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Mind wandering, or the tendency for attention to drift to task-irrelevant thoughts, has been associated with worse intra- and inter-personal functioning. Utilizing daily experience sampling with 51 adults during 9-weeks of a compassion meditation program, we examined effects on mind wandering (to neutral, pleasant, and unpleasant topics) and caring behaviors for oneself and others. Results indicated that compassion meditation decreased mind wandering to neutral topics and increased caring behaviors towards oneself. When collapsing across topics, mind wandering did not serve as an intermediary between the frequency of compassion meditation practice and caring behaviors, though mind wandering to pleasant and unpleasant topics was linked to both variables. A path analysis revealed that greater frequency of compassion meditation practice was related to reductions in mind wandering to unpleasant topics and increases in mind wandering to pleasant topics, both of which were related to increases in caring behaviors for oneself and others.

Keywords: mind wandering; awareness; attention; meditation; compassion; caring behavior

Introduction

> The faculty of voluntarily bringing back a wandering attention, over and over again, is the very root of judgment, character, and will. No one is compos sui [master of oneself] if he have it not. – James (1890, p. 42)

Mind wandering has been defined as drifting to task-irrelevant thoughts. Recent studies suggest that people spend as much as 50% of their waking hours in mind wandering (Killingsworth & Gilbert, 2010) and generally have limited awareness that their mind has wandered (Schooler et al., 2011). The spontaneous thoughts that constitute mind wandering steer the mind away from its primary task and lead to a 'decoupling of attention from an immediate task context toward unrelated concerns' (Mooneyham & Schooler, 2013, p. 11; also see Schooler et al., 2011; Smallwood & Schooler, 2006). Research suggests that mind wandering has negative consequences on both intrapersonal and interpersonal levels. Specifically, mind wandering impairs performance on a variety of attention and performance tasks (Mrazek, Smallwood, Franklin, et al., 2012), decreases happiness (Killingsworth & Gilbert, 2010; Smallwood & O'Connor, 2011), impairs physical health (e.g. Epel et al., 2013; Ottaviani, Shapiro, & Couyoumdjian, 2013),

and reduces sensitivity to observed pain or discomfort in others (e.g. Kam, Xu, & Handy, 2013).

It is important to note that mind wandering can be take many forms – it can include self or other related topics as well as various subtypes, including mind wandering to positive, negative, and neutral topics. Although the majority of the research on mind wandering has examined this topic more generally, recent research has suggested that different types of mind wandering may have different consequences. For example, Killingsworth and Gilbert (2010) reported that mind wandering to unpleasant or neutral topics was associated with lesser happiness, whereas mind wandering to pleasant topics was not.

Mind wandering and meditation training

One way to reduce unhelpful forms of mind wandering is through attention training practices that enhance mindfulness, or the state of paying attention, on purpose, in the present moment, non-judgmentally (Kabat-Zinn, 1990). Beyond being a trait, state, or process, mindfulness is also a form of mental training within a larger family of meditation techniques. Although these trainings occur in a variety of formats and doses, preliminary evidence suggests that practice outside of the training

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program (e.g. formal daily home practice) is associated with greater benefits (e.g. Carson, Carson, Gil, & Baucom, 2004; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Pace et al., 2009; Shapiro, Bootzin, Figueredo, Lopez, & Schwartz, 2003).

One of the goals of mindfulness practice is to '… develop insight as to when one's mind has wandered so that attention may be redirected to the present moment' (Farb, Anderson, & Segal, 2012, p. 73). Mindfulness training has been shown to enhance attentional monitoring systems in the brain (Farb et al., 2012) and help refocus attention (Jha, Krompinger, & Baime, 2007). Mindfulness trainings have also been shown to reduce mind wandering (Mrazek et al., 2013), which appears to be inversely related to mindfulness skills (Mrazek, Smallwood, & Schooler, 2012). Most meditation practices require cultivating focused attention to support greater awareness and attentional control (Lutz, Slagter, Dunne, & Davidson, 2008). A cross-sectional study found that, compared to individuals with no meditation training, experienced meditators reported less mind wandering (Brewer et al., 2011). Thus, reduction in mind wandering may be a key mechanism for a variety of meditation techniques (Hasenkamp, Wilson-Mendenhall, Duncan, & Barsalou, 2012).

At present, however, there is no consensus on which type (e.g. beyond mindfulness training) and dose (e.g. longer-term trainings over several months) of meditation training is related to changes in mind wandering. For example, compassion meditation training programs (which also include components of mindfulness meditation) provide the potentially important explicit feature of the recognition of and wish to relieve suffering in others and oneself (e.g. Jazaieri et al., 2013). In compassion meditation there is an emphasis on focus of one's attention (e.g. a particular person, object, or situation) rather than engaging in open monitoring/receptive awareness practice where there is no specific object of meditation. This difference in technique may in turn lead to changes in mind wandering that are different from what is observed with mindfulness training.

