Mindfulness
Application to diverse populations and working mechanisms

Emotional distress is prevalent in modern society and has become a significant global health problem, both in adult and adolescent populations (Twenge et al., 2010; Mojtabai et al., 2016). Recent studies point to a growing number of mental problems worldwide (e.g. Steel et al., 2014), a rise in medication use (e.g. Moore et al., 2009) and the under-treatment of mental disorders (Layard and Clark, 2015). Mental disorders are especially a disease of working age and accounts for over half of all illness up to age forty-five (Layard and Clark, 2015). This means that it has an important economic cost (see Layard and Clark, 2015 for an extended discussion). Many mental health problems in adults have their first onset in adolescence (Gore et al., 2011). In fact, 50% of adults with psychiatric disorders have experienced clinically impairing psychopathology by the age of 15, and 75% by the age of 24 (Kessler et al., 2007). The occurrence of mental ill-health has also been shown to be associated with social and socio-economic inequalities. In general, rates of overall psychopathology are 2.6 times higher in the lowest social class than in the highest class (e.g. Lorant et al., 2013). Unfortunately, low socio-economic status and being less-educated is generally also associated with poor access to intervention programs and greater difficulty in accessing professional help (Wang et al., 2007). All this leads to a vicious circle, as mental ill-health in turn enhances social inequalities (World Health Organization, 2007). Targeting the individual needs or treatment in isolation will not solve this problem since the demand is high and wait-lists are long. Therefore it is not feasible to enhance mental care without simultaneously increasing service capacity (e.g. Group, 2007).

Increased access to group (mental) health promotion programs that are feasible, have a low threshold and have a broad social scope, could offer part of a solution. These programs should focus on training self-regulatory skills helping to reduce overall emotional distress (=symptoms of depression, anxiety and stress) and enabling people to successfully cope with the challenges they face in their daily life. These skills should be based on alterations in basic cognitive and emotional processes, neural systems and behavioral outcomes. Is it possible that a training in mindfulness may tick most or even all of these boxes?

What is mindfulness and what are mindfulness-based programs?

The most widely used definition, applicable to all people in secular settings, is the definition by Jon Kabat-Zinn: “Mindfulness is the awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally” (Kabat-Zinn, 1994, p. 4). Two core elements are (1) awareness of one’s present moment experience, which can be awareness of sounds, bodily sensations, thoughts, emotions, and (2) an attitude of openness and acceptance (non-judging) toward one’s experience. This open and accepting attitude changes the person’s relationship with the experience, being a detached and non-reactive orientation. This shift in relationship or perspective influences additional psychological processes (see further) that may mediate training outcomes. Based on this operational definition of Jon Kabat-Zinn, which is also the approach taken by scientists to study and apply mindfulness, mindfulness is considered as a life skill. It is something that can be developed and deepened by mindfulness-based programs.
The two most well-known and most frequently studied Mindfulness-Based Programs (MBPs) are Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn, 2013) and Mindfulness-Based Cognitive Therapy (MBCT) (Segal, Williams, & Teasdale, 2012). Both programs involve extensive training in mindfulness meditation skills, and mindfulness meditation practice is employed as a central foundational methodology (Crane et al., 2017). This is important as mindfulness meditation practices offer a methodology for observing how the human mind works, and for practically engaging with the observed processes. The programs follow a structured curriculum that is taught in a group format over six to eight weeks. Participants develop specific skills in their capacity to become non-judgmentally aware of thoughts and feelings, and sensations, and increase their capacity to replace automatic, habitual, and often judgmental reactions with more conscious responses. Both curricula include didactic instructions and group practice in meditation exercises including formal and informal meditation practices. Formal meditation practices are body scan meditations, sitting focused attention meditation and open awareness meditation, walking meditation, and gentle Hatha yoga exercises. Informal practices refer to mindfulness in everyday life, such as awareness of pleasant and unpleasant moments, awareness of breathing, awareness of routine activities (e.g. eating, driving, interpersonal communication). During the sessions there are group discussions of the didactic material and “sharing” of personal experiences encountered during group and home meditation practice. Participants are encouraged to think of mindfulness as a “way of being” rather than a compartmentalized home practice.

