmental theory and its application to psychopathology. *American Journal of Psychiatry, 144*(2), 133-143. doi:10.1176/ajp.144.2.133

Lane, R. D., Quinlan, D. M., Schwartz, G. E., Walker, P. A., & Zeitlin, S. B. (1990). The levels of emotional awareness scale: A cognitive-developmental measure of emotion. *Journal of Personality Assessment, 55*(1-2), 124-134. doi:10.1080/00223891.1990.9674052

Lane, R. D., Sechrest, L., Riedel, R., Shapiro, D. E., & Kaszniak, A. W. (2000). Pervasive emotion recognition deficit common to alexithymia and the repressive coping style. *Psychosomatic Medicine, 62*(4), 492-501. doi:10.1097/00006842-200007000-00007

Lane, R. D. (2008). Neural substrates of implicit and explicit emotional processes: A unifying framework for psychosomatic medicine. *Psychosomatic Medicine, 70*(2), 214-231. doi:10.1097/PSY.0b013e3181647e44

Langens, T. A., & Mörth, S. (2003). Repressive coping and the use of passive and active coping strategies. *Personality and Individual Differences, 35*(2), 461-473. doi:10.1016/S0191-8869(02)00207-6

Lappalainen, P., Langrial, S., Oinas-Kukkonen, H., Tolvanen, A., & Lappalainen, R. (2015). Web-based acceptance and commitment therapy for depressive symptoms with minimal support: a randomized controlled trial. *Behavior Modification*, 39(6), 805–834. https://doi.org/10.1177/0145445515598142

Lazar, S. W., Kerr, C. E., Wasserman, R. H., Gray, J. R., Greve, D. N., Treadway, M. T., . . . Fischl, B. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport, 16*(17), 1893-1897. doi:10.1097/01.wnr.0000186598.66243.19

Lazarus, R.S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer.

Lazarus, R. S. (1966). *Psychological stress and the coping process.* New York: McGraw-Hill.

Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., . . . Devins, G. (2006). The toronto mindfulness scale: Development and validation. *Journal of Clinical Psychology, 62*(12), 1445-1467. doi:10.1002/jclp.20326

Leary, M. R., & Gohar, D. (2014). Self-Awareness and Self-Relevant Thought in the Experience and Regulation of Emotion. In Gross, J. J. (Ed.), *Handbook of emotion regulation (2nd ed.).* New York: Guilford Press.

Lebois, L. A., Papies, E. K., Gopinath, K., Cabanban, R., Quigley, K. S., Krishnamurthy, V., et al. (2015). A shift in perspective: Decentering through mindful attention to imagined stressful events. *Neuropsychologia*, 75, 505-524. https://doi.org/10.1016/j.neuropsychologia.2015.05.030

LeDoux, J. E. (2000). Emotion circuits in the brain. *Annual Review of Neuroscience,* 23, 155–184. doi:10.1146/annurev.neuro.23.1.155

LeDoux, J. (2012). Rethinking the Emotional Brain. *Neuron, 73*(4), 653–676. https://doi.org/10.1016/j.neuron.2012.02.004Lengacher, C. A., Reich, R. R., Kip, K. E., Barta, M., Ramesar, S., Paterson, C. L., . . . Park, J. Y. (2014). Influence of mindfulness-based stress reduction (MBSR) on telomerase activity in women with breast cancer (BC). *Biological Research for Nursing, 16*(4), 438-447. doi:10.1177/1099800413519495

Lewin, K. (1935). *A dynamic theory of personality*. New York: McGraw-Hill.

Levine, D., Marziali, E., & Hood, J. (1997). Emotion processing in borderline personality disorders. *Journal of Nervous and Mental Disease, 185*(4), 240-246. doi:10.1097/00005053-199704000-00004

Levinson, D. B., Stoll, E. L., Kindy, S. D., Merry, H. L., & Davidson, R. J. (2014). A mind you can count on: Validating breath counting as a behavioral measure of mindfulness. *Frontiers in Psychology*, *5*(OCT), 1–10. https://doi.org/10.3389/fpsyg.2014.01202

Linehan, M. M. (1993). *Cognitive-Behavioral Treatment of Borderline Personality Disorder*. New York: Guilford Press.

Linehan, M. M., Dimeff, L. A., Reynolds, S. K., Comtois, K. A., Welch, S. S., Heagerty, P., & Kivlahan, D. R. (2002). Dialectical behavior therapy versus comprehensive validation therapy plus 12-step for the treatment of opioid dependent women meeting criteria for borderline personality disorder. *Drug and Alcohol Dependence,*

*67*(1), 13-26. doi:10.1016/S0376-8716(02)00011-X

Lippelt, D. P., Hommel, B., & Colzato, L. S. (2014). Focused attention, open monitoring and loving kindness meditation: Effects on attention, conflict monitoring, and creativity - A review. *Frontiers in Psychology*, *5*(SEP), 1–5. https://doi.org/10.3389/fpsyg.2014.01083

Lissek, S., Bradford, D. E., Alvarez, R. P., Burton, P., Espensen-Sturges, T., Reynolds, R. C., & Grillon, C. (2014). Neural substrates of classically conditioned fear-generalization in humans: A parametric fMRI study. *Social Cognitive and Affective Neuroscience*, *9*(8), 1134-1142. doi:10.1093/scan/nst096

López, A., Sanderman, R., Ranchor, A. V., & Schroevers, M. J. (2018). Compassion for Others and Self-Compassion: Levels, Correlates, and Relationship with Psychological Well-being. *Mindfulness*, 9(1), 325–331. https://doi.org/10.1007/s12671-017-0777-z

Lovibond, P. F. (2004). Cognitive processes in extinction. *Learning and Memory, 11*(5), 495-500. doi:10.1101/lm.79604

Lutz, A., Jha, A. P., Dunne, J. D., & Saron, C. D. (2015). Investigating the phenomenological matrix of mindfulness-related practices from a neurocognitive perspective. *American Psychologist, 70*(7), 632-658. doi:10.1037/a0039585

Lutz, J., Herwig, U., Opialla, S., Hittmeyer, A., Jäncke, L., Rufer, M., . . . Brühl, A. B. (2013). Mindfulness and emotion regulation-an fMRI study. *Social Cognitive and Affective Neuroscience, 9*(6), 776-785. doi:10.1093/scan/nst043

Lutz, A., Brefczynski-Lewis, J., Johnstone, T., & Davidson, R. J. (2008). Regulation of the neural circuitry of emotion by compassion meditation: Effects of meditative expertise. *PLoS ONE, 3*(3) doi:10.1371/journal.pone.0001897

Marsova, K. (2016). Vztah emočního uvědomění, emoční regulace a emočního prožívání u adolescentů (Diplomová práce). Brno: FSS MU.

