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Within-person changes in mindfulness and self-compassion predict enhanced emotional well-being in healthy, but stressed adolescents



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ABSTRACT

Meditation training programs for adolescents are predicated on the assumptions that mindfulness and self-compassion can be directly cultivated, and further, that doing so is beneficial for emotional well-being. Yet, very little research with adolescents has tested these assumptions directly. In the current study, I examined longitudinal relationships between changes in mindfulness and self-compassion and changes in emotional well-being among healthy, but stressed adolescents who participated in five-day, intensive meditation retreats. Immediately before and after the retreats, and then three months later, 132 adolescents ($M_{\text{age}} = 16.76$ years, 61% female) completed questionnaires measuring mindfulness, self-compassion, and emotional well-being. Repeated measures ANOVA showed adolescents improved in mindfulness, self-compassion, and all indices of emotional well-being immediately following the retreat (Cohen's $d = |0.39-1.19|$), and many of these improvements were maintained three months later (Cohen's $d = |0.04-0.68|$). Further, multilevel growth curve analyses with time-varying covariates indicated within-person changes in self-compassion predicted enhanced emotional well-being more consistently than within-person changes in mindfulness. Specifically, increases in self-compassion predicted reductions in perceived stress, rumination, depressive symptoms, and negative affect, and conversely, increases in positive affect and life satisfaction (pseudo- R^2 variance explained = 5.9% and 15.8%, $ps < 0.01$).

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Introduction

Adolescents' stress is on the rise. In a recent national survey conducted by the [American Psychological Association \(2014\)](#), 31% of adolescents aged 13 to 17 said their stress increased in the previous year; 42% said they are not doing enough to manage their stress. Adolescents who experience frequent stress are more prone to depression ([American Psychological Association, 2014](#)) and perform worse in school ([Flook & Fuligni, 2008](#)). Building resilience to stress and mitigating the onset of mental illness is therefore of national concern. One increasingly popular approach to foster emotional well-being in adolescents is through meditation training ([Roeser & Eccles, 2015](#)).

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Meditation training (MT) programs for adolescents are predicated on at least two key assumptions: First, that is possible to intentionally cultivate positive mental capacities, including mindfulness and self-compassion, through meditation; and second, that improvements in these mental capacities are a key mechanism linking meditation to improved emotional functioning (Roeser & Eccles, 2015). There is a growing body of evidence that indirectly supports the validity of these two assumptions. Research suggests that MT programs are effective in reducing stress and promoting emotion regulation in adolescents (Black, 2015; Burke, 2010; Zenner, Herrleben-Kurz, & Walach, 2014). Moreover, research supports the predictive validity of self-report measures of mindfulness and self-compassion on enhanced emotional well-being (Brown, West, Loverich, & Biegel, 2011; Ciarrochi, Kashdan, Leeson, Heaven, & Jordan, 2011; Neff & McGhee, 2010). However, very little empirical research with adolescents has examined a major component of the assumptions underlying MT: Specifically, that mindfulness and self-compassion are amenable to *change*, and more importantly, that changes in these capacities improve emotional well-being (Black, 2015).

In the current study, longitudinal changes in mindfulness and self-compassion were tracked—in conjunction with changes in emotional well-being—among adolescents who participated in five-day intensive meditation retreats. The main objective was to test the hypothesis that within-person changes in mindfulness and self-compassion predict concomitant changes in emotional well-being.

Mindfulness, self-compassion, and emotional well-being among adolescents

Mindfulness is defined as a nonreactive awareness of ongoing subjective experience (Brown & Ryan, 2003). Mindfulness is commonly operationalized as involving two core components, regulating attention to current experience and adopting an open-minded, nonreactive orientation toward that experience (Bishop et al., 2004). This implies that when experience is observed mindfully, there are no attempts made to control, suppress, or get involved with it; mindfulness simply reveals what is occurring in any given moment of experience in a receptive, nonjudgmental manner. Self-compassion, on the other hand, is defined as an open-hearted awareness of and sympathy toward one's own suffering or personal failures (Neff, 2003b). Self-compassion emerges during times of difficulty and involves three components: extending kindness toward oneself, rather than criticism or harsh judgments; recognizing that one's own failings are part of a universal human experience; and a balanced awareness of suffering that avoids disassociation or over-identification with it (Baer, Lykins, & Peters, 2012; Neff, 2003b).

Self-compassion and mindfulness are closely related constructs; scores on validated self-report measures are usually strongly correlated (Baer et al., 2012; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Indeed, Neff (2003b) argues that self-compassion and mindfulness are mutually supportive insofar as the development of one often reinforces and potentiates the development of the other. For example, a capacity for nonreactive awareness may be required in order for feelings of kindness and shared humanity to arise in response to failure experiences or difficult emotions. And the kindness offered to oneself can, in turn, reduce over-identification with the difficult experience, making it easier to remain mindfully aware of it (Baer et al., 2012). Yet, for all their interrelatedness, self-compassion and mindfulness are distinct mental qualities: Whereas mindfulness involves maintaining a nonreactive awareness toward all experiences that arise—good, bad, and neutral—self-compassion specifically concerns the kindhearted attitudes and actions one marshals forth in response to suffering (Baer et al., 2012).

Cultivating mindfulness and self-compassion may be especially relevant for adolescents as they cope with the inevitable stresses and emotional challenges of forming integrated self-concepts and identities (Neff & McGhee, 2010; Roeser & Pinela, 2014). Identity formation often involves intense self-evaluation and social comparison as adolescents search for and construct “themselves” (Harter, 1999). However, the challenges facing adolescents—anxieties concerning self-worth, competence, and peer acceptance, intense academic and social pressures, self-consciousness regarding one's body and sexual attractiveness, uncertain expectations for the future, and so forth—mean that self-evaluations are frequently harsh and overly critical (Harter, 1993; Neff & McGhee, 2010). Making matters worse, adolescents often feel alone in their experience, regarding themselves as more unique or disliked than others consider them to be (Elkind, 1967). By learning how to mindfully observe and compassionately respond to unpleasant self-evaluations and experiences, adolescents can potentially disengage the habitual ruminative thoughts and judgments that serve to perpetuate psychological distress (Grabovac, Lau, & Willett, 2011; Holzel et al., 2011). Likewise, cultivating kindhearted attitudes and a sense of common humanity might help mitigate the stress associated with harsh self-criticism and feelings of isolation.