Evidence and research gaps

- Evidence on effectiveness. The most recent meta-analyses and reviews indicate that mindfulness-based programs reduce emotional distress in clinical as well as non-clinical populations (Gotink et al., 2015; Goyal et al., 2014; Khoury et al., 2013; Kuyken et al., 2016). A large comprehensive meta-analysis by Khoury et al. (2013) including both clinical and non-clinical populations (209 studies, n=12145) showed that MBPs are especially effective for reducing anxiety, depression and stress, with effect sizes ranging from .33 (when compared to active control treatments) to .53 (when compared to waitlist controls). MBIs did not differ from cognitive behavioral therapies or pharmacological treatments (Khoury et al., 2013). The review by Goyal et al. (2014) compared meditation in clinical conditions (medical or psychiatric) relative to only active control groups (41 studies, n=2993) and found moderate evidence of reduced anxiety, depression and pain (effect size, .38, .30 and .33, respectively). The authors found no evidence that mindfulness meditation programs were better than other active treatment (i.e., drugs, exercise, and other cognitive-behavioral therapies). Gotink et al. (2015) aimed to assess in which populations MBSR and MBCT are effective based on an overview of published systematic reviews and meta-analyses (23 included) of randomized controlled trials (115 trials, n=8683). Most of the target populations were suffering from common chronic conditions (e.g. cancer: n=1668, chronic pain: n=722, cardiovascular disease: n=577, depression: n=1058, anxiety: n=1244). Significant beneficial effects were seen in symptoms of depression, anxiety, stress, with an effect size of .37, .49 and .51, respectively. These effects were seen both in patients with medical conditions and in patients with psychological disorders, and in comparison with different control conditions (waitlist, treatment as usual or active control). The work of Kuyken et al. (2016), which involved a meta-analysis conducted at the individual patient level including 9 randomized clinical trials and 1258 patients, provides compelling evidence to support the clinical utility of MBCT in minimizing depressive relapse.

Based on these reviews and meta-analyses, the evidence of a positive effect of MBPs on emotional distress is, so far, most compelling for adult populations in clinical settings, suffering from mental or physical chronic conditions. The studies provide convincing evidence that mindfulness-based
programs may increase the range of treatment choices in a therapeutic context, or may complement or support other forms of therapy (e.g. support cancer therapy).

**Research gap.** Although evidence on the effectiveness of MBPs to reduce emotional distress in some contexts is strong and building, there is very little research on sustainable community mindfulness intervention programs, delivered by community providers under routine conditions “in the real world” (Dimidjian & Segal, 2015). Good examples of real life contexts where MBPs might be very useful are schools, social welfare centers, shelters for refugees. Learning adolescents and young adults self-regulatory skills to prevent mental illness may turn out to be crucial (Weare and Nind 2011) and several authors suggest to include universal prevention programs in the school curriculum (Horowitz and Garber 2006; Stockings et al. 2016; Ahlen et al. 2015). Recent epidemiological work suggests that more affluent healthy white adults are the ones who are most likely to seek out and use mindfulness practices, whereas mindfulness practices are underutilized among low income minorities with worse health (Olano et al., 2015). From an effectiveness standpoint, this is problematic because evidence to date suggests that these more high-stress, low-income, and health-compromised individuals would be the type of individuals who might benefit the most from MBPs (Creswell, 2017; Creswell & Lindsay, 2014).