Consistent with the effects of decreased mind wandering, compassion meditation training has been shown to enhance mindfulness skills, positive affect, and reduce negative affective states (e.g. Gilbert & Procter, 2006; Jazaieri et al., 2014; Neff & Germer, 2012; Pace et al., 2009). However, the direct impact of compassion meditation training on different types of mind wandering has yet to be investigated. Given that the foundation of compassion meditation is built upon settling and stabilizing the mind and extends beyond mindfulness practice (a potential antidote to mind wandering), it stands to reason that compassion mediation might positively influence mind wandering. Furthermore, given that the explicit focus of attention is on recognizing the suffering of

oneself and others and cultivating states of love and compassion rather than simply training attention more generally (as is the case in breath-focused practices or open monitoring/receptive awareness practices), compassion meditation training should reduce the tendency of the mind to wander. Preliminary evidence suggests that mindfulness meditation (and meditation more generally) reduces mind wandering (e.g. Brewer et al., 2011). Here we expect that compassion meditation training will have a more refined effect in the reduction of mind wandering.

Compassion and caring behaviors

Compassion is a multi-componential construct encompassing: (1) an awareness of suffering (cognitive/attentional component), (2) sympathetic concern related to being emotionally moved by suffering (affective component), (3) a wish to see the relief of that suffering (intentional component), and (4) a responsiveness or readiness to help relieve that suffering (motivational component) (Jinpa, 2010). Compassion meditation is aimed at ultimately increasing caring behaviors. However, to date, no published research has examined whether compassion meditation influences caring behaviors for oneself and others, or the relationship between mind wandering and caring behaviors.

Although there are many types of attention, self-focused attention (such as some forms of mind wandering) has been shown to inhibit attention to others' needs and is associated with less helping (Batson & Powell, 2003). There is often an assumption that compassion *requires* an explicit action or behavior. While the terms 'caring behaviors', 'helping behaviors', 'prosocial behaviors', and 'altruism' refer to behavioral actions, compassion refers to the recognition of and motivation to relieve suffering in others, without an explicit reference to behavior. From this perspective, compassion prepares the mind to engage in caring behaviors.[1]

One well-researched form of caring behaviors is prosocial behaviors, which refers to a variety of actions intended to enhance the welfare of *others*, such as volunteering, sharing, donating, and so forth (Brief & Motowidlo, 1986). Prosocial behaviors are found cross-culturally (Schwartz & Bilsky, 1990) and are associated with positive outcomes including fostering cooperation and building relationships. A one-day compassion training workshop increased prosocial behaviors directed towards strangers in the Zurich Prosocial Game (Leiberg, Klimecki, & Singer, 2011). Another encouraging study linked meditation trainings (8-weeks of mindfulness or compassion meditation) with prosocial responding, measured by the willingness of participants to give up their seat to someone who was suffering (Condon, Desbordes, Miller, & DeSteno, 2013). Although promising, these

studies do not address whether and how sustained compassion meditation impacts prosocial behaviors over time, and it also does not address changes in both self-focused and other-focused caring behaviors.

Although laboratory experiments have elucidated the cognitive and neural bases of mind wandering and its impact on emotion, no studies have examined the effects of mind wandering on caring behavior. The lack of attention to the present-moment found in mind wandering might interfere with one's abilities to identify and perform caring behaviors. Thus, it is important to determine whether mind wandering can be reduced through compassion training (where there is a specific object of one's attention) and whether this reduction allows individuals to perform caring behaviors.

Present study

The goals of the present study were to examine mind wandering as a barrier to caring behaviors for oneself and others, as well as investigate if compassion meditation influences mind wandering, caring behaviors, and the relationship between mind wandering and caring behaviors. Within a community sample of 51 adults, we collected twice-daily experience sampling over 9 weeks compassion meditation training to examine the relationships between mind wandering (in general and also to specific topics – neutral, pleasant, and unpleasant), frequency of daily compassion meditation practice, and daily self-reported caring behaviors for oneself and others. We tested the following three hypotheses: In examining mind wandering and caring behaviors trajectories from baseline to post-CCT, we expected that all forms of mind wandering would *decrease* over time, and that the frequency of caring behaviors (towards oneself and others) would *increase* (H1). Further, we expected that *decreases* in mind wandering (all forms) would be related to concurrent *increases* in caring behaviors for oneself and others (H2). We also expected that *increases* in the frequency of daily formal compassion meditation practice would be linked to *increases* in daily caring behaviors (for oneself and others) via reductions in overall mind wandering (all forms). For greater specificity (as in H1 and H2), we tested mind wandering to neutral, pleasant, and unpleasant topics as the intermediary between meditation practice and caring behaviors and expected a similar pattern of indirect effects (H3).