Indeed, MT programs for adolescents appear feasible and acceptable to diverse groups of adolescents (Black, 2015; Zenner et al., 2014), and they show promise in reducing stress, improving focus, and promoting emotion regulation (Biegel, Brown, Shapiro, & Schubert, 2009; Black, 2015; Britton et al., 2014; Broderick & Metz, 2009; Burke, 2010; Quach, Jastrowski Mano, & Alexander, 2015; Schonert-Reichl & Lawlor, 2010; Sibinga et al., 2013; Zenner et al., 2014). For example, high school seniors who participated in a six-session mindfulness training program had lower negative affect, better emotion regulation, and increased feelings of calm, relaxation, and self-acceptance compared to a no-treatment control group (Broderick & Metz, 2009). Non-training studies relying on self-report measures also show that adolescents with higher mindfulness and self-compassion ruminate less often in response to stressful events (Ciesla, Reilly, Dickson, Emanuel, & Updegraff, 2012), are happier and more satisfied with their lives (Brown et al., 2011), are less afraid, angry, and sad (Ciarrochi et al., 2011), are less stressed and have higher self-control (Black, Sussman, Johnson, & Milam, 2012a), smoke fewer cigarettes (Black, Sussman, Johnson, & Milam, 2012b), and have fewer internalizing and externalizing symptoms (Greco, Baer, & Smith, 2011; Muris, Meesters, Pierik, & de Kock, 2016; Neff & McGhee, 2010).

Assessing the effect of within-person changes in mindfulness and self-compassion on emotional well-being

Despite promising findings, these studies are limited in important ways. Regarding MT studies, long-term follow-up assessments are rare, so little is known about the enduring effects of training on emotional well-being (Zenner et al., 2014; Zoogman, Goldberg, Hoyt, & Miller, 2014). Moreover, few MT studies with adolescents have included self-report measures of mindfulness and self-compassion to enable a test of whether changes in these capacities predict improvements in emotional well-being. Conversely, studies involving self-report measures of mindfulness and self-compassion have largely relied on between-person, correlational designs which carry well-known threats to internal validity. For example, an observed relationship between self-reported mindfulness and emotional well-being may in fact be fully explained by an unmeasured (i.e., third variable) confound. As such, these studies cannot unequivocally conclude that self-reported mindfulness and self-compassion are supportive of emotional well-being. More importantly, between-person designs cannot account for the possibility that mindfulness and self-compassion change *within* an individual, and correspondingly, whether within-person changes predict emotional well-being (Duckworth, Tsukayama, & May, 2010; Galla et al., 2014; Willoughby, Kupersmidt, & Voegler-Lee, 2012).

To date, only two studies involving MT with adolescents have examined the link between *within-person changes* in mindfulness and concomitant within-person changes in mental health outcomes. In secondary data analysis of a study examining MT for 102 adolescent psychiatric outpatients (Biegel, Brown, Shapiro, & Schubert, 2009), Brown et al. (2011) found that positive change in mindful attention was associated with improvements in self-esteem, perceived stress, and psychological symptoms across the study period. Similarly, in a small-scale MT study among 14 adolescents with externalizing disorders, Bögels, Hoogstad, van Dun, de Schutter, and Restifo (2008) found that pre-post changes in mindful attention were correlated with reductions in internalizing, externalizing, and attention problems.

The current investigation

The current investigation sought to extend these prior studies in several important and novel ways. First, longitudinal changes in mindfulness, self-compassion, and emotional well-being were tracked in the context of an intensive meditation retreat, rather than MT in a clinic or school. Schools and clinics pose numerous challenges for researchers interested in studying the effects of mindfulness training. Lack of time and scheduling problems are seen by teachers as major barriers to successful implementation of MT programs in schools (Zenner et al., 2014). And given competing commitments and time constraints to a typical school day, many MT programs can only offer several minutes of daily practice (e.g., Britton et al., 2014). Moreover, not all school-based MT programs are taught by experienced meditation practitioners (Schonert-Reichl & Lawlor, 2010; Schonert-Reichl et al., 2015). There is continued debate about the quality of mindfulness (and self-compassion) training when it is delivered by classroom teachers who lack formal training in meditation (Piet, Fjorback, & Santorelli, 2016).

Intensive, residential retreats provide a unique opportunity to study the effects of MT among adolescents (Black, Belzer, Semple, & Galla, 2015). During a meditation retreat, individuals voluntarily set aside regular daily activities (e.g., work, leisure) and relinquish everyday diversions (e.g., smartphones, television) to focus exclusively on developing mindfulness and self-compassion. Retreats therefore offer a dramatically more intensive form of training than what is typically possible for programs delivered in schools or clinics. And in contrast to some school-based MT programs, retreats are facilitated by experienced practitioners, many of whom have decades of formal meditation training.

Second, the current investigation tested the predictive validity of within-person changes in mindfulness *and* self-compassion on emotional well-being simultaneously, rather than focusing solely on mindful attention. Moreover, self-report measures targeting the two major components of mindfulness—attention regulation and non-reactivity—were included. Third, the current investigation focused on a sample of healthy, but stressed adolescents who had an interest in meditation training, rather than adolescents with pre-specified health conditions (e.g., mood or anxiety disorders) seeking treatment. Fourth, and finally, the current investigation examined whether individual difference characteristics (i.e., sex, prior meditation experience) moderate the effect of within-person change in mindfulness and self-compassion on emotional well-being.

Method

Participants

The sample included $N = 132$ youth ($M_{\text{age}} = 16.76$ years, $SD = 1.48$) who participated in one of 5, five-day meditation retreats offered during summer 2013. Study participants were a self-selected group of adolescents interested in meditation practice; they were not recruited for the study on the basis of any preexisting health conditions and nor were the meditation retreats designed as treatment for emotional or behavioral problems. According to self-reported demographic information, 65% of participants were White, 21% were of mixed race/ethnicity, 11% were Hispanic, and 3% were Asian; 61% were female. Nearly half (48%) of participants reported that their parents were currently married. According to participants, 81% of their mothers and 72% of their fathers attended college (although data were missing for 5% and 9% of responses, respectively). Over half of participants ($n = 84$, 64%) indicated that they had practiced meditation prior to start of the retreat; the median level of

meditation experience was between 1 and 3 years (range = less than 3 months to more than 3 years). Finally, according to records obtained from the retreat organization, just under half (46%) of participants paid the full retreat price; the remaining 54% received either a full or a partial scholarship (which was awarded on the basis of family income).

Participants were recruited through an information letter and opt-out parent consent form, both sent at least two weeks prior to the start of each retreat. Informed consent was obtained from all participants in the study.

Meditation retreat format

The five-day residential meditation retreats were offered through Inward Bound Mindfulness Education (www.ibme.info), a non-profit organization dedicated to improving the lives of youth through mindfulness training. The annual summer retreats take place at various retreat centers throughout the United States. Each retreat accommodates approximately 20 and 50 youth and is facilitated by a staff of at least 3 meditation teachers and additional volunteers (the ideal teen/adult ratio is 3:1). To be considered for the role of meditation teacher, individuals must have a minimum of 8 years of personal meditation practice, 100 days of silent retreat practice (including at least one, 28-day silent retreat), recommendations from 2 or more senior teachers, and 2 years of experience in a teacher-training program, among other qualities.