- Evidence on working mechanisms. In contrast to progress in elucidating MBPs clinical outcomes, our understanding of the specific mechanisms by which these outcomes are achieved is still in its infancy. Several potential mechanisms that underpin the effects of MBPs on emotional distress, which are in line with the above mentioned central elements of mindfulness, have already been identified. The most recent meta-analyses (Alsubaie et al., 2017; Gu, Strauss, Bond, & Cavanagh, 2015; van der Velden et al., 2015) show that evidence is most consistent for (1) an improvement in global mindfulness skills as a mediator to reduce symptoms of stress, anxiety and depression, including a decentered mindset and self-compassion, and (2) a reduction in vulnerability factors such as repetitive negative thinking (rumination and worry), and cognitive and emotional reactivity (see Figure 1). Global mindfulness skills refer to treat mindfulness considered as a construct including different facets (observation/awareness, attention/acting with awareness, acceptance/non-judgement related to self-compassion, non-reactivity/decentering) (Baer 2016; Quaglia et al. 2016). A decentered mindset refers to a shift in perspective or a change in relationship toward the experience being processed. It helps individuals to view their thoughts, and emotions as transient, rather than indicators of truth (Segal, Williams, & Teasdale, 2002). Cognitive reactivity refers to the ease with which negative (often ruminative) thinking patterns are (re-)activated when in a mild dysphoric state (Scher, Ingram, & Segal, 2005). Emotional reactivity is defined as progressively prolonged or intensified negative affect in response to stress (Britton, Shahar, Szepsenwol, & Jacobs, 2012).

**Research gap.** The majority of studies testing working mechanisms in statistical mediation analyses so far, lack methodological rigor (Alsubaie et al., 2017). In most studies no timeline is established that enables to assess change in mechanisms separately before change in outcomes, which is necessary to provide a full test of mediation. As a result, findings so far must be considered preliminary.

A detailed analysis on the status of the evidence for MBPs using the National Institutes of Health (NIH) Stage Model (Onken, Carroll, Shoham, Cuthbert, & Riddle, 2014) is given by Dimidjian & Segal (2015). They concluded that the evidence is saturated in Stage I (intervention generation, refinement, modification, and adaptation and pilot testing), lightly represented in Stage 0 (basic science) and Stage II (traditional efficacy testing), and that there is minimal research in Stage III (efficacy testing with real
To conclude, although MBPs start to have a substantial evidence-base, there are still essential empirical research questions for which evidence is less strong or lacking. Among these, we here identify three: (1) can MBPs support mental well-being in different non-therapeutic contexts (e.g. schools, social welfare centers, shelters for refugees)?; (2) can we replicate trial outcomes in “real life settings”, especially because the intervention protocols typically undergo some necessary adaptations when implemented in these different contexts?; (3) what are the underlying processes that lead to the effect of MBPs?

Thesis outline
The research described in this thesis is driven by two overall aims: [1] to investigate the degree to which mindfulness is a feasible and effective approach to relieve different kinds of mental suffering as encountered in different contexts and “real life settings” such as social welfare centers (Chapter 2), schools (Chapter 3 and 4), pediatric oncology units (Chapter 5) and the stress clinique, a low threshold mental health facility (Chapter 6); and [2] to investigate its working mechanisms across different study populations involving both adolescents (Chapter 4 and 5) and adults (Chapter 6).

➢ In CHAPTER 2, A mindfulness-based intervention for economically disadvantaged people: effects on symptoms of stress, anxiety and depression, and on cognitive reactivity and overgeneralization, we applied MBP on low-income urban adults. The chronic exposure to stress of living with less money than one needs affects people’s well-being. Studies show that mental ill-health is associated with socio-economic inequalities and that poverty-related stress is directly related to symptoms of anxiety and depression. We offered a mindfulness based program (MBP) between September 2011 and September 2012 to a sample of low-income urban adults in Brussels and Antwerp. A two-baseline (8 weeks and 1 week before the intervention), post (1 week after the intervention) and 3 months follow-up within-subjects design was used. The impact on symptoms of stress, anxiety and depression was examined together with the effects on cognitive vulnerability.
processes of cognitive reactivity and overgeneralization, and on the development of mindfulness skills. Results suggest that the MBP significantly reduced symptoms of stress, anxiety and depression, cognitive reactivity and overgeneralization, and significantly improved mindfulness skills. Greater improvement in mindfulness skills caused by MBIs might result in greater reduction in both symptoms and cognitive vulnerabilities. These findings provide promising evidence of the effectiveness of MBPs to promote economically disadvantaged people’s well-being. The results are consistent with previous studies that have examined the effectiveness of MBPs in other populations and show that a MBP is feasible in social welfare centers that serve low-income adults.