Methods

Participants and procedure

Participants in this study were a subset (only those randomized to immediate CCT) of a larger study (Jazaieri et al., 2013, 2014). Here we examined daily experience

sampling of behaviors across 9 weeks from a community sample of 51 adults while training in compassion meditation.[2] We also utilized behavioral ratings for two days immediately prior to CCT (i.e. at baseline) as well as for 10 days immediately after the training program (i.e. post-CCT). Participants were primarily middle aged (*M (years)* = 44.36, SD = 12.14), women (70.6%; *n* = 36), and Caucasian (76.5%; *n* = 39).

We recruited participants through via web-based online community listings, email listservs, and advertisements on community bulletin boards. Participants had to pass an initial online screening procedure which excluded individuals who self-endorsed bipolar disorder, major depressive disorder, psychosis, or active suicidal ideation. Participants provided informed consent in accordance with Stanford University Human Subjects Committee rules and were not paid for their participation.

Compassion cultivation training

Compassion cultivation training (CCT) is a structured, secular, compassion meditation training program developed at Stanford University that consists of nine, 2-h classes with a certified CCT instructor. CCT begins with stabilizing focused mental attention and progressing through a sequence of focused loving-kindness and compassion practices for oneself and others. In addition to meditation practice, the course includes brief lectures on related topics, group discussion, and small group exercises (for a more detailed description of the CCT program see Jazaieri et al., 2013, 2014). To integrate these practices into daily life, participants are encouraged and instructed to engage in daily formal home compassion meditation practices for at least 15 min (building up to 30 min) using recorded guided meditations. The feasibility of enhancing compassion through CCT has already been established (see Jazaieri et al., 2013).

Daily experience sampling

Participants were pinged[3] twice daily (once in the morning between the hours of 7 am and 9 am and once in the evening, between the hours of 7 pm and 9 pm) for two days prior to CCT (i.e. at baseline), throughout the duration of the course (9 weeks), and for 10 days immediately after the course (i.e. post-CCT). Here we examine a subset of questions, the first question participants were asked pertained to mind wandering: 'Are you thinking about something other than what you're currently doing?' (Figure 1; Panel A). We specified that mind wandering referred to what their mind was focused on during the activity that they were doing just before responded to the notification to provide a rating. We also assessed frequency of formal compassion meditation practice by asking 'Have you completed a formal
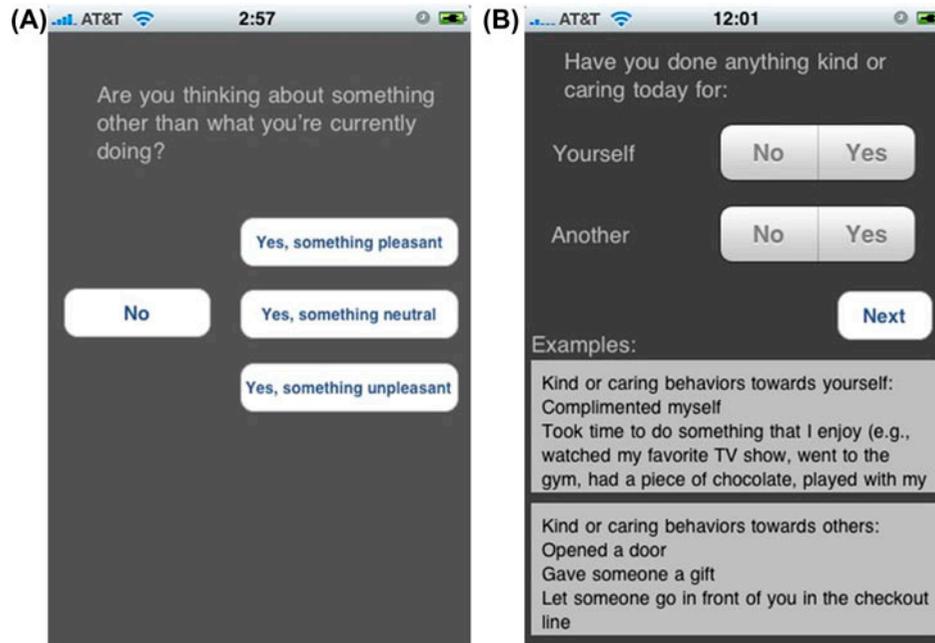
Figure 1.   Panel A: iPhone image of question regarding amount of mind wandering; Panel B: iPhone image of question regarding caring behaviors.

practice today?' We specified that this was referring to practices introduced in the CCT course, done with or without the guiding audio instructions.