The retreats are structured much like meditation retreats for adults, and include the acceptance of basic ethical precepts not to take the life of any living thing, not to steal, to be respectful in speech, to be celibate, and to refrain from using intoxicants. The retreats differ from silent adult retreats insofar as adolescents enter in and out of periods of silence throughout the day. They observe silence for about half the day, during which they engage primarily in periods of formal sitting and walking meditation, and yoga, each lasting between 20 and 30 min (adolescents may engage in roughly 4 to 5 h of silent meditation per day). The daily schedule varies based on practical needs, but in general each day begins at 6:30 a.m., with the first morning meditation at 7:00 a.m., and ends around 10:30 p.m. Another important element of each day is two, 1-hour small group sessions. Adolescents are divided into groups of approximately six to eight individuals, based primarily on age, with two to three adult facilitators. These same groups meet each day of the retreat. The small groups provide opportunities to practice mindfulness in relationship with peers through dialog about internal experiences.

The focus of each retreat is the cultivation of mindfulness, loving-kindness, and other positive mental capacities (e.g., self-compassion, gratitude). As such, mindfulness and loving-kindness are woven into each of the daily activities, which include periods of silent sitting or walking meditation, small group exercises, guided activity periods, and free time. Adolescents are taught methods designed to cultivate concentration and nonreactive acceptance of present-moment experience, self-compassion and loving-kindness, as well as methods for dealing with difficult emotions. The basic meditation instructions are drawn from Buddhist insight meditation practices but are presented using secular language that does not assume (or require) any particular religious affiliation.

Procedure

Participants completed a battery of self-report questionnaires at three assessment points (henceforth labeled T1, T2, and T3, respectively). The T1 and T2 assessments were administered in hard copy, and the T3 assessment was completed online or in hard copy. Participants completed the T1 assessment immediately prior to the start of the meditation retreat, the T2 assessment immediately after the retreat ended, and the T3 assessment approximately three months later. Participants were paid \$25 for completing all three assessments.

Overall, retention in the study was high: $n = 109$ (83%) participants completed the three-month follow-up assessment. Participants with a T3 assessment versus those without did not differ on any T1 demographic characteristics.

Self-report measures

For each questionnaire described below, items were averaged to create a composite score in which higher scores indicated greater endorsement of the construct. Full descriptive statistics for all self-report measures, including internal consistency reliability estimates, are presented in [Table 1](#).

Process measures

Three validated self-report questionnaires were used to assess mindfulness and self-compassion.

Mindful attention. Participants completed the 14-item Mindful Attention Awareness Scale for Adolescents ([Brown et al., 2011](#)). This is among the most commonly used self-report measures of mindfulness, and taps the general tendency to be attentive to and aware of present-moment experience in daily life (e.g., “It seems I am “running on automatic” without much awareness of what I’m doing”). Items were endorsed using a slightly modified scaling from 1 = *never* to 5 = *very often*.

Mindful non-reactivity. Participants completed the 7-item Non-Reactivity to Inner Experience subscale of the Five Facet Mindfulness Questionnaire ([Baer et al., 2008](#)). The Non-Reactivity subscale taps the tendency to allow thoughts and feelings

Table 1
Descriptive statistics for study variables.

Variable	N	M	SD	Min	Max	Possible range	Alpha
Mindful non-reactivity T1	131	2.96	0.70	1.14	4.86	1.00–5.00	0.83
Mindful non-reactivity T2	128	3.19	0.69	1.57	5.00	1.00–5.00	0.87
Mindful non-reactivity T3	109	3.23	0.69	1.57	5.00	1.00–5.00	0.88
Mindful attention T1	132	3.06	0.57	1.21	4.36	1.00–5.00	0.82
Mindful attention T2	129	3.24	0.57	1.14	4.36	1.00–5.00	0.86
Mindful attention T3	108	3.30	0.61	1.07	4.64	1.00–5.00	0.89
Self-compassion T1	131	2.86	0.69	1.36	4.36	1.00–5.00	0.86
Self-Compassion T2	127	3.19	0.62	1.64	4.91	1.00–5.00	0.84
Self-compassion T3	108	3.32	0.67	1.91	4.82	1.00–5.00	0.88
Perceived stress T1	128	3.18	0.72	1.50	4.70	1.00–5.00	0.88
Perceived stress T3	108	2.90	0.67	1.50	4.20	1.00–5.00	0.88
Rumination T1	132	3.76	0.74	1.17	5.00	1.00–5.00	0.91
Rumination T2	128	3.37	0.72	1.18	4.75	1.00–5.00	0.89
Rumination T3	109	3.22	0.75	1.42	5.00	1.00–5.00	0.92
Depressive symptoms T1	130	23.24	12.63	0.00	52.00	0.00–57.00	0.92
Depressive symptoms T2	129	12.69	8.00	1.00	51.00	0.00–57.00	0.84
Depressive symptoms T3	109	19.74	11.21	0.00	44.00	0.00–57.00	0.91
Negative affect T1	131	2.58	0.99	1.00	5.00	1.00–5.00	0.86
Negative affect T2	129	1.95	0.79	1.00	5.00	1.00–5.00	0.86
Negative affect T3	108	2.51	0.85	1.00	5.00	1.00–5.00	0.82
Positive affect T1	131	3.09	0.79	1.20	5.00	1.00–5.00	0.78
Positive affect T2	129	4.01	0.72	2.00	5.00	1.00–5.00	0.82
Positive affect T3	108	3.36	0.77	1.60	4.80	1.00–5.00	0.82
Life satisfaction T1	132	4.37	1.53	1.20	7.00	1.00–7.00	0.87
Life satisfaction T2	127	5.03	1.35	1.00	7.00	1.00–7.00	0.88
Life satisfaction T3	109	4.84	1.37	1.60	7.00	1.00–7.00	0.90

Note. T1 = Baseline Assessment, T2 = Immediate Post-Retreat Assessment, T3 = Three-Month Follow-up Assessment.

to arise and pass away without getting caught up in them (e.g., “When I have distressing thoughts or images, I am able just to notice them without reacting”). Items were endorsed from 1 = *never or very rarely true* to 5 = *very often or always true*.

Self-compassion. Participants completed the 12-item Self-Compassion Scale, Short Form (Raes, Pommier, Neff, & Van Gucht, 2011). This scale taps facets related to self-compassion, including self-kindness, self-judgment, common humanity, balanced awareness, isolation, and over-identification. Due to a copy error, one item on the Self-Compassion Scale was repeated twice during the T3 assessment; only the 11 non-duplicated items were used to calculate self-compassion composite scores during each of the three assessment waves. Items were endorsed from 1 = *never* to 5 = *very often*.