McBee, L. (2008). *Mindfulness-based elder care: A CAM model for frail elders and their caregivers*. New York: Springer Publishing Co.

Macnab, R. M., & Koshland Jr., D. E. (1972). The gradient-sensing mechanism in bacterial chemotaxis. *Proceedings of the National Academy of Sciences of the United States of America, 69*(9), 2509-2512. doi:10.1073/pnas.69.9.2509

MacCoon, D. G., MacLean, K. A., Davidson, R. J., Saron, C. D., & Lutz, A. (2014). No sustained attention differences in a longitudinal randomized trial comparing mindfulness based stress reduction versus active control. *PLoS ONE, 9*(6) doi:10.1371/journal.pone.0097551

Mani, M., Kavanagh, D. J., Hides, L., & Stoyanov, S. R. (2015). Review and Evaluation of Mindfulness-Based iPhone Apps. *JMIR MHealth and UHealth*, 3(3), e82. https://doi.org/10.2196/mhealth.4328

MacBeth, A., & Gumley, A. (2012). Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review, 32*(6), 545-552. doi: 10.1016/j.cpr.2012.06.003

Martin, J. R. (1997). Mindfulness: A proposed common factor. *Journal of Psychotherapy Integration, 7*(4), 291-312. doi:10.1023/B:JOPI.0000010885.18025.bc

Mauss, I. B., McCarter, L., Levenson, R. W., Wilhelm, F. H., & Gross, J. J. (2005). The tie that binds? coherence among emotion experience, behavior, and physiology. *Emotion, 5*(2), 175-190. doi:10.1037/1528-3542.5.2.175

McRae, K., Hughes, B., Chopra, S., Gabrieli, J. D. E., Gross, J. J., & Ochsner, K. N. (2010). The neural bases of distraction and reappraisal. *Journal of Cognitive Neuroscience, 22*(2), 248-262. doi:10.1162/jocn.2009.21243

McWilliams, N. (2011). *Psychoanalytic diagnosis: Understanding personality structure in the clinical process* (2nd ed.). New York, NY, US: Guilford Press.

Mehling, W. E., Gopisetty, V., Daubenmier, J., Price, C. J., Hecht, F. M., & Stewart, A. (2009). Body awareness: Construct and self-report measures. *PLoS ONE, 4*(5) doi:10.1371/journal.pone.0005614

Mendis, N. K. G. (2006). The Abhidhamma in practice. Retrieved from http://www.accesstoinsight.org/lib/authors/mendis/wheel322.html. Accessed 25 June 2018.

Mennin, D. S., Holaway, R. M., Fresco, D. M., Moore, M. T., & Heimberg, R. G. (2007). Delineating components of emotion and its dysregulation in anxiety and mood psychopathology. *Behavior Therapy, 38*(3), 284-302. doi:10.1016/j.beth.2006.09.001

Mennin, D. S., & Fresco, D. M. (2009). Emotion regulation as a framework for understanding and treating anxiety pathology. In A. M. Kring, & D. M. Sloan (Eds.), Emotion regulation in psychopathology New York: Guilford Press.

Mennin, D. S., & Fresco, D. M. (2009). Emotion regulation as a framework for understanding and treating anxiety pathology. In A. M. Kring, & D. M. Sloan (Eds.), *Emotion regulation in psychopathology.* New York: Guilford Press.

Moon, A., & Berenbaum, H. (2009). Emotional awareness and emotional eating. *Cognition and Emotion, 23*(3), 417-429. doi:10.1080/02699930801961798

Mowrer, O. H. (1947). On the dual nature of learning—a re-interpretation of "conditioning" and "problem-solving." *Harvard Educational Review, 17,* 102-148.

Milad, M. R., Wright, C. I., Orr, S. P., Pitman, R. K., Quirk, G. J., & Rauch, S. L. (2007). Recall of fear extinction in humans activates the ventromedial prefrontal cortex and hippocampus in concert. *Biological Psychiatry, 62*(5), 446-454. doi:10.1016/j.biopsych.2006.10.011

Mulder, R., Murray, G., & Rucklidge, J. (2017). Common versus specific factors in psychotherapy: Opening the black box. *The Lancet Psychiatry, 4*(12), 953-962. doi:10.1016/S2215-0366(17)30100-1

Neacsiu, A.D., Bohus, M., & Linehan, M. M. (2014). Dialectical Behavior Therapy: An Intervention for Emotion Dysregulation. In Gross, J. J. (Ed.), *Handbook of emotion regulation (2nd ed.).* New York: Guilford Press.

Neff, K. (2003). Self-Compassion: An Alternative Conceptualization of a Healthy Attitude Toward Oneself. *Self and Identity*, 2(2), 85–101. https://doi.org/10.1080/15298860309032

Neff, K. D., & Rude, S. S., & Kirkpatrick, K. (2007). An examination of self-compassion in relation to positive psychological functioning and personality traits. *Journal of Research in Personality*, 41, 908–916. doi: 10.1016/j.jrp.2006.08.002

Neff, K. D., Hsieh, Y.-P., & Dejitterat, K. (2005). Self-compassion, Achievement Goals, and Coping with Academic Failure. *Self and Identity, 4*(3), 263-287. http://dx.doi.org/10.1080/13576500444000317

Neely, M. E., Schallert, D. L., Mohammed, S. S., Roberts, R. M., & Chen, Y. -. (2009). Self-kindness when facing stress: The role of self-compassion, goal regulation, and support in college students' well-being. *Motivation and Emotion, 33*(1), 88-97. doi:10.1007/s11031-008-9119-8

Newberg, A. B., & Iverson, J. (2003). The neural basis of the complex mental task of meditation: Neurotransmitter and neurochemical considerations. Medical Hypotheses, 61, 282–291.