Chapter 3, 4 and 5 focus on adolescents and young adults. Adolescence is a transitional stage characterized by changes in development of adaptive attentional, emotional and behavioral regulation. It is also a period of heightened vulnerability and the point at which much of the disease burden from mental disorders later in life emerge. From the neurodevelopmental perspective it might be seen as a critical time window to deliver effective mental health promoting interventions (Paus, Keshavan, & Giedd, 2008). Interventions should focus on preventive efforts to decrease the risk of later adult disorders and to diminish the intergenerational transmission of risk for anxiety and depression (Layard & Clark, 2015). They should have a broad social scope as the occurrence of mental ill-health has been shown to be associated with social and socio-economic inequalities. So what is needed are programs that can be easily utilized by a large number of students, that are easy to implement, highly efficient and that are inexpensive. MBPs are recognized for their potential with youth both in clinical settings and schools (e.g. Klingbeil et al., 2017). Chapter 3 and 4 focus on the impact of MBP as a universal program in secondary schools. Chapter 5 focuses on the feasibility and impact of MBP for adolescent and young adult cancer survivors. Adapting the intervention protocol so that it can be used in a school setting also provides opportunities to use MBPs for population-based prevention purposes, exploring the potential effects of mindfulness training to reduce vulnerability factors for depression, anxiety and stress.

In CHAPTER 3, Potential moderators of the effects of a school-based mindfulness program on symptoms of depression in adolescents, we carried out a large randomized controlled trial delivering a universal school-based mindfulness program in secondary schools in Flanders. In this study we examined moderators of the effects of MBP on adolescents’ depressive symptoms, an essential step to wide-scale dissemination. Based on theory and previous research we identified the following potential moderators: 1) severity of symptoms of depression at baseline, 2) gender, 3) age and 4) school-track. The study used a pooled data-set from two consecutive randomized controlled trials in adolescents (13-18 years), yielding a total of 605 students from 9 schools. In each school parallel classes were randomized to the mindfulness condition or usual curriculum control condition. Data were collected one week before and one week after delivery of the training, and at 6 months follow-up. The mindfulness program was found to be effective in reducing symptoms of depression post-intervention (effect size .38) and at six months follow-up (effect size .36). Further, in the mindfulness condition, a significantly larger percentage of students (15%) scored within the normal range of depression symptoms one week after the intervention and at follow-up compared to the control condition. This percentage was a combination of a larger number of students who started within the normal range and stayed well (preventive aspect) and a larger number of students with baseline symptoms above the normal range and who ameliorated during the study period (curative aspect). Moderation was tested longitudinally with multilevel models across the three repeated measures and across condition. We found no moderation effects of gender, age, and school-track. Six months after the training we
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found a marginally significant moderation effect for severity of symptoms of depression at baseline with greater decrease in symptoms for students with high levels of depression. The general absence of differential intervention effects for gender, age and school-track support the broad scope of the school-based mindfulness group intervention.

- In CHAPTER 4, *Processes of change in a school-based mindfulness program: cognitive reactivity and self-coldness as mediators*, we examined the potential mediating effects of cognitive reactivity and self-compassion on symptoms of depression, anxiety and stress in the randomized controlled trial conducted in schools (cf. Chapter 3). A moderated time-lagged mediation model based on multilevel modelling was used to analyse the data. The findings showed that post-treatment changes in cognitive reactivity and self-coldness, an aspect of self-compassion, mediated subsequent changes in symptoms of depression, anxiety and stress. These results suggest that cognitive reactivity and self-coldness may be considered as transdiagnostic mechanisms of change of a mindfulness-based intervention program for youth.