Emotional well-being

Five validated self-report questionnaires were then used to assess various aspects of emotional well-being.

Depressive symptoms. Participants reported on their depressive feelings in the *past week* using 19 items from the Center for Epidemiological Studies Depression Scale for Children (CES-DC; Faulstich, Carey, Ruggiero, Enyart, & Gresham, 1986). Items (e.g., “I felt down and unhappy”) were rated from 0 = *not at all* to 3 = *a lot*. The item, “I was more quiet than usual”, was not administered (due to the fact that several hours per day during the retreat were spent in silent meditation).

Rumination. Participants completed the 12-item Rumination subscale of the Rumination-Reflection Questionnaire (Trapnell & Campbell, 1999). The Rumination subscale taps the duration and frequency of negative thinking and self-attention about past events (e.g., “I tend to “ruminate” or dwell over things that happen to me for a really long time afterward”). Items were endorsed from 1 = *strongly disagree* to 5 = *strongly agree*.

Perceived stress. Participants reported on the degree to which they globally appraise their current life demands in the *past month* as overwhelming, unpredictable, and uncontrollable using the 10-item Perceived Stress Scale (e.g., “In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?;” Cohen, Kamarck, & Mermelstein, 1983). Items were endorsed from 1 = *never* to 5 = *very often*. This scale was administered only during T1 and T3 assessments.

Positive and negative affect. Participants reported their positive and negative affect in the *past week* using the 10-item Positive and Negative Affectivity Schedule, Short Form (Mackinnon et al., 1999). Five items were used to capture positive affect (i.e., alert, excited, enthusiastic, inspired, determined) and five items were used to capture negative affect (i.e., distressed, upset, scared, nervous, afraid). Items were endorsed from 1 = *not at all* to 5 = *extremely*.

Life satisfaction. Participants reported on their global cognitive judgments of satisfaction using the 5-item Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). Items (e.g., “In most ways my life is close to my ideal”) were rated from 1 = *strongly disagree* to 7 = *strongly agree*.

Analytic plan

Repeated measures ANOVAs were first used to test for mean-level differences in mindfulness, self-compassion, and emotional well-being across assessment waves. Post-hoc tests with Bonferroni corrections were used to compare the means at each assessment wave. Effect size estimates were calculated using Cohen’s *d* (Cohen, 1988).

Longitudinal, multilevel growth curve analyses were then used to test the main hypothesis that within-person changes in mindfulness (i.e., mindful attention and mindful non-reactivity) and self-compassion predict within-person changes in emotional well-being. Growth curve analyses, using all available data from each participant, were conducted using the Linear Mixed Models function in SPSS, version 22 (IBM Corp., 2013). First, unconditional means models were used to partition the variance in emotional well-being outcomes across levels. In the second phase, a series of two-level growth curve models were fit in which mindfulness and self-compassion were treated as time-varying predictors of emotional well-being outcomes. In these models, each emotional well-being outcome was modeled with an intercept, linear and quadratic growth slopes (based on days elapsed since baseline assessment), and three time-varying covariates (TVC) entered simultaneously (mindful attention, mindful non-reactivity, and self-compassion). Using mindfulness and self-compassion as time-varying covariates tests whether they can explain short-term deviations in the overall growth trajectory of each emotional well-being outcome. In other words, by using repeated measures of both the predictors and the outcome, it is possible to study whether mindfulness, self-compassion, and emotional well-being, measured at the within-person level, change together across time.

To arrive at unbiased, independently interpretable parameter estimates, Level 1 time-varying covariates were within-person centered (Raudenbush & Bryk, 2002). Centering a variable within an individual removes all between-person variance, which rules out all time-invariant (measured and unmeasured) between-person characteristics (e.g., sex) that could confound the association between mindfulness, self-compassion, and emotional well-being (Enders & Tofghi, 2007; Raudenbush & Bryk, 2002). Growth slopes were centered at 0 so that the intercept represented T1 (baseline) emotional well-being.

Multilevel regression analyses allow for modeling $n - 1$ random effects (McCoach & Kaniskan, 2010), where n is the number of assessment waves. Because there were three waves in the current study, two random effects terms were modeled (intercept and linear growth slope). Preliminary analyses revealed nonsignificant random effects for the linear growth slope. Consequently, in all multilevel growth curve analyses the intercept was permitted to vary randomly between participants.

Variance explained (pseudo- R^2) for mindfulness and self-compassion was calculated using the following equation: $\text{pseudo-}R^2 = ((\text{Level 1 unconditional error} - \text{Level 1 conditional error}) / \text{Level 1 unconditional error})$ (Singer & Willett, 2003).

As a final exploratory step, individual differences in sex and meditation practice history (both measured at baseline) were tested as moderators of the effect of within-person changes in mindfulness and self-compassion on emotional outcomes. In these models, sex (0 = female, 1 = boy) and meditation practice history (0 = no prior experience, 1 = prior experience) were entered as Level 2 fixed effect predictors of the intercept, and fixed effect moderators of the linear and quadratic growth slopes, and all three TVCs. Between-person factors such as sex and meditation practice history cannot *confound* within-person effects, although they do have the potential to *moderate* within-person effects (Duckworth et al., 2010; Galla et al., 2014). For example, the within-person association between mindfulness or self-compassion and emotional well-being may be stronger (or weaker) for girls versus boys or individuals with meditation practice experience versus those without.

Results

Descriptive statistics

As shown in Table 1, internal reliability consistency estimates across all questionnaires were acceptable at each assessment wave (T1: $\alpha_s = 0.78$ to 0.92, T2: $\alpha_s = 0.82$ to 0.89, T3: $\alpha_s = 0.82$ to 0.92) suggesting that they were age-appropriate for the current sample of adolescents. Crucially, for the purposes of comparing predictive validity, the reliability estimates for mindful non-reactivity, mindful attention, and self-compassion were similar at each assessment wave.

Though the current sample was *not* selected on the basis of preexisting health conditions, baseline data (T1) suggest participants were stressed and had elevated depressive symptoms prior to the retreat. Approximately 41% ($n = 53$) of participants scored 24 or higher on the depressive symptoms scale at T1 (observed range = 0–52). This cutoff value has sometimes been used to screen for depression in adolescents (Stockings et al., 2015). It is crucial to mention here that cutoff values have very high false positive rates in nonclinical settings (Stockings et al., 2015). Notwithstanding this important caveat, this means that 53 participants had elevated levels of sadness, irritability, and other somatic and affective aspects of depression prior to the retreat. Likewise, participants had slightly higher levels of perceived stress at T1 compared to national adult samples (Cohen & Janicki-Deverts, 2012) and adolescents in other studies involving mindfulness (Black, Milam, Sussman, & Johnson, 2012). Interestingly, comparable levels of self-compassion and mindful non-reactivity at T1 were observed in the current sample compared to other adolescent samples (Bluth & Blanton, 2014; Ciesla et al., 2012; Neff & McGhee, 2010).