Niedenthal, P. M. (2007). Embodying emotion. *Science, 316*(5827), 1002-1005. doi:10.1126/science.1136930

Nielsen, L., & Kaszniak, A. W. (2007). "Awareness of subtle emotional feelings: A comparison of long-term meditators and nonmeditators": Correction to Nielsen and Kaszniak (2006). *Emotion, 7*(4), 754. http://dx.doi.org/10.1037/1528-3542.7.4.754

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science, 3*(5), 400-424. doi:10.1111/j.1745-6924.2008.00088.x

Norcross, J. C., Krebs, P. M., & Prochaska, J. O. (2011). Stages of change. *Journal of Clinical Psychology*, 67(2), 143–154. https://doi.org/10.1002/jclp.20758

Northoff, G., Heinzel, A., de Greck, M., Bermpohl, F., Dobrowolny, H., & Panksepp, J. (2006). Self-referential processing in our brain-A meta-analysis of imaging studies on the self. *NeuroImage, 31*(1), 440–457. https://doi.org/10.1016/j.neuroimage.2005.12.002

Nyklíček I., Vingerhoets A., & Zeelenberg, M. (2011) Emotion Regulation and Well-Being: A View from Different Angles. In Nyklíček I., Vingerhoets A., & Zeelenberg, M. (Ed.), *Emotion Regulation and Well-Being*. New York, NY: Springer

Ochsner, K. N., Ray, R. D., Cooper, J. C., Robertson, E. R., Chopra, S., Gabrieli, J. D. E., & Gross, J. J. (2004). For better or for worse: Neural systems supporting the cognitive down- and up-regulation of negative emotion. *NeuroImage, 23*(2), 483-499. doi:10.1016/j.neuroimage.2004.06.030

Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences, 9*(5), 242-249. doi:10.1016/j.tics.2005.03.010

Ochsner, K., & Gross, J. (2014). The neural bases of emotion and emotion regulation: a valuation perspective. In Gross, J. (Ed.). *Handbook of emotion regulation*. New York: The Guilford Press.

O'Doherty, J. P. (2004). Reward representations and reward-related learning in the human brain: Insights from neuroimaging. *Current Opinion in Neurobiology, 14*(6), 769-776. doi:10.1016/j.conb.2004.10.016

Ochsner, K. N., Silvers, J. A., & Buhle, J. T. (2012). Functional imaging studies of emotion regulation: a synthetic review and evolving model of the cognitive control of emotion. *Annals of the New York Academy of Sciences, 1251*(1), E1–E24. https://doi.org/10.1111/j.1749-6632.2012.06751.x

Olendzki, A. (2005). The roots of mindfulness. In Germer, C. K., Siegel, R. D., & Fulton, P. R. (Ed.). *Mindfulness and psychotherapy* (pp. 241-261). New York: Guilford Press.

Olendzki, A. (2010). *Unlimiting mind: The radically experiential psychology of Buddhism*. Somerville, MA: Wisdom Publications.

Olsson, A., & Phelps, E. A. (2007). Social learning of fear. *Nature Neuroscience, 10*(9), 1095-1102. doi:10.1038/nn1968

Osgood, C. E. (1969). On the whys and wherefores of E, P, and A. *Journal of Personality and Social Psychology, 12*(3), 194-199. http://dx.doi.org/10.1037/h0027715

Osgood, C. E., May, W. H., & Miron, M. S. (1975). *Cross-cultural universals of affective meaning.* Urbana: University of Illinois Press.

Panksepp, J. (1998). *Affective neuroscience: The foundations of human and animal emotions*. New York: Oxford University Press.

Park, T., Reilly-Spong, M., Gross, C. R., Park, T., Reilly-Spong, M., & Gross, C. R. (2013). Mindfulness: a systematic review of instruments to measure an emergent patient- reported outcome (PRO) Mindfulness: a systematic review of instruments to measure an emergent patient-reported outcome (PRO). *Source: Quality of Life Research Qual Life Res*, *22*(22). https://doi.org/10.1007/s

Parkinson, B., & Totterdell, P. (1999). Classifying affect-regulation strategies. *Cognition and Emotion, 13*(3), 277-303. doi:10.1080/026999399379285

Pascuzzi, D., & Smorti, A. (2017). Emotion regulation, autobiographical memories and life narratives. *New Ideas in Psychology, 45*, 28-37. doi:10.1016/j.newideapsych.2016.12.001

Pennebaker, J. W., & Beall, S. K. (1986). Confronting a traumatic event. toward an understanding of inhibition and disease. *Journal of Abnormal Psychology, 95*(3), 274-281. doi:10.1037/0021-843X.95.3.274

Pennebaker, J. W. (1993). Putting stress into words: Health, linguistic, and therapeutic implications. *Behaviour Research and Therapy, 31*(6), 539-548. doi:10.1016/0005-7967(93)90105-4

Pennebaker, J. W. (2018). Expressive writing in psychological science. *Perspectives on Psychological Science, 13*(2), 226-229. doi:10.1177/1745691617707315

Perrez, M., & Reicherts, M. (1992). *Stress, coping, and health.* Seattle, WA: Hogrefe & Huber.

Phillips, M. L., Ladouceur, C. D., & Drevets, W. C. (2008). A neural model of voluntary and automatic emotion regulation: Implications for understanding the pathophysiology and neurodevelopment of bipolar disorder. *Molecular Psychiatry, 13*(9), 833-857. doi:10.1038/mp.2008.65

Posner, M. I., & Rothbart, M. K. (2007). *Research on attention networks as a model for the integration of*

*psychological science* doi:10.1146/annurev.psych.58.110405.085516

Parsons, C. E., Crane, C., Parsons, L. J., Fjorback, L. O., & Kuyken, W. (2017). Home practice in mindfulness-based cognitive therapy and mindfulness-based stress reduction: A systematic review and meta-analysis of participants' mindfulness practice and its association with outcomes. *Behaviour Research and Therapy, 95*, 29-41. doi:10.1016/j.brat.2017.05.004

Prochaska, J. O., & Velicer, W. F. (1997). The Transtheoretical Model of Health Behavior Change. *American Journal of Health Promotion*, 12(1), 38–48. https://doi.org/10.4278/0890-1171-12.1.38

Prochaska, J. O., & Norcross, J. C. (2003). *Systems of psychotherapy: A transtheoretical analysis*. Pacific Grove, CA: Brooks/Cole Pub.