We assessed caring behaviors by asking: 'Have you done anything kind or caring today for:' *yourself* and then again for *another* (Figure 1; Panel B). We specified that 'one way to determine if a behavior counts as being kind or caring is if that behavior or action is associated with a clear intention to relieve or reduce any level (gross or subtle) of suffering, pain, or discomfort.' We also gave participants examples of what we meant by 'kind or caring behaviors' for oneself and for others (see Appendix 1). Examples included: 'Taking time to do something that I enjoy' and 'Let someone go in front of you in the checkout line'. Intraclass correlation coefficients (ICCs) reflect the proportion of variability in a repeated measure due to individual differences. The ICCs for caring for oneself and caring for others (based on ratings made during CCT) are 0.46 and 0.31, respectively.[4]

Calculation/statistical analyses

For the preliminary analyses, to address whether there was a change in the strength of association between caring behaviors for one self and for others from pre- to post-CCT, we first created proportion scores for each caring behavior per person at both time intervals (i.e. 2 days at baseline, and 10 days after CCT). The frequency of caring behaviors reported was divided by the total number of baseline ratings (observed range: 0–3) and

post-CCT ratings (observed range: 0–18) made. These proportion scores were utilized in examining the caring for self-others associations (reported as weighted Pearson's correlation coefficients), where the total number of baseline and post-CCT ratings was used as a weighting variable. To test for a difference between the caring for self-other correlation at baseline and the corresponding correlation post-CCT, we used a Fisher's *r*-to-*z* transformation and significance test suited for dependent correlations (see web utility by Lee & Preacher, 2013). In addition, gender differences in the caring for self-other associations at baseline and post-CCT were evaluated using a similar Fisher's *r*-to-*z* transformation and significance test suited for independent correlations. Gender differences in the frequencies of mind wandering and meditation practice were tested using multilevel logistic regression analyses, in which gender was the sole predictor of each binary (mind wandering, meditation practice) outcome (see general description of multilevel modeling (MLM) below). Single-level regression analyses were conducted to examine the effects of general and specific mind wandering on caring behaviors at baseline.

We conducted MLM analyses to determine H1 (whether the mind wandering and caring behaviors trajectories changed from baseline to post-CCT), H2 (whether changes in daily mind wandering were associated with concurrent changes in caring behaviors for self and others throughout CCT), and H3 (whether the effect of frequency of formal compassion meditation practice on caring behaviors was transmitted via the frequency of

mind wandering). MLM facilitates the analysis of clustered data (e.g. with a two-level structure, daily ratings nested within participant) and accounts for dependency of repeated observations by directly modeling the clustering as within- and between-persons orthogonal components. This statistical modeling approach allows for level 1 effects (daily ratings) to vary across level 2 units (individuals), as well as yields unbiased standard errors (avoiding Type I errors) and estimates of variance explained (R^2; see Hox (2002) and Snijders and Bosker (1999) for additional MLM details and specification).

To examine the baseline-to-post CCT trajectories of mind wandering (H1), we created three dummy-coded variables from the categorical mind wandering variable with four response options (no mind wandering, mind wandering to pleasant, unpleasant, neutral), with 'no mind wandering' as the reference. We conducted multilevel logistic regression analyses to model the change from baseline to post-CCT in these three mind wandering outcomes (pleasant, unpleasant, neutral), with time elapsed (as reflected by each assessment/ping) as the predictor. We also examined the baseline-to-post-CCT trajectories of caring behaviors (caring for oneself or not, caring for others or not) using the same multilevel logistic regression model specification.

Model H1: Within-persons (Level 1):

$$\text{Mind Wandering (or Caring Behaviors)}_{ij} = \boldsymbol{\beta}_{0j} + \boldsymbol{\beta}_{1j}(\text{Time}) + e_{ij}$$

The time elapsed since baseline was used to predict within-person variance in mind wandering (or caring for self/others) at time i for person j. $\boldsymbol{\beta}_{0j}$ represents the conditional mean mind wandering (or caring) score, $\boldsymbol{\beta}_{1j}$ represents the time slope, and e_{ij} represents the within-persons random error. In addition, an autoregressive residual covariance matrix was specified to account for serial dependency in repeated measures. This approach ensures that each dependent variable represents a change in relation to previous scores.