Bivariate correlations between measures are presented in online supplemental material (see Table S1), but a brief overview is provided here. Recall that mindfulness and self-compassion are seen as related, but distinct constructs (Neff, 2003b). The current data offer support for this hypothesis: Participants with higher mindful attention and mindful non-reactivity also had higher self-compassion at each assessment wave ($r_s = 0.42$ to 0.67 , $p_s < 0.001$). Though these correlations are moderate-to-strong in size, the shared variance between mindful non-reactivity, mindful attention, and self-compassion is between 18% and 45%, suggesting that they also capture distinct constructs. Also consistent with prior research, mindfulness and self-compassion were associated with emotional well-being. Participants with higher mindfulness and self-compassion also had lower perceived stress ($r_s = -0.44$ to -0.74), rumination ($r_s = -0.45$ to -0.66), depressive symptoms ($r_s = -0.24$ to -0.64), and negative affect ($r_s = -0.18$ to -0.56 , all $p_s < 0.05$) at each assessment wave. Likewise, participants with higher mindfulness and self-compassion had greater positive affect ($r_s = 0.07$ to 0.54) and life satisfaction ($r_s = 0.15$ to 0.65) at each assessment wave, although not all correlations reached statistical significance at $p < 0.05$.

Mean-level differences in mindfulness, self-compassion, and emotional well-being at baseline, post-retreat, and 3-month follow-up assessments

Participants improved significantly on every measure from the baseline assessment to the immediate post-retreat assessment (T1 to T2), and on nearly every measure from baseline to the three-month follow-up assessment (T1 to T3) (see Table 2 and Fig. 1). More importantly, immediate improvements in mindful attention, mindful non-reactivity, self-compassion, rumination, and life satisfaction were maintained during the three-month follow-up period, as indicated by non-significant differences in T2 and T3 scores. Effect size estimates were moderate-to-large in size from T1 to T2 (Cohen's $d = |0.39-1.19|$) and were small-to-moderate in size from T1 to T3 (Cohen's $d = |0.04-0.68|$).

Within-person changes in mindfulness and self-compassion as predictors of change in emotional well-being

Across all unconditional multilevel models, between 37% and 91% of the variation in emotional well-being outcomes occurred within rather than across participants. To explain this within-person variation in emotional well-being, conditional, multilevel growth curve models with time-varying covariates were used. Table 3 summarizes the results of these conditional models.

Mindful non-reactivity

Within-person change in mindful non-reactivity was associated with reductions in rumination and improvements in life satisfaction, above and beyond the linear and quadratic growth slopes and the effects of within-person change in both mindful attention and self-compassion. For every 1 point change in non-reactivity, rumination decreased by 0.11 points and life satisfaction increased by 0.22 points, both marginally significant changes ($p_s = 0.061$ and 0.056 , respectively). Pseudo- R^2 values were small: Change in mindful non-reactivity explained 0.4% of the within-person variance in rumination and 1.1% of the within-person variance in life satisfaction.

Mindful attention

Within-person change in mindful attention was associated with significant reductions in perceived stress and rumination, and increases in positive affect. For every 1 point change in mindful attention, perceived stress decreased by 0.29 points, rumination decreased by 0.36 points, and positive affect increased by 0.33 points, all significant changes ($p_s < 0.05$). Mindful attention also had a marginally significant effect on depressive symptoms: For every 1 point change in mindful attention, depressive symptoms decreased by 2.98 points ($p = 0.059$). Changes in mindful attention explained 3.3% of the within-person

Table 2

Repeated measures ANOVA assessing mean-level differences in mindfulness, self-compassion, and emotional well-being following the meditation retreat.

Variable	T1		T2		T3		Cohen's d			ANOVA
	M	SD	M	SD	M	SD	T1 vs. T2	T1 vs. T3	T2 vs. T3	$F(df)$
Mindful non-reactivity	2.92 ^a	0.72	3.20 ^b	0.70	3.23 ^b	0.69	0.39	0.43	0.04	11.09(2,208)***
Mindful attention	3.07 ^a	0.53	3.28 ^b	0.52	3.29 ^b	0.61	0.40	0.42	0.02	9.86(2, 208)***
Self-compassion	2.89 ^a	0.71	3.24 ^b	0.61	3.33 ^b	0.68	0.49	0.62	0.15	30.65(2, 206)***
Perceived stress	3.17 ^a	0.70	—	—	2.90 ^b	0.67	—	-0.38	—	12.49(1,104)**
Rumination	3.73 ^a	0.77	3.35 ^b	0.70	3.21 ^b	0.76	-0.50	-0.68	-0.20	30.67(2,208)***
Depressive symptoms	22.63 ^a	12.29	12.39 ^b	7.91	19.76 ^a	11.16	-0.83	-0.23	0.93	39.78(1.87,194.30)***
Negative affect	2.56 ^a	0.98	1.93 ^b	0.76	2.52 ^a	0.84	-0.65	-0.04	0.78	21.68(1.90,195.65)***
Positive affect	3.09 ^a	0.79	4.03 ^b	0.70	3.37 ^c	0.77	1.19	0.35	-0.94	55.52(2,206)***
Life satisfaction	4.52 ^a	1.53	5.17 ^b	1.28	4.92 ^b	1.34	0.43	0.26	-0.19	15.63(1.87,193.02)***

Notes: T1 = Baseline Assessment, T2 = Immediate Post-Retreat Assessment, T3 = Three-Month Follow-up Assessment. Listwise deletion resulted in final samples between $n = 104$ and 105 . Means with different superscript letters are significantly different at $p < 0.05$ (Bonferroni corrected). Perceived stress was only measured at T1 and T3 assessments. ** $p < 0.01$, *** $p < 0.001$.