Querstret, D., Cropley, M., & Fife-Schaw, C. (2018). The Effects of an Online Mindfulness Intervention on Perceived Stress, Depression and Anxiety in a Non-clinical Sample: A Randomised Waitlist Control Trial. *Mindfulness*, https://doi.org/10.1007/s12671-018-0925-0

Qin, S., Hermans, E. J., van Marle, H. J. F., Luo, J., & Fernández, G. (2009). Acute psychological stress reduces working memory-related activity in the dorsolateral prefrontal cortex. *Biological Psychiatry, 66*(1), 25-32. doi:10.1016/j.biopsych.2009.03.006

Qin, P., & Northoff, G. (2011). How is our self related to midline regions and the default-mode network? *Neuroimage*, 57, 1221–1233. doi: 10.1016/j.neuroimage.2011.05.028

Quirk, G. J., & Beer, J. S. (2006). Prefrontal involvement in the regulation of emotion: Convergence of rat and human studies. *Current Opinion in Neurobiology, 16*(6), 723-727. doi: 10.1016/j.conb.2006.07.004

Quaglia, J. T., Braun, S. E., Freeman, S. P., McDaniel, M. A., & Brown, K. W. (2016). Meta-analytic evidence for effects of mindfulness training on dimensions of self-reported dispositional mindfulness. *Psychological Assessment, 28*(7), 803-818. doi:10.1037/pas0000268

Raes, F., Pommier, E., Neff, K. D., & Van Gucht, D. (2011). Construction and factorial validation of a short form of the Self-Compassion Scale. *Clinical Psychology and Psychotherapy*, 18(3), 250–255. https://doi.org/10.1002/cpp.702

Rahimi-Ardabili, H., Reynolds, R., Vartanian, L. R., McLeod, L. V. D., & Zwar, N. (2018). A Systematic Review of the Efficacy of Interventions that Aim to Increase Self-Compassion on Nutrition Habits, Eating Behaviours, Body Weight and Body Image. *Mindfulness*, 9(2), 388–400. https://doi.org/10.1007/s12671-017-0804-0

Ray, W. J., Odenwald, M., Neuner, F., Schauer, M., Ruf, M., Wienbruch, C., et al. (2006). Decoupling neural networks from reality: Dissociative experiences in torture victims are reflected in abnormal brain waves in left frontal cortex. *Psychological Science, 17*(3), 825–829.

Rhodes, E. (2015, September). Mindfulness on trial. *Psychologist*, *28*(9). Retrieved from https://thepsychologist.bps.org.uk/mindfulness-trial. Accessed 25 June 2018.

Robinson, J. L., & Demaree, H. A. (2007). Physiological and cognitive effects of expressive dissonance. *Brain and Cognition, 63*(1), 70-78. doi:10.1016/j.bandc.2006.08.003

Roffman, J. L., Marci, C. D., Glick, D. M., Dougherty, D. D., & Rauch, S. L. (2005). Neuroimaging and the functional neuroanatomy of psychotherapy. *Psychological Medicine, 35*(10), 1385-1398. doi:10.1017/S0033291705005064

Roman, R., Světlák, M., Damborská, A., & Kukleta, M. (2014). Neurophysiology of defence behaviour. [Neurofyziologie obranného chování] *Ceska a Slovenska Psychiatrie, 110*(2), 96-104.

Roman, R., Brázdil, M., Chládek, J., Rektor, I., Jurák, P., Světlák, M., . . . Kukleta, M. (2013). Hippocampal negative event-related potential recorded in humans during a simple sensorimotor task occurs independently of motor execution. *Hippocampus, 23*(12), 1337-1344. doi:10.1002/hipo.22173
Rosseel, Y. (2012). lavaan: an R package for structural equation modelling. *Journal of Statistical Software, 48*(2), 1–36. https://doi.org/10.18637/jss.v048.i02

Rosenzweig, S., Reibel, D. K., Greeson, J. M., Brainard, G. C., & Hojat, M. (2003). Mindfulness-based stress reduction lowers psychological distress in medical students. *Teaching and Learning in Medicine*, 15(2), 88–92.

https://doi.org/10.1207/S15328015TLM1502_03

Rothermund, K. (2011). Counter-regulation and control-dependency: Affective processing biases in the service of action regulation. *Social Psychology, 42*(1), 56-66. doi:10.1027/1864-9335/a000043

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2002). Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse. NewYork: The Guildford Press.

Sher, K. J., & Grekin, E. R. (2007). Alcohol and affect regulation. In Gross J.J. (Ed.), *Handbook of emotion regulation* (pp. 560−580). New York, NY: Guilford Press.

Schmeichel, B. J., Volokhov, R. N., & Demaree, H. A. (2008). Working memory capacity and the self-regulation of emotional expression and experience. *Journal of Personality and Social Psychology, 95*(6), 1526-1540. doi:10.1037/a0013345

Schneider, W., & Shiffrin, R. M. (1977). Controlled and automatic human information processing: I. detection, search, and attention. *Psychological Review, 84*(1), 1-66. doi:10.1037/0033-295X.84.1.1

Schneirla, T. (1959). An evolutionary and developmental theory of biphasic processes underlying approach and withdrawal. In M. Jones (Ed.), *Nebraska Symposium on Motivation* (pp. 1–42). Lincoln: University of Nebraska Press.

Schwager, S., & Rothermund, K. (2014). On the dynamics of implicit emotion regulation: Counter-regulation after remembering events of high but not of low emotional intensity. *Cognition and Emotion, 28*(6), 971-992. doi:10.1080/02699931.2013.866074

Schlotz, W., Yim, I. S., Zoccola, P. M., Jansen, L., & Schulz, P. (2011). The Perceived Stress Reactivity Scale: measurement invariance, stability, and validity in three countries. *Psychological Assessment*, 23(1), 80–94. https://doi.org/10.1037/a0021148

Selby, E. A., Anestis, M. D., & Joiner, T. E. (2008). Understanding the relationship between emotional and behavioral dysregulation: Emotional cascades. *Behaviour Research and Therapy, 46*(5), 593-611. doi:10.1016/j.brat.2008.02.002

Shackman, A. J., Salomons, T. V., Slagter, H. A., Fox, A. S., Winter, J. J., & Davidson, R. J. (2011). The integration of negative affect, pain and cognitive control in the cingulate cortex. *Nature Reviews Neuroscience, 12*(3), 154-167. doi:10.1038/nrn2994

Shahidi, S., Akbari, H., & Zargar, F. (2017). Effectiveness of mindfulness-based stress reduction on emotion regulation and test anxiety in female high school students. *Journal of Education and Health Promotion*, 6(1), 87. https://doi.org/10.4103/jehp.jehp_98_16

Shapiro, S. L., & Schwartz, G. E. R. (2000). Intentional systemic mindfulness: An integrative model for self-regulation and health. *Advances in Mind-Body Medicine, 16*(2), 128-134.