Model H1: Between-persons (Level 2):

$$\boldsymbol{\beta}_{0j} = \gamma_{00} + u_{0j}$$

$$\boldsymbol{\beta}_{1j} = \gamma_{10} + u_{1j}$$

$$\text{where } \begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \tau_{00} & \\ \tau_{10} & \tau_{11} \end{bmatrix} \right)$$

The intercept and time slope were specified as random (i.e. varying across individuals; u_{0j}, u_{1j}) and hypothesized to be drawn from a multivariate normal distribution with a mean vector of zero and unknown variances (τ_{00}, τ_{11}). An intercept-slope covariance was estimated (τ_{10}), which reflects the association between one's initial standing (at baseline) and the degree of change over time. The fixed effect of interest is γ_{10}

(change in mind wandering or caring), which is reported as an odds ratio (OR). Odds ratio effect sizes are interpreted as follows: small = 1.44, medium = 2.47, large = 4.25 (based on derivations from Cohen's d; Chinn, 2000).

To investigate the concurrent effects of mind wandering to pleasant, unpleasant, and neutral on caring behaviors (H2), we conducted multilevel logistic regression analyses using the three mind wandering dummy variables as focal predictors of two caring behavior outcomes (caring for oneself/others or not). Baseline mind wandering (the proportion of mind wandering at baseline, as calculated by the frequency of mind wandering occurrences divided by the total number of baseline ratings), and time elapsed since baseline (or number of pings) were included as covariates.

Model H2: Within-persons (Level 1):

$$\begin{aligned} \text{Caring Behavior (self or others)}_{ij} \\ = \boldsymbol{\beta}_{0j} + \boldsymbol{\beta}_{1j}(\text{MW pleasant}) + \boldsymbol{\beta}_{2j}(\text{MW unpleasant}) \\ + \boldsymbol{\beta}_{3j}(\text{MW neutral}) + \boldsymbol{\beta}_{4j}(\text{Baseline MW}) \\ + \boldsymbol{\beta}_{5j}(\text{Time}) + e_{ij} \end{aligned}$$

The dummy-coded mind wandering (MW) variables (pleasant, unpleasant, neutral), controlling for baseline mind wandering and time elapsed since baseline, were used to predict within-person variance in caring behavior outcomes at time i for person j. $\boldsymbol{\beta}_{0j}$ represents the conditional mean caring score, $\boldsymbol{\beta}_{1j}$ represents the mind wandering to pleasant slope, $\boldsymbol{\beta}_{2j}$ represents the mind wandering to unpleasant slope, $\boldsymbol{\beta}_{3j}$ represents the mind wandering to neutral slope, $\boldsymbol{\beta}_{4j}$ represents the baseline mind wandering slope, $\boldsymbol{\beta}_{5j}$ represents the time slope, and e_{ij} represents the within-persons random error. An autoregressive residual covariance matrix was specified to account for serial dependency in repeated measures.

Model H2: Between-persons (Level 2):

$$\boldsymbol{\beta}_{0j} = \gamma_{00} + u_{0j}$$

$$\boldsymbol{\beta}_{1j} = \gamma_{10} + u_{1j}$$

$$\boldsymbol{\beta}_{2j} = \gamma_{20} + u_{2j}$$

$$\boldsymbol{\beta}_{3j} = \gamma_{30} + u_{3j}$$

$$\boldsymbol{\beta}_{4j} = \gamma_{40}$$

$$\boldsymbol{\beta}_{5j} = \gamma_{50}$$

$$\text{where } \begin{bmatrix} u_{0j} \\ u_{1j} \\ u_{2j} \\ u_{3j} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \tau_{00} & & & \\ 0 & \tau_{11} & & \\ 0 & 0 & \tau_{22} & \\ 0 & 0 & 0 & \tau_{33} \end{bmatrix} \right)$$

Intercepts and slopes of three mind wandering variables were specified as random (i.e. varying across individuals; u_{0j}, u_{1j}, u_{2j}, u_{3j}) and hypothesized to be drawn from a multivariate normal distribution with a mean vector of zero and unknown variances (τ_{00}, τ_{11}, τ_{22}, τ_{33}). For parsimony, no covariances were estimated, and the baseline mind wandering and time variables were entered as fixed effects. The fixed effects of interest are γ_{10}, γ_{20}, and γ_{30} (mind wandering during CCT), which are reported as odds ratios (OR). MLM analyses were conducted using SAS PROC GLIMMIX.