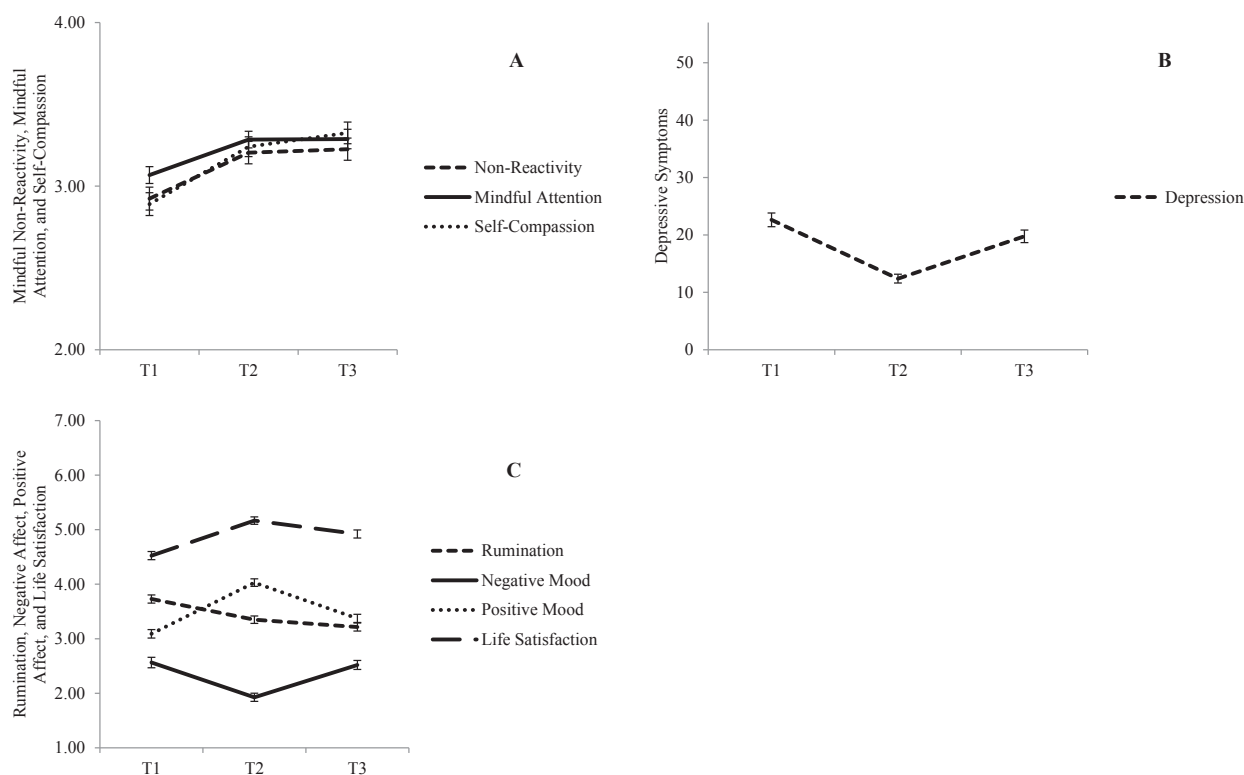


Fig. 1. Mean-level differences in mindful attention, mindful non-reactivity, and self-compassion (Panel A), depressive symptoms (Panel B), and rumination, negative affect, positive affect, and life satisfaction (Panel C). Perceived stress was only measured at T1 and T3 assessments and is therefore not displayed. Panel A y-axis has been rescaled for ease of presentation (possible range is 1–5). Panel B y-axis possible range is 0–57. Panel C y-axis possible range is 1–5 (positive affect, negative affect, rumination) and 1–7 (life satisfaction). T1 = Baseline Assessment, T2 = Immediate Post-Retreat Assessment, T3 = Three-Month Follow-up Assessment. Error bars are +/- one standard error from the mean.

Table 3

Multilevel growth curve analyses testing within-person change in mindfulness and self-compassion as predictors of change in emotional well-being.

Variable	Perceived stress		Rumination		Depressive symptoms		Negative affect		Positive affect		Life satisfaction	
	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Fixed effects (within-person)												
Intercept	3.04***	0.06	3.56***	0.06	17.82***	0.85	2.27***	0.07	3.56***	0.06	4.72***	0.12
Linear growth slope	0.00	0.00	-0.01†	0.01	-0.22*	0.10	-0.02*	0.01	0.01†	0.01	0.00	0.01
Quadratic growth slope	—	—	0.00	0.00	0.003**	0.00	0.0002**	0.00	-0.0002*	0.00	0.00	0.00
Non-reactivity	-0.13	0.10	-0.11†	0.06	-0.28	1.28	-0.06	0.12	0.05	0.11	0.22†	0.11
Mindful attention	-0.29*	0.13	-0.36***	0.08	-2.98†	1.57	-0.05	0.14	0.33*	0.13	0.08	0.15
Self-compassion	-0.36**	0.12	-0.40***	0.08	-10.44***	1.59	-0.64***	0.14	0.61***	0.13	0.85***	0.14
Random effects												
Level-1 residual	0.22***	0.03	0.17***	0.02	71.20***	6.70	0.58***	0.06	0.51***	0.05	0.58***	0.05
Level-2 intercept	0.22***	0.05	0.33***	0.05	45.16***	9.28	0.18**	0.05	0.12**	0.04	1.43***	0.21

Notes. Time-varying covariates (mindful non-reactivity, mindful attention, and self-compassion) and dependent variables were z-standardized prior to analyses. Mindful non-reactivity, mindful attention, and self-compassion were within-person centered. Perceived stress was only measured at T1 and T3 assessments. Linear and quadratic growth slopes represented days elapsed since baseline assessment.

† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

variance in perceived stress, 8.4% of the variance in rumination, 2.4% of the variance in positive affect, and 1.2% of the variance in depressive symptoms.

Self-compassion

Within-person change in self-compassion was associated with concomitant change in every emotional well-being outcome. For every 1 point change in self-compassion, participants experienced a 0.36 point reduction in perceived stress

(pseudo- $R^2 = 5.9\%$), a 0.40 point reduction in rumination (pseudo- $R^2 = 10.4\%$), a 10.44 point reduction in depressive symptoms (pseudo- $R^2 = 15.8\%$), and a 0.64 point reduction in negative affect (pseudo- $R^2 = 8.4\%$), all significant changes ($ps < 0.01$). Likewise, positive affect increased by 0.61 points (pseudo- $R^2 = 7.0\%$) and life satisfaction increased by 0.85 points (pseudo- $R^2 = 13.2\%$) for every 1 point change in self-compassion ($ps < 0.001$).

Exploratory analyses: moderation of within-person effects by sex and meditation practice history

Finally, sex and meditation practice history were tested as moderators of the effect of within-person change in mindfulness and self-compassion on emotional well-being. In total, 2 of a possible 36 interaction effects were significant at $p < 0.05$. Sex moderated the effect of within-person change in self-compassion on perceived stress ($b = 0.67$, $SE = 0.25$, $p = 0.007$). Simple slopes tests revealed that within-person change in self-compassion was associated with significant reductions in perceived stress among girls ($b = -0.43$, $SE = 0.21$, $p = 0.04$). However, within-person change in self-compassion did not predict concomitant change in perceived stress among boys ($b = 0.24$, $SE = 0.28$, $p = 0.402$). See Fig. 2A for a graphical depiction of this moderation effect.