Shapiro, S. L., Schwartz, G. E., & Bonner, G. (1998). Effects of mindfulness-based stress reduction on medical and premedical students. *Journal of Behavioral Medicine*, 21(6), 581–599. https://doi.org/10.1023/A:1018700829825

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology, 62*(3), 373-386. doi:10.1002/jclp.20237

Shapiro, S. L., Brown, K. W., Thoresen, C., & Plante, T. G. (2011). The moderation of mindfulness-based stress reduction effects by trait mindfulness: Results from a randomized controlled trial. *Journal of Clinical Psychology, 67*(3), 267-277. doi:10.1002/jclp.20761

Shapiro, S. L., Astin, J. A., Bishop, S. R., & Cordova, M. (2005). Mindfulness-Based Stress Reduction for Health Care Professionals: Results From a Randomized Trial. *International Journal of Stress Management, 12*(2), 164-176. http://dx.doi.org/10.1037/1072-5245.12.2.164

Shapiro, S. L., Brown, K. W., & Biegel, G. M. (2007). Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the mental health of therapists in training. *Training and Education in Professional Psychology, 1*(2), 105-115. doi:10.1037/1931-3918.1.2.105

Schutte, N. S., & Malouff, J. M. (2014). A meta-analytic review of the effects of mindfulness meditation on telomerase activity. *Psychoneuroendocrinology, 42*, 45-48. doi: 10.1016/j.psyneuen.2013.12.017

Sifneos, P. E. (1973). The prevalence of 'alexithymic' characteristics in psychosomatic patients. *Psychotherapy and Psychosomatics, 22*(2-6), 255-262. doi:10.1159/000286529

Skinner, E. A., & Edge, K. (1998). Reflections on coping and development across the lifespan. *International Journal of Behavioral Development, 22*, 357–366. doi:10.1080/016502598384414

Skinner, E. A., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the structure of coping: A review and critique of category systems for classifying ways of coping. *Psychological Bulletin, 129*(2), 216-269. http://dx.doi.org/10.1037/0033-2909.129.2.216

Siegel, R. D. (2010). *The Mindfulness Solution: Everyday Practices for Everyday Problems*. New York: Guilford Press.

Siegel, R.D., Germer, Ch.K., & Olendzki, A. (2009). Mindfulness: What Is It? Where Did It Come From? In Didonna, F. (2009). *Clinical handbook of mindfulness*. New York, NY: Springer.

Sloan, E., Hall, K., Moulding, R., Bryce, S., Mildred, H., & Staiger, P. K. (2017). Emotion regulation as a transdiagnostic treatment construct across anxiety, depression, substance, eating and borderline personality disorders: A systematic review. *Clinical Psychology Review, 57*, 141-163. doi:10.1016/j.cpr.2017.09.002

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *International Journal of Behavioral Medicine*, 15(3), 194–200. https://doi.org/10.1080/10705500802222972

Snel, E. (2013). *Sitting still like a frog: Mindfulness exercises for kids (and their parents)*.

Sojka, P., Bareš, M., Kašpárek, T., & Světlák, M. (2018). Processing of emotion in functional neurological disorder. *Frontiers in Psychiatry, 9*(OCT) doi:10.3389/fpsyt.2018.00479

Sperduti, M., Martinelli, P., & Piolino, P. (2012). A neurocognitive model of meditation based on activation likelihood estimation (ALE) meta-analysis. *Consciousness and Cognition, 21*(1), 269–276. https://doi.org/10.1016/j.concog.2011.09.019

Spijkerman, M. P., Pots, W. T., & Bohlmeijer, E. T. (2016). Effectiveness of online mindfulness-based interventions in improving mental health: A review and meta-analysis of randomised controlled trials. *Clinical Psychology Review*, 45, 102–114. https://doi.org/10.1016/j.cpr.2016.03.009

Subic-Wrana, C., Bruder, S., Thomas, W., Lane, R. D., & Köhle, K. (2005). Emotional awareness deficits in inpatients of a psychosomatic ward: A comparison of two different measures of alexithymia. *Psychosomatic Medicine, 67*(3), 483-489. doi:10.1097/01.psy.0000160461.19239.13

Subic-Wrana, C., Beutel, M. E., Knebel, A., & Lane, R. D. (2010). Theory of mind and emotional awareness deficits in patients with somatoform disorders. *Psychosomatic Medicine, 72*(4), 404-411. doi:10.1097/PSY.0b013e3181d35e83

Světlák, M., & Pšenicová, K. (2012). Food craving symptoms in older school age children and its relation to body-mass index. [Příznaky bažení po jídle u dětí staršího školního věku a jejich vztah k body-mass indexu] *Vnitrni Lekarstvi, 58*(2), 110-117.

Svetlak, M. (2010c). Food craving, stress and limbic irritability. *Activitas Nervosa Superior, 52*(3-4), 113-117. doi:10.1007/BF03379574

Světlák, M., Bob, P., & Kukleta, M. (2010b). Complex partial seizure-like symptoms and smoking in university students. *Scripta Medica Facultatis Medicae Universitatis Brunensis Masarykianae, 83*(2), 124-129.

Světlák, M. (2010a). Activation of processes of change in adolescent smokers. [Aktivace procesů změny u mladistvých kuřáků] *Prakticky Lekar, 90*(6), 371-375.

Světlák, M. (2007). Motivation to smoking cessation in a sample of smokers measured by transtheoretic model: A pilot study. [Motivace k zanechání kouření u vybraného vzorku kuřáků perspektivou transteoretického modelu: Pilotní studie] *Prakticky Lekar, 87*(12), 727-731.