- In CHAPTER 5, *A mindfulness-based intervention for adolescents and young adults after cancer treatment: effects on quality of life, emotional distress, and cognitive vulnerability*, we studied the potential impact of MBP on quality of life, emotional distress and cognitive vulnerability in adolescent and young adult cancer (AYAC) survivors. A group of cancer survivors who psychosocial needs remain largely unmet and who need more age-appropriate interventions. Participants were 16 AYAC survivors, aged 14-24, who had completed acute medical treatment. A two-baseline (8 weeks and 1 week before the intervention), post (1 week after the intervention) and 3 months follow-up within-subjects design was used. Each participant completed two baseline assessments, followed by an 8-week MBP. The primary outcome variables were emotional distress and quality of life. Secondary outcomes were cognitive vulnerability factors and mindfulness skills. Multilevel modelling showed 1) a significant reduction in emotional distress and improvement in quality of life at 3 months follow-up, 2) a significant reduction in negative attitudes toward self (i.e. a cognitive vulnerability factor) and 3) a significant improvement in mindfulness skills. MBP is a promising approach to treat emotional distress and to improve quality of life in AYAC survivors. Further research using randomized controlled trials is needed to generalize these findings.

- In CHAPTER 6, *An experience sampling study examining the potential impact of a mindfulness-based intervention on emotion differentiation*, we continued investigating mechanisms of change, and were specifically interested in a key aspect of the emotion regulation process, being emotion differentiation. Research has shown that how well people can differentiate between different emotional states is an essential requirement for adaptive emotion regulation. People with low levels of emotion differentiation tend to be more vulnerable to develop emotional disorders. Although we

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**MBPs used in this work**

The MBPs used in this work share the same basic program structure as MBSR and MBCT, but have been slightly modified to use them in specific contexts (e.g. Schools) or with specific populations (e.g. Minority groups). As it is essential to capture what is delivered with close reference to the theory and basic protocols of the intervention (Crane et al., 2017), detailed descriptions of these modifications are described in the different studies or a reference is given to the manual. The intervention protocol of our study with adolescent and young adult cancer survivors is also available in “open source format”, where certified trainers can download the manual and audio material for free, in exchange of sharing their experience and expertise ([https://ppw.kuleuven.be/home/mindfulness/adolescents/bymaudio](https://ppw.kuleuven.be/home/mindfulness/adolescents/bymaudio)).
know quite a lot about the correlates of emotion differentiation, research on factors or interventions which could improve emotion differentiation skills is scarce. Here, we hypothesize, and study empirically, whether a mindfulness-based intervention (MBI) may impact the differentiation of negative and positive emotions. A within-subjects pre (1 week before the intervention), post (1 week after the intervention) and 4 months follow-up design involving experience sampling was used. At each phase participants reported their current emotions and mindfulness skills up to 40 times across four consecutive days using smartphones. Multilevel modelling showed a significant improvement in negative emotion differentiation post-intervention and at four months follow-up, and a significant improvement in positive emotion differentiation at four months follow-up. The improvement in negative emotion differentiation, however, was no longer significant when controlling for levels of negative affect. A time-lagged mediation model showed that post-treatment changes in mindfulness skills mediated subsequent changes in negative emotion differentiation, also when controlling for levels of negative affect. These results suggest that MBI is a promising approach to improve people’s emotion differentiation skills. This study was conducted in the Stress Clinic (Hospital Network Antwerp) with adults experiencing different levels of emotional distress.

➢ In CHAPTER 7, General Conclusion, an integration of the main results by comparing the findings across the different contexts and populations is provided. This synthesis is supported by results from a meta-analysis of the findings across the different studies reported in the PhD.