Sex also moderated the effect of within-person change in mindful non-reactivity on life satisfaction ($b = -0.61$, $SE = 0.24$, $p = 0.011$). Simple slopes tests revealed that within-person change in mindful non-reactivity was associated with significant improvements in life satisfaction among girls ($b = 0.60$, $SE = 0.23$, $p = 0.01$), but not among boys ($b = -0.01$, $SE = 0.28$, $p = 0.963$). See Fig. 2B for a graphical depiction of this moderation effect.

Discussion

Research shows that self-reported mindfulness and self-compassion are associated with enhanced emotional well-being among adolescents. However, these studies have largely relied on between-person, correlational designs which are vulnerable to third variable confounds. Moreover, most studies have not examined the core assumption underlying MT that

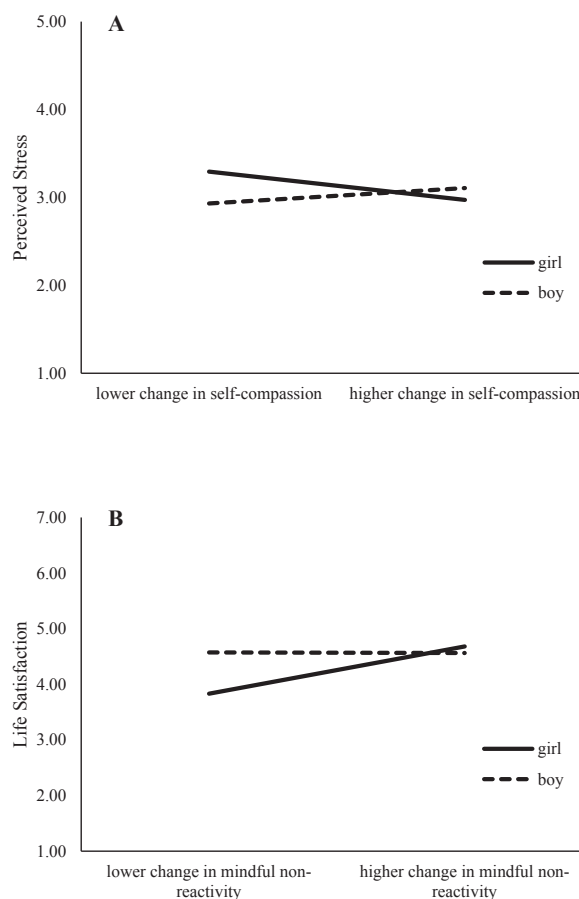


Fig. 2. Exploratory moderation analyses. Sex moderates the effect of within-person change in self-compassion on perceived stress (Panel A) and the effect of within-person change in mindful non-reactivity on life satisfaction (Panel B).

cultivating mindfulness and self-compassion will in turn enhance emotional well-being. The current study therefore sought to examine the relationship between longitudinal, within-person changes in mindfulness and self-compassion and concomitant changes in emotional well-being among adolescents participating in five-day, intensive meditation retreats. By isolating the within-person effect of mindfulness and self-compassion, this study was able to methodologically rule out all between-person characteristics that could confound the association between mindfulness, self-compassion, and emotional well-being. Results of multilevel, growth curve analyses revealed that within-person changes in self-compassion predicted significant changes in emotional well-being more consistently than changes in mindful attention and mindful non-reactivity. Specifically, adolescents whose self-compassion increased during the three-month study—relative to their own average levels—were also less stressed, less depressed, ruminated less often in response to difficult experiences, had lower negative affect, and conversely, had higher positive affect and were more globally satisfied with their lives.

Implications for theory and research

The current investigation extends theory and research linking MT to enhanced emotional well-being among adolescents in several ways. This study provides, for the first time, data on intensive meditation retreats for adolescents living in North America. The vast majority of prior studies assessing MT with North American adolescents have occurred in either schools or clinics. This study shows that retreats offer another valuable context in which to study the effects of MT on adolescent development. The current data suggest that intensive forms of meditation training—involving multiple hours of formal daily practice—are feasible for adolescents, and may enhance emotional well-being across a variety of different indices. Yet, the current data also suggest that adolescents who attend retreats may on average be more stressed and exhibit more depressive symptoms compared to other typically-developing adolescent samples. In many ways, this is not surprising: The objective of meditation training is to gain a deeper insight into the habits of mind that exacerbate psychological suffering, and to cultivate positive habits of mind to alleviate it (Analayo, 2003; Grabovac et al., 2011). For many people—adults and adolescents alike—the initial motivation to practice meditation may in fact be to alleviate one's own suffering.

This study also provides support for the assumption that specific mental capacities can be targeted and cultivated through meditation training. That is, self-reported mindful attention, mindful non-reactivity, and self-compassion all increased immediately after a five-day meditation retreat, relative to baseline functioning. Moreover, immediate improvements in these self-reported capacities were all maintained during the three-month follow-up period. Though mindfulness and self-compassion are sometimes considered to be fundamental capacities of mind whose expression varies across individuals (Brown & Ryan, 2003; Neff, 2003a), the current results demonstrate evidence that they are also amenable to direct training.

Most importantly, this study sheds light on how changes in mental capacities targeted during MT are related to changes in emotional well-being. Within-person changes in self-reported mindful attention and self-compassion (and to a lesser degree, mindful non-reactivity) each independently predicted declines in rumination. These findings align with the idea that a substantial portion of meditation training involves learning to disengage from ruminative thought patterns (Grabovac et al., 2011). The data also showed that self-reported mindful attention and self-compassion predicted declines in perceived stress and increases in positive affect; findings which are generally consistent with prior literature (Black, Sussman, Johnson, & Milam, 2012a; Brown et al., 2011). Beyond rumination, perceived stress, and positive affect however, the data showed that changes in self-compassion more consistently predicted significant improvements in emotional well-being than changes in mindfulness (Galla, O'Reilly, Kitil, Smalley, & Black, 2015; Van Dam, Sheppard, Forsyth, & Earleywine, 2011). In fact, self-compassion accounted for a larger percentage of variance in every outcome compared to mindful attention and mindful non-reactivity. It is worth noting that when considered independently from self-compassion (in exploratory, post hoc analyses not reported), within-person changes in mindfulness *did* predict significant changes in all measures of emotional well-being. However, the predictive validity of mindfulness was substantially reduced when considered simultaneously with self-compassion.