Světlák, M., Hodoval, R., Damborská, A., Pilát, M., Roman, R., Černík, M., . . . Bob, P. (2013). The emotional impact of the text of cigarette package health warning on older school age and adolescent children. [Emoční reakce vyvolaná textovými zdravotními varováními na obalech tabákových výrobků u dětí staršího školního věku a adolescentů] *Cesko-Slovenska Pediatrie, 68*(2), 78-91.

Světlák, M., Konečný, Š., & Kukleta, M. (2007). Smoking in adolescents: Verification of the procedure and basic theoretical assumptions of the transtheoretical model. [Kouření u adolescentů: Ověřová ní Metodiky a základních teoretických předpokladů transteoretického modelu] *Ceskoslovenska Psychologie, 51*(1), 22-31.

Svetlak, M., & Kukleta, M. (2006a). Pros and cons of smoking evaluated in czech adolescents. *Homeostasis in Health and Disease, 44*(1-2), 89-92.

Svetlak, M., & Kukleta, M. (2006b). Smokers' self-monitoring scale: A pilot study of possibilities of a graphic form. *Homeostasis in Health and Disease, 44*(1-2), 75-77.

Světlák, M., & Kukleta, M. (2003). Application of the transtheoretical model of behavioral changes in the czech population: A pilot study. *Homeostasis in Health and Disease, 42*(3-4), 163-165.

Bob, P., & Svetlak, M. (2011). Dissociative states and neural complexity. *Brain and Cognition, 75*(2), 188-195. doi:10.1016/j.bandc.2010.11.014

Světlák, M., Bob, P., Černík, M., Chládek, J., & Kukleta, M. (2010d). Electrodermal dimensional complexity and smoking. *Scripta Medica Facultatis Medicae Universitatis Brunensis Masarykianae, 83*(1), 63-68.

Svetlak, M., Bob, P., Cernik, M., & Kukleta, M. (2010e). Electrodermal complexity during the stroop colour word test. *Autonomic Neuroscience: Basic and Clinical, 152*(1-2), 101-107. doi:10.1016/j.autneu.2009.10.003

Světlák, M., Bob, P., Roman, R., Ježek, S., Damborská, A., Chládek, J., . . . Kukleta, M. (2013). Stress-induced alterations of left-right electrodermal activity coupling indexed by pointwise transinformation. *Physiological Research, 62*(6), 711-719.

Světlák, M., Marsová, K., Bernátová, T., & Winklerová, L. (2017). Emotional awareness in adolescents – A pilot study of psychometric properties of the czech adaptation of the levels of emotional awareness scale for children LEAS-C. [Emoční uvědomění u adolescentů - Pilotní studie ověřující základní psychometrické vlastnosti české verze Škály úrovně emočního uvědomění pro děti LEAS-C]. *Ceska a Slovenska Neurologie a Neurochirurgie, 80*(2), 197-207. doi:10.14735/amcsnn2017197

Světlák, M., Bernátová, T., Pavlíková, E., & Winklerová, L. (2015). Measuring emotional awareness - A pilot study of psychometric properties of the czech adaptation of the levels of emotional awareness scale. [Měření úrovně emočního uvědomění – Pilotní studie ověřující základní psychometrické vlastnosti české verze Škály úrovně emočního uvědomění LEAS]. *Ceska a Slovenska Neurologie a Neurochirurgie, 78*(6), 680-686.

Světlák, M., Theiner, P., & Kubicová, E. (2018, July). Short-term effect of simple mindfulness practices on the emotional state in hospitalized adolescents with mental disorders: a pilot study. Oral presentation at the 23rd International Association for Child and Adolescent Psychiatry and Allied, Prague, Czech Republic.

Svetlak, M., Linhartova, P., Knejzlikova, T., Kosa, B., Sumec, R., Hornickova, V., Jarolinova, K., Lucanska, K., Slezackova, A., Kasparek, T. (2019 submited to Applied Psychology: Health and Well-Being). Mindful in Medical School, Thanks to Facebook: Online Mindfulness-Based Mental Health Support Program with Intensive Reminder System.

Tacón, A. M., Caldera, Y. M., & Ronaghan, C. (2004). Mindfulness-Based Stress Reduction in Women With Breast Cancer. *Families, Systems, & Health, 22*(2), 193-203. http://dx.doi.org/10.1037/1091-7527.22.2.193

Tamir, M., John, O. P., Srivastava, S., & Gross, J. J. (2007). Implicit theories of emotion: Affective and social outcomes across a major life transition. *Journal of Personality and Social Psychology, 92*(4), 731-744. doi:10.1037/0022-3514.92.4.731

Tang, Y. Y., Hölzel, B. K., & Posner, M. I. (2015). The neuroscience of mindfulness meditation. *Nature Reviews Neuroscience,* 16(4), 213–225. https://doi.org/10.1038/nrn3916

Tang, Y. -., Ma, Y., Fan, Y., Feng, H., Wang, J., Feng, S., . . . Fan, M. (2009). Central and autonomic nervous system interaction is altered by short-term meditation. *Proceedings of the National Academy of Sciences of the United States of America, 106*(22), 8865-8870. doi:10.1073/pnas.0904031106

Taren, A. A., Creswell, J. D., & Gianaros, P. J. (2013). Dispositional mindfulness co-varies with smaller amygdala

and caudate volumes in community adults. *PLoS ONE, 8*(5) doi:10.1371/journal.pone.0064574

Teasdale, J. D., Segal, Z., & Williams, J. M. G. (1995). How does cognitive therapy prevent depressive relapse and why should attentional control (mindfulness) training help? *Behaviour Research and Therapy, 33*(1), 25-39. doi:10.1016/0005-7967(94)E0011-7

Teasdale, J.D., & Chaskalson, M. (2011). How does mindfulness transform suffering? I: the nature and origins of *dukkha, Contemporary Buddhism*, 12:01, 89-102, DOI: 10.1080/14639947.2011.564824

Teasdale, J. D., & Chaskalson, M. (2011b). How does mindfulness transform suffering? II: The transformation of dukkha. *Contemporary Buddhism*, *12*, 103–124.