To evaluate the feasibility and acceptability across the different contexts the study retention rate, the program adherence and the frequency of home practice during and after the MBP is compared. A distinction is made between the studies based on self-selected samples [social-welfare centers (Chapter 2), pediatric oncology units (Chapter 5), and stress clinic (Chapter 6)] and the studies based on a community sample conducted in secondary schools (Chapter 3 and 4). We experienced the following problems with feasibility: recruitment with adolescent and young adult cancer survivors, retention with economically disadvantaged people, and in the study conducted in the stress clinic where the burden of the experience sampling methodology was the main reason for drop out. Yet, these are the typical problems encountered in a wide range of clinical trials (e.g. Malboeuf-Hurtubise et al., 2016). Based on informal conversations with potential candidates and participants they were not related to certain perceptions, beliefs or attitudes towards MBPs. In terms of acceptance, the small number of sessions missed (mean ≤ 1 session) and the mean frequency of home practice (more than once a week during the program; and once a week after the program) suggest a high commitment among participants in the studies with self-selected samples. The frequency of home practice was significantly lower in the study conducted in schools. It is known that participants in self-selected samples are usually more motivated, and both motivation and/or belief in or preference for a specific treatment affect subsequent therapeutic alliance (Iacoviello et al., 2007; Martin, Garske, & Davis, 2000). This also means that our results with the self-selected samples might be extrapolated only to participants who are interested in participating in the intervention.

To provide a summary of the effects across the studies of this dissertation, we conducted a comprehensive effect-size analysis to quantify the effect of MBPs for emotional distress across settings and study populations. Despite the variation in target populations (adolescents recruited from the general population, a clinical self-selected population of adolescents and young adults, people living in poverty, and a mixed heterogeneous population of middle class adults) the results of the meta-analysis show that the MBPs as delivered in our studies are moderately effective for improved emotional distress immediately after the intervention and largely effective at follow-up (see Figure 2). Our overall results are comparable with previous meta-analyses of MBSR and MBCT (see above).
Figure 2. Forest plot showing the effectiveness of MBPs on the outcome emotional distress one week after the intervention and at follow-up. The size of the marker indicates the size of the study population.

As home practice is a core component of the approach we investigated whether the change in emotional distress was moderated by the frequency of home practice. The effect of MBPs on emotional distress was positively moderated by the frequency of home practice at follow-up ($\beta = -0.12$, SE = 0.05, $p = 0.017$). These results are consistent with recent studies and one meta-analysis investigating the relationship between frequency of home practice and outcomes showing that greater levels of home practice are associated with more favorable treatment outcomes (Crane et al., 2014; Parsons, Crane, Parsons, Fjorback, & Kuyken, 2017, Perich, Manicavasagar, Mitchell, & Ball, 2013).

To provide a summary of the mechanisms underlying the effect of MBPs across the studies, we first conducted a comprehensive effect-size analysis to quantify the effect of MBPs for the different potential mechanisms examined: mindfulness skills, self-criticism and cognitive reactivity combined with repetitive negative thinking across settings and study populations. Our results suggest moderate effects for mindfulness skills and self-criticism in pre-post analyses (mindfulness skills: Hedge’s $g = .53$; self-criticism: Hedge’s $g = -0.54$) and moderate to large effects in pre- to follow-up analyses (mindfulness skills: Hedge’s $g = .76$; self-criticism: Hedge’s $g = - .79$). For cognitive reactivity and repetitive negative thinking, the overall effect was small in pre-post analyses (Hedge’s $g = -.29$) and medium in pre- to follow-up analyses (Hedge’s $g = -.47$). Finally, we conducted a meta-regression analysis to assess the relationship between the effect size of mindfulness outcomes, the effect size of self-criticism, the effect size of cognitive reactivity and repetitive negative thinking and the effect size on emotional distress. The effect size of MBPs on emotional distress was positively moderated by the effect size on mindfulness outcomes both at post-intervention and at follow-up (see Figure 3). Self-criticism and the combination of cognitive reactivity and repetitive negative thinking did not reach statistical significance.

Limitations and future recommendations

Due to the limited funds that we had available and time constraints three studies (Chapter 2, 5 and 6) suffered from small sample sizes and suboptimal study designs. These studies are without a control group. Therefore, it is possible that participants may have experienced improvements that are not due
to the MBPs. However, given the use of two baseline assessments in two of the three studies, these studies appear to give preliminary support to the hypothesis that MBPs are effective in reducing emotional distress in these populations. The results are also in line with previous published findings in meta-analyses. The low number of participants is associated with low statistical power and entails the risk of finding false positive results and exaggerated size effects. We have to be aware of that and therefore formulate our findings cautiously.