Self-compassion and emotional well-being among adolescents

Why would changes in self-compassion be such a strong predictor of emotional well-being compared to changes in mindfulness? It is possible that bringing self-compassion to bear on negative experience is generally more proximate to reducing ruminative and depressive thoughts that exacerbate stress and negative affect (Van Dam et al., 2011), and to promoting positive qualities that enhance life satisfaction and positive affect (Neff & Dahm, 2015). In other words, paying close attention to subjective experience through the cultivation of mindfulness may promote metacognitive insights and compassionate attitudes that in turn foster enhanced emotional well-being (Kabat-Zinn, 2003; Neff, 2003b). For the current sample of adolescents—many of whom began the retreat stressed—cultivating compassionate attitudes, inner kindness, and sympathetic warmth may have been particularly helpful as they confronted disliked aspects of themselves and dealt with ongoing concerns in their lives. To be clear, not all studies examining the simultaneous contribution of self-compassion and mindfulness (in adults) find superior predictive validity of self-compassion on emotional well-being (Baer et al., 2012; Van Dam, Hobkirk, Sheppard, Aviles-Andrews, & Earleywine, 2014). Another possibility is that intensive retreat practice offers more in-depth training on the cultivation of self-compassionate attitudes than what is typical for mindfulness-based interventions delivered in schools or clinics. Where feasible, future research should consider comparing different mechanisms of action (e.g., mindfulness, self-compassion) among adolescents who participate in intensive retreats versus those who

participate in school or clinic-based MT programs, and among adolescents who begin MT programs with elevated stress versus those who are not as stressed.

Sustained benefits of training

One might wonder why the immediate improvements in depressive symptoms and negative affect were not maintained during the three-month follow up period, while changes in mindfulness, self-compassion, rumination, and life satisfaction (and to a lesser degree, positive affect) were maintained. Here, it is only possible to speculate. Set point models of happiness suggest that emotional reactions to life events diminish relatively quickly and that people eventually return to their baseline levels of happiness (Lucas, 2007). It is therefore possible that any effect of the retreat on negative affect “wore off” more quickly than the mental capacities and coping skills cultivated during the retreat. A second explanation again has to do with the fact that adolescents in this sample appeared on average to be more stressed prior to the retreat. It seems reasonable to assume that long-term, enduring changes in mindfulness and self-compassion may be necessary before experiencing similarly enduring improvements in mood profiles.

Exploratory analyses

Exploratory moderation analyses indicated that the effect of within-person changes in mindfulness and self-compassion on emotional well-being varied minimally across subgroups of adolescents. I focused in particular on two groups of adolescents: girls versus boys, and those with meditation experience prior to the retreat versus those without meditation experience. In 2 of 36 possible interaction effects, the effect of within-person change in self-compassion and mindful non-reactivity on emotional well-being differed by participants' sex (no significant moderation effects were observed based on meditation practice history). First, within-person changes in self-compassion appeared more beneficial for reducing perceived stress among girls compared to boys. Among boys, changes in self-compassion had no effect on perceived stress, whereas changes in self-compassion had a robust effect on perceived stress among girls (i.e., greater change in self-compassion predicted reductions in perceived stress). Similarly, within-person changes in mindful non-reactivity predicted increases in life satisfaction among girls, but not among boys. Given the exploratory nature of these analyses, caution is warranted in generalizing beyond the current sample. Moreover, the large number of nonsignificant moderation effects overwhelmingly suggests that changes in self-compassion and mindfulness support emotional well-being among healthy adolescents regardless of sex and meditation practice history. These exploratory results do, however, offer useful directions for future research to explore whether particular types of meditation training (e.g., mindfulness versus self-compassion) may be more beneficial for boys compared to girls.

Limitations and future directions

This study had several important limitations that offer useful directions for future research. First, no comparison group was available, so it is not possible to infer a causal relationship between MT and changes in mindfulness and self-compassion; nor is it possible to rule out the possibility that factors extraneous to meditation contributed to improvements in these capacities. It is worth noting, however, that scores on self-reported mindfulness and self-compassion scales are relatively stable across time (i.e., high test-retest reliabilities) and tend not to improve in wait-list control groups (e.g., Brown et al., 2011; Neff & Germer, 2013). As such, I would not have expected changes in self-reported mindfulness and self-compassion in the current sample if MT was not delivered. Nonetheless, between-group studies are necessary to help determine the causal effect of intensive meditation practice on mindfulness and self-compassion. It is important to point out, however, that this design limitation does not adversely affect the internal validity of the growth curve analyses examining within-person change in mindfulness and self-compassion on emotional well-being.

Second, though the current study was based on a socioeconomically diverse sample of adolescents (based on scholarship eligibility), it was a self-selected group of healthy, but stressed adolescents with an interest in meditation training. As such, caution is warranted in generalizing the findings to other adolescent populations (e.g., those without an interest in meditation) or making direct comparisons between the effects of intensive retreat practice and meditation training in other settings. Future research should continue to explore how adolescents who enroll in retreats differ from adolescents who receive meditation training programs in schools so that more accurate comparisons can be made. It is important to note that despite limitations to external validity, studies of intensive retreat practice among adults have enhanced scientific understanding of the neurocognitive (MacLean et al., 2010; Sahdra et al., 2011; Slagter et al., 2007), immune (Jacobs et al., 2011), and affective (Orzech, Shapiro, Brown, & McKay, 2009) responses to meditation training; similar advances to the science of positive youth development may be possible through the continued exploration of intensive meditation retreats for adolescents.

Third, and finally, the results of this study are based exclusively on self-report questionnaires, which have well-known limitations (Lucas & Baird, 2005). Future research should consider incorporating multi-method and multi-informant assessments. It is also worth noting that I did not include an exhaustive battery of process measures; future studies should include measures of other mental processes targeted during MT, including mindful acceptance (Baer et al., 2006) and metacognitive insight (Monshat et al., 2013).

Concluding comment

Meditation training is increasingly seen as one promising approach to help support positive adolescent development (Roeser & Eccles, 2015). Meditation training programs for adolescents are predicated on the assumptions that mindfulness and self-compassion can be directly cultivated, and further, that doing so is beneficial for emotional well-being. Yet, very little research with adolescents has tested these assumptions directly. Results of the current study suggest that it appears possible to directly target and cultivate positive qualities of mind through intensive meditation retreat training, and that doing so seems to support adolescents' health and well-being. Results also indicated that changes in self-compassion—compared to changes in mindfulness—emerged as the more consistent predictor of emotional well-being among stressed, but otherwise healthy adolescents with an interest in meditation training. Examining the differential effects of various styles of meditation training (e.g., mindfulness, loving-kindness) on adolescents' emotional well-being, and increasing the rigor of study designs are two important directions for future research.

Conflicts of interest

The author reports no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.adolescence.2016.03.016>.

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