To examine H3, whether compassion meditation practice frequency was linked to daily caring behaviors via mind wandering, we conducted a multilevel path analysis to test the indirect effect of meditation practice via mind wandering (to any topic) on each of two outcomes, caring for oneself and others. For greater specificity, we ran additional path analyses to test three indirect effects of meditation practice (via mind wandering to pleasant, unpleasant, and neutral) on the caring for oneself and others outcomes. Indirect effects are quantified as the product of the path coefficients, *a* and *b* (or b_1 and b_2 for multivariate analyses, see Figure 2).[5] This product term (ab_1, ab_2) was tested for significance using the Monte Carlo method (see MacKinnon, Lockwood, & Williams, 2004; Preacher & Selig, 2012)[6]; this approach is similar to the parametric bootstrap procedure, but more easily implemented with multilevel data (Bauer, Preacher, & Gil, 2006). We tested a total of 8 indirect effects in 4 separate multivariate models. Mediation analyses were conducted in Mplus v.6.1 (Muthén & Muthén, 1998–2010), which can accommodate the hierarchical data structure[7] as well as simultaneously estimate all relevant path coefficients (a, b_1, b_2, ab_1, ab_2).

Missing values[8] (23.4%) were handled using full-information maximum likelihood estimation procedures, which generate unbiased parameter estimates and standard errors using all available observations (Enders, 2001).
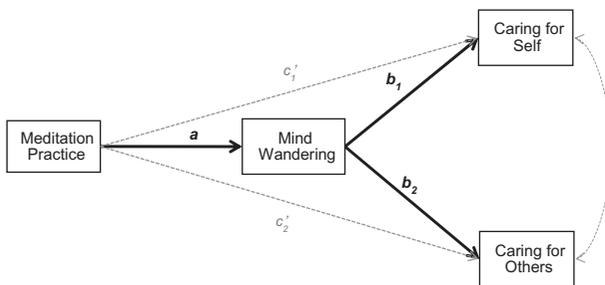

Figure 2.   Multilevel path analysis to test the indirect effect of meditation practice on caring behaviors via mind wandering (to pleasant, unpleasant, and neutral).

Results

Preliminary analyses

Association between caring behaviors for self and others at baseline and post CCT

At baseline, the proportions of caring behaviors towards oneself and others were 73.7 and 77.3% (weighted by number of observations), respectively. Post-CCT, the weighted proportions were 81.1% (caring for oneself) and 77.5% (caring for others). The post-CCT distributions were negatively skewed and slightly kurtotic[9] (i.e. showing high frequencies of caring for oneself/others). Thus, we implemented a square-root transformation of post-CCT proportion scores prior to generating weighted correlation coefficients. The proportion of caring behaviors towards oneself and others was not correlated at baseline ($r = -0.05$, $p > 0.74$), but was positively correlated at post-CCT ($r = 0.59$, $p < 0.001$); this caring for self-others association increased significantly from baseline to post-CCT ($z = 3.45$, $p < 0.001$).

Gender did not moderate these associations at baseline ($z = 1.48$, $p = 0.13$) or at post-CCT ($z = 0.53$, $p > 0.05$). For both males and females, the proportion of caring behaviors towards oneself and others was not correlated at baseline ($r_{male} = -0.37$, $p = 0.18$; $r_{female} = 0.12$, $p > 0.05$), but was positively correlated post-CCT ($r_{male} = 0.51$, $p < 0.05$; $r_{female} = 0.63$, $p < 0.001$).

Mind wandering at baseline and post-CCT

At baseline, the proportion of occasions in which participants reported mind wandering (to any topic) was 59.1%, with specific forms of mind wandering (to pleasant, unpleasant, and neutral) reported on 11.3, 17.3, and 30.4% of occasions, respectively. Post-CCT, participants reported overall mind wandering on 54.5% of occasions, with specific forms of mind wandering (to pleasant, unpleasant, and neutral) reported on 13.0, 15.4, and 26.0% of occasions, respectively. No gender differences were observed in mind wandering (to any, pleasant, unpleasant, and neutral) at baseline ($ps > 0.53$) and post-CCT ($ps > 0.48$).

Compassion meditation practice at baseline and post CCT

At baseline, participants reported practicing formal compassion meditation on 14.8% of occasions. Post-CCT, the proportion of occasions spent practicing meditation was 49.4%. There were no gender differences in the frequency of meditation practice at baseline ($p = 0.30$) and post-CCT ($p = 0.38$).