Telch, C. F., Agras, W. S., & Linehan, M. M. (2000). Group dialectical behavior therapy for binge-eating disorder: A preliminary, uncontrolled trial. *Behavior Therapy, 31*(3), 569-582. doi:10.1016/S0005-7894(00)80031-3

Temoshok, L. (1987). Personality, coping style, emotion and cancer: Towards an integrative model. *Cancer Surveys, 6*(3), 545-567.

Thompson, R. A. (1994). Emotion regulation: a theme in search of definition. *Monographs of the Society for Research in Child Development, 59*(2-3), 25-52. doi:10.1111/j.1540-5834. 1994.tb01276.x

Thompson, M., & Gauntlett-Gilbert, J. (2008). Mindfulness with children and adolescents: Effective clinical application. *Clinical Child Psychology and Psychiatry, 13*(3), 395-407. doi:10.1177/1359104508090603

Tice, D. M., Bratslavsky, E., & Baumeister, R. F. (2001). Emotional distress regulation takes precedence over impulse control: If you feel bad, do it! *Journal of Personality and Social Psychology*, *80*(1), 53–67. https://doi.org/10.1037/0022-3514.80.1.53

Thayer, R. E., Newman, J. R., & McClain, T. M. (1994). Self-Regulation of Mood: Strategies for Changing a Bad Mood, Raising Energy, and Reducing Tension. *Journal of Personality and Social Psychology*, *67*(5), 910–925. https://doi.org/10.1037/0022-3514.67.5.910

Thomas, N. K. (2004). Resident burnout. *Journal of the American Medical Association*, 292(23), 2880-2889. https://doi.org/10.1001/jama.292.23.2880

Thompson, B. L., & Waltz, J. (2007). Everyday mindfulness and mindfulness meditation: Overlapping constructs or not? *Personality and Individual Differences, 43*(7), 1875-1885. doi:10.1016/j.paid.2007.06.017

Tomlinson, E. R., Yousaf, O., Vittersø, A. D., & Jones, L. (2018). Dispositional Mindfulness and Psychological Health: a Systematic Review. *Mindfulness*, 9(1), 23–43. https://doi.org/10.1007/s12671-017-0762-6

Travis, F., & Shear, J. (2010). Focused attention, open monitoring and automatic self-transcending: Categories to organize meditations from Vedic, Buddhist and Chinese traditions. *Consciousness and Cognition*, *19*(4), 1110–1118. https://doi.org/10.1016/j.concog.2010.01.007

Travis, F. (2014). Transcendental experiences during meditation practice. *Annals of the New York Academy of Sciences*, *1307*(1), 1–8. https://doi.org/10.1111/nyas.12316

Travis, F., & Parim, N. (2017). Default mode network activation and transcendental meditation practice: Focused attention or automatic self-transcending? *Brain and Cognition*, *111*, 86-94. doi:10.1016/j.bandc.2016.08.009

Travis, F., & Wallace, R. K. (1999). Autonomic and EEG pattern during eye-closed rest and Transcendental Meditation (TM) practice: The basis for a neural model of TM practice. Consciousness and Cognition, 8, 302–318.

Van Dam, N. T., van Vugt, M. K., Vago, D. R., Schmalzl, L., Saron, C. D., Olendzki, A., . . . Meyer, D. E. (2018). Mind the hype: A critical evaluation and prescriptive agenda for research on mindfulness and meditation. *Perspectives on Psychological Science, 13*(1), 36-61. doi:10.1177/1745691617709589

van den Berg, A. E., Hartig, T., & Staats, H. (2007). Preference for nature in urbanized societies: Stress, restoration, and the pursuit of sustainability. *Journal of Social Issues, 63*(1), 79-96. doi:10.1111/j.1540-4560.2007.00497.x

van der Kolk, B. A., & Fisler, R. (1995). Dissociation and the fragmentary nature of traumatic memories: Overview and exploratory study. *Journal of Traumatic Stress, 8*(4), 505-525. doi:10.1007/BF02102887

van der Meer, L., Costafreda, S., Aleman, A., & David, A. S. (2010). Self-reflection and the brain: A theoretical

review and meta-analysis of neuroimaging studies with implications for schizophrenia. *Neuroscience and Biobehavioral Reviews, 34*(6), 935-946. doi:10.1016/j.neubiorev.2009.12.004

van der Velden, A. M., Kuyken, W., Wattar, U., Crane, C., Pallesen, K. J., Dahlgaard, J., . . . Piet, J. (2015). A systematic review of mechanisms of change in mindfulness-based cognitive therapy in the treatment of recurrent major depressive disorder. *Clinical Psychology Review, 37*, 26-39. doi:10.1016/j.cpr.2015.02.001

Velicer, W. F., Prochaska, J. O., Fava, J. L., Rossi, J. S., Redding, C. A., Laforge, R. G., et al. (2000). Using the transtheoretical model for population-based approaches to health promotion and disease prevention. *Homeostasis in Health and Disease*, 40(5), 174-195.

Virgili, M. (2015). Mindfulness-Based Interventions Reduce Psychological Distress in Working Adults: a Meta-Analysis of Intervention Studies. *Mindfulness*, 6(2), 326–337. https://doi.org/10.1007/s12671-013-0264-0

Vago, D. R., & Silbersweig, D. A. (2012). Self-awareness, self-regulation, and self-transcendence (S-ART): a framework for understanding the neurobiological mechanisms of mindfulness. *Frontiers in Human Neuroscience*, *6*(October), 1–30. https://doi.org/10.3389/fnhum.2012.00296

Vrtička, P., Sander, D., & Vuilleumier, P. (2011). Effects of emotion regulation strategy on brain responses to the valence and social content of visual scenes. *Neuropsychologia, 49*(5), 1067-1082. doi:10.1016/j.neuropsychologia.2011.02.020

Wahbeh, H., Svalina, M. N., & Oken, B. S. (2014). Group, One-on-One, or Internet? Preferences for Mindfulness Meditation Delivery Format and their Predictors. *Open Medicine Journal*, 1(1), 66–74. https://doi.org/10.2174/1874220301401010066

Way, B. M., Creswell, J. D., Eisenberger, N. I., & Lieberman, M. D. (2010). Dispositional mindfulness and depressive symptomatology: correlations with limbic and self-referential neural activity during rest. *Emotion,* 10, 12–24. doi: 10.1037/a0018312