In order to be able to generalize our research findings, it is highly important to include minority groups in future, larger-scale intervention research and to conduct high quality research in settings where mental support is limited. To date vulnerable populations (socio-economically disadvantaged, ethnically diverse populations) remain underrepresented in all kinds of clinical research (UyBico, Pavel, & Gross, 2007). More in general, there is a tension zone between well-designed research aimed at studying underlying mechanisms that can be published in respectable journals and are often carried out on student populations and studies on real-life groups that might benefit from these interventions but are more difficult to study. While quality and robustness are important, carrying out more research in real life groups is also important. Precisely because mechanism-oriented research is difficult and complex, the results obtained can be expected highly context and group dependent. A higher inclusion of minority populations in study trials can contribute to equity in provision of mental health care.

Also adolescents are an essential sample to target for future work, as healthy adolescents and are a key for the future well-being of society. Important, especially for this group, is to focus not just on treatment, but also on preventive efforts to decrease the risk of later adult disorders and to diminish the intergenerational transmission of risk for anxiety and depression (e.g. Collishaw, Maughan, Natarajan, & Pickles, 2010; Kessler et al., 2007).

Future studies should also explore the cost-effectiveness of MBPs. Insight in financial consequences is useful for further practical implementation in health care, especially as there are few side effects (Gotink et al., 2015).
Overall conclusion

✓ Despite the limitations of our studies, our results show that in general MBPs were well tolerated and accepted across the different settings and populations. They are moderately to largely effective in reducing emotional distress in (1) people living in poverty, (2) in a real life setting (stress clinic) visited by a mixed population of adults, (3) in adolescent and young adult cancer survivors, and (4) in a school context. The largest effects were consistently found at follow-up, three to six months after the training, and were moderated by the frequency of home practice. These overall larger effects when engaging in home practice across all our studies support the idea that mindfulness can be seen as a form of mental training, where like physical training, ongoing practice is needed for the training to be effective.

✓ In addition, our findings suggest that decreases in cognitive reactivity and self-criticism as well as increases in mindfulness might be central components of MBPs effectiveness. Again the largest effects for these potential working mechanisms were found at follow-up. The change in mindfulness skills moderated the change in emotional distress one week after the intervention and at follow-up. Because of the need for active participation, it is desirable that mindfulness is actively chosen. While bias is inherent in self-selected samples, meaning that the results might be extrapolated only to participants who are interested in and able to participate in the intervention, the results of self-selected studies still are applicable to the overall group of people that might be interested in following a MBP. For most types of psychotherapy: motivation to follow the intervention and trust in the intervention are essential (Gotink et al., 2015).

Our results have potentially important CLINICAL IMPLICATIONS. Based on our findings and previous research, mindfulness may be an effective prevention and treatment strategy for a broad array of people. Individuals with mild to moderate symptoms of stress, anxiety or depression, who do not evidence clinically significant levels of psychopathology, might benefit the most of it.

Most of our results are still preliminary in nature and need to be repeated in larger trials to verify their generalizability. I therefore recommend to conduct more research on mindfulness using methodologically rigorous trial designs to establish the efficacy in real life conditions and with minority groups, which are now underrepresented in psychological studies in general.

Most studies comparing MBPs with active control conditions indicate that mindfulness is not more effective than other forms of therapy (e.g. cognitive behavioral therapy) to help manage stress and mood disorders (Gotink et al., 2015; Khoury et al., 2013). Therefore, we have to look at mindfulness in the context of a range of options, and more large-scaled studies are needed to find out what works best for whom (Dimidjian et al., 2016). An important advantage of mindfulness is that it is a low-threshold intervention that can be delivered in group. It has a broad social scope and is not stigmatizing, and it can be self-led at a certain point—it becomes a life practice (Kabat-Zinn, 2013). Because of this, mindfulness might be especially attractive in a prevention context for people who are vulnerable to mental distress.

References of the literature cited in this summary can be found in the PhD.