Effects of mind wandering on caring behaviors at baseline

At baseline, the proportion of mind wandering to any topic was not associated with caring for oneself ($\beta = -0.17$, $p = 0.24$), but predicted more frequent caring behaviors for others ($\beta = 0.47$, $p < 0.001$). With regard to more specific forms of mind wandering, the proportion of mind wandering to pleasant topics predicted higher frequencies of caring behaviors for oneself ($\beta = 0.09$, $p < 0.001$) and others ($\beta = 0.03$, $p = 0.02$), while the proportion of mind wandering to unpleasant topics predicted less frequent caring behaviors for oneself ($\beta = -0.21$, $p < 0.001$) and others ($\beta = -0.26$, $p < 0.001$). The proportion of baseline mind wandering to neutral predicted more frequent caring behaviors for others ($\beta = 0.12$, $p < 0.001$), but was not associated with caring behaviors for oneself ($\beta = -0.02$, $p = 0.20$).

H1: trajectories of mind wandering and caring behaviors from baseline to post-CCT

Mind wandering

The frequency with which participants reported all mind wandering (neutral, pleasant, and unpleasant topics) decreased from baseline (59.1% of occasions) to post-CCT (54.5%); a significant negative linear trajectory was observed, where the likelihood of mind wandering decreased from one assessment (ping) to the next ($p = 0.001$; week-to-week[10] OR = 0.95, 95% CI = [0.93, 0.98]). More specifically, there was a significant negative trajectory for the likelihood of mind wandering to *neutral* topics ($p = .031$; week-to-week OR = 0.93, 95% CI = [0.88, 0.99]), which decreased from baseline (30.4%) to post-CCT (26.0%). No individual differences were found in this decrease in mind wandering to neutral ($\tau_{11} = 0.04$, $\chi^2(1) = 1.89$, $p = .17$); however, frequent mind wandering to neutral topics at baseline was associated with steeper baseline-to-post-CCT decreases in mind wandering to neutral ($\tau_{10} = -0.04$, $\chi^2(1) = 8.49$, $p < .001$). The likelihood of mind wandering to *pleasant* topics occurred at similar frequencies at baseline (11.3%) and post-CCT (13.0%), though the estimated likelihood of mind wandering actually decreased[11] over time ($p = 0.003$; week-to-week OR = 0.89, 95% CI = [0.84, 0.95]). No individual differences were found in this decrease in mind wandering to pleasant topics ($\tau_{11} = 0.03$, $\chi^2(1) = 0.12$, $p > 0.73$); however, frequent mind wandering to pleasant topics at baseline was associated with more gradual (or less steep) baseline-to-post-CCT decreases in mind wandering to positive ($\tau_{10} = 0.02$, $\chi^2(1) = 15.28$, $p < 0.001$). The likelihood of mind wandering to *unpleasant* topics did not change significantly from baseline (17.3%) to post-CCT (15.4%; $p = 0.89$; week-to-week OR = 0.98, 95% CI = [0.92,
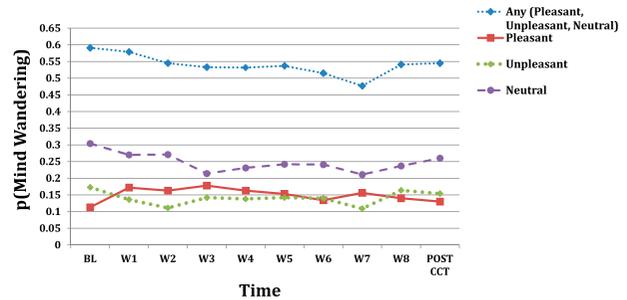

Figure 3. Observed trajectory of the probability of mind wandering to any topic and specifically to pleasant, unpleasant, and neutral topics from baseline (BL), throughout CCT (WX), and post-CCT.

1.04]), and no individual differences were found in mind wandering to unpleasant topics over time ($\tau_{11} = 0.03$, $\chi^2(1) = 0.01$, $p > 0.98$) (see Figure 3).

Caring behaviors for oneself and others

The proportion of caring behaviors for *oneself* increased from baseline (67.8%) to post-CCT (81.9%), with participants being more likely to care for oneself from one assessment (ping) to the next ($p = 0.005$; week-to-week OR = 1.07, 95% CI = [1.01, 1.13]). No individual differences were found in this increase in caring for oneself over time ($\tau_{11} = 0.02$, $\chi^2(1) = 0.96$, $p = 0.33$); however, a significant intercept-slope covariance was observed which indicates that caring for oneself at baseline was associated with steeper increases in caring for oneself from baseline to post-CCT ($\tau_{10} = 0.05$, $\chi^2(1) = 19.62$, $p < 0.001$).