Warnecke, E., Quinn, S., Ogden, K., Towle, N., & Nelson, M. R. (2011). A randomised controlled trial of the effects of mindfulness practice on medical student stress levels. *Medical Education*, 45(4), 381–388. https://doi.org/10.1111/j.1365-2923.2010.03877.x

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin, 134*(2), 163-206. doi:10.1037/0033-2909.134.2.163

Watson, D., & Clark, L. A. (1984). Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin, 96*(3), 465-490. doi:10.1037/0033-2909.96.3.465

Webb, T. L., Miles, E., & Sheeran, P. (2012). Dealing with feeling: A meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychological Bulletin*, *138*(4), 775–808. https://doi.org/10.1037/a0027600

Wegner, D. M., Erber, R., & Zanakos, S. (1993). Ironic processes in the mental control of mood and mood -related thought. *Journal of Personality and Social Psychology, 65*(6), 1093-1104. http://dx.doi.org/10.1037/0022-3514.65.6.1093

Wegner, D. M., & Gold, D. B. (1995). Fanning old flames: Emotional and cognitive effects of suppressing thoughts of a past relationship. *Journal of Personality and Social Psychology, 68*(5), 782-792. http://dx.doi.org/10.1037/0022-3514.68.5.782

Westbrook, C., Creswell, J. D., Tabibnia, G., Julson, E., Kober, H., & Tindle, H. A. (2013). Mindful attention reduces neural and self-reported cue-induced craving in smokers. *Social Cognitive and Affective Neuroscience, 8*(1), 73-84. doi:10.1093/scan/nsr076

Whalen, P.J., & Phelps, E.A. (2009). *The human amygdala*. New York: Guilford Press.

Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review, 101*(1), 34-52. http://dx.doi.org/10.1037/0033-295X.101.1.34

Weinberger, D. A., Schwartz, G. E., & Davidson, R. J. (1979). Low-anxious, high-anxious, and repressive coping styles: Psychometric patterns and behavioral and physiological responses to stress. *Journal of Abnormal Psychology, 88*(4), 369-380. doi:10.1037/0021-843X.88.4.369

Wenzlaff, R. M., Wegner, D. M., & Roper, D. W. (1988). Depression and mental control: The resurgence of unwanted negative thoughts. *Journal of Personality and Social Psychology, 55*(6), 882-892. doi:10.1037/0022-3514.55.6.882

Wheeler, M. S., Arnkoff, D. B., & Glass, C. R. (2016). What is being studied as mindfulness meditation? *Nature Reviews Neuroscience, 17*(1), 59. doi:10.1038/nrn.2015.6

Whelton, W. J. (2004). Emotional processes in psychotherapy: Evidence across therapeutic modalities. *Clinical Psychology and Psychotherapy, 11*(1), 58-71. doi:10.1002/cpp.392

Williams, M., & Penman, D. (2011). *Mindfulness: A practical guide to finding peace in a frantic world*. London: Hachette.

Williams, M., Teasdale, J., Segal, Z., Kabat-Zinn, J. (2007). *The Mindful Way through Depression*. New York: Guilford Press.

Williams, L. E., Bargh, J. A., Nocera, C. C., & Gray, J. R. (2009). The unconscious regulation of emotion: Nonconscious reappraisal goals modulate emotional reactivity. *Emotion, 9*(6), 847-854. http://dx.doi.org/10.1037/a0017745

Williams, M. J., Dalgleish, T., Karl, A., & Kuyken, W. (2014). Examining the factor structures of the five facet mindfulness questionnaire and the self-compassion scale. *Psychological Assessment, 26*(2), 407–418. https://doi.org/10.1037/a0035566

Williams, J.M.G., Crane, R.S., Soulsby, J.S. (2007). *The Mindfulness-based Curriculum in Practice: Summary outline, intentions and rationale for practices*. Bangor and Oxford University, unpublished handout.

Wolf, Ch. (2015). *A Clinician's Guide to Teaching Mindfulness: The Comprehensive Session-by-Session Program for Mental Health Professionals and Health Care Providers*. Oacland: New Harbinger Publications, Inc.

Wolpe, J. (1958). *Psychotherapy by reciprocal inhibition*. Stanford, CA: Stanford University Press.

Wong, K., Massar, S., Chee, M. & Lim, J. (2018). Towards an Objective Measure of Mindfulness: Replicating and Extending the Features of the Breath-Counting Task. *Mindfulness*. https://doi.org/10.1007/s12671-017-0880-1

Wupperman, P., Neumann, C. S., & Axelrod, S. R. (2008). Do deficits in mindfulness underlie borderline personality features and core difficulties? *Journal of Personality Disorders, 22*(5), 466-482. doi:10.1521/pedi.2008.22.5.466

Zannotti, M. & Pringuey, D. (1992). A method for quality of life assessment in psychiatry: the S-QUA-L-A (Subjective QUAlity of Life Analysis). *Quality of Life News Letter*, 4(6), 1-8.

Zeidan, F., Johnson, S. K., Gordon, N. S., & Goolkasian, P. (2010). Effects of brief and sham mindfulness meditation on mood and cardiovascular variables. *Journal of Alternative and Complementary Medicine, 16*(8), 867-873. doi:10.1089/acm.2009.0321

Zernicke, K. A., Campbell, T. S., Speca, M., McCabe-Ruff, K., Flowers, S., & Carlson, L. E. (2014). A randomized wait-list controlled trial of feasibility and efficacy of an online mindfulness-based cancer recovery program: The eTherapy for cancer applying mindfulness trial. *Psychosomatic Medicine*, 76(4), 257–267. https://doi.org/10.1097/PSY.0000000000000053

Zernicke, K. A., Campbell, T. S., Speca, M., McCabe-Ruff, K., Flowers, S., Tamagawa, R., & Carlson, L. E. (2016). The eCALM Trial: eTherapy for Cancer Applying Mindfulness. Exploratory Analyses of the Associations Between Online Mindfulness-Based Cancer Recovery Participation and Changes in Mood, Stress Symptoms, Mindfulness, Posttraumatic Growth, and Spirituality. *Mindfulness*, 7(5), 1071–1081. https://doi.org/10.1007/s12671-016-0545-5