A positive but non-significant trajectory was observed for the change in the proportion of caring behaviors for *others* from baseline (73.9%) to post-CCT (78.7%; $p = 0.075$; week-to-week OR = 1.05, 95% CI = [0.99, 1.10]). Similarly, no individual differences were found in the trajectory to care for others over time ($\tau_{11} = 0.02$, $\chi^2(1) = 0.53$, $p = 0.46$). However, caring for others at baseline was inversely associated with baseline-to-post-CCT change in caring for others from baseline to post-CCT ($\tau_{10} = -0.03$, $\chi^2(1) = 14.45$, $p < 0.001$); in other words, less caring for others at baseline corresponded with steeper increases in caring for others over time.

H2: concurrent effects of mind wandering on caring behaviors during CCT

Controlling for time elapsed since baseline (i.e. number of pings) and baseline mind wandering, mind wandering to both unpleasant and neutral topics predicted less caring behaviors towards oneself. Participants were half as likely to care for oneself when their minds wandered to

unpleasant topics (OR = 0.50, 95% CI = [0.35, 0.72]) and neutral topics (OR = 0.69, 95% CI = [0.50, 0.95]). No individual differences were found for these effects of mind wandering to unpleasant and neutral ($ps > 0.38$). They were no more or less likely to care for oneself when mind wandering to pleasant topics (OR = 1.40, 95% CI = [0.96, 2.01]), though there were significant individual differences in this effect of mind wandering to pleasant topics ($\tau_{11} = 0.05$, $\chi^2(1) = 15.94$, $p < .001$; see Table 1).

A similar pattern of results was observed for caring for others. Controlling for time and baseline mind wandering, mind wandering to unpleasant and neutral topics predicted less caring behaviors towards others. Participants were less likely to care for others when their minds wandered to unpleasant topics (OR = 0.56, 95% CI = [0.44, 0.71]) and neutral topics (OR = 0.76, 95% CI = [0.61, 0.94]). No individual differences were found for these effects of mind wandering to unpleasant and neutral topics ($ps > 0.65$). Participants were no more or less likely to care for others when mind wandering to positive topics (OR = 1.25, 95% CI = [0.93, 1.67]), though there were significant individual differences in this effect of mind wandering to pleasant topics ($\tau_{11} = 0.05$, $\chi^2(1) = 12.58$, $p < 0.001$; see Table 1).

H3: indirect effect of compassion meditation practice on caring behaviors via mind wandering

Table 2 shows the direct effects of: a) meditation practice on mind wandering (to any topic), b) mind wandering (to any topic) on caring behaviors, as well as the indirect effects of meditation practice on caring behaviors via mind wandering (to any topic). When participants engaged in formal compassion meditation practice, they reported no more or less mind wandering to any topic ($p > 0.28$). While mind wandering was related to an increased likelihood of caring for oneself and others ($ps < 0.005$), there was no indirect effect of frequency of compassion meditation practice on caring behaviors via mind wandering ($ps > 0.30$).

However, a different pattern of results emerged when examining specific forms of mind wandering (to neutral, pleasant, and unpleasant). When participants engaged in compassion meditation practice, they reported less mind wandering to unpleasant topics ($p < 0.03$), more mind wandering to pleasant topics ($p < 0.02$), but no more or less mind wandering to neutral topics ($p > 0.18$). In addition, mind wandering to unpleasant topics predicted a reduced likelihood of caring for oneself and others ($ps < 0.001$), while mind wandering to pleasant topics predicted an increased likelihood of caring for oneself and others ($ps < 0.001$). Furthermore, this effect of compassion meditation practice was indirectly linked to caring behaviors via mind wandering to pleasant and unpleasant topics ($ps < 0.048$). Compassion meditation practice decreased mind wandering to unpleasant topics, which in turn increased the likelihood of engaging in caring behaviors towards oneself ($ab_1 = 0.16$, 95% CI = [0.02, 0.32]) and others ($ab_2 = 0.10$, 95% CI = [0.01, 0.22]). Similarly, compassion meditation practice increased mind wandering to pleasant topics, which in turn increased the likelihood of caring for oneself ($ab_1 = 0.12$, 95% CI = [0.02, 0.27]) and others ($ab_2 = 0.10$, 95% CI = [0.01, 0.21]). However, no indirect effect of meditation practice on caring behaviors was observed via mind wandering to neutral (self: $ab_1 = 0.02$, 95% CI = [–0.01, 0.07]); others ($ab_2 = 0.02$, 95% CI = [–0.01, 0.05]).

Discussion

The goal of this present study was to utilize twice-daily experience sampling over 9-weeks of compassion training (CCT) to examine the relationship between changes in mind wandering (in general and also to specific topics – neutral, unpleasant, and pleasant topics) and daily self-reported caring behaviors for oneself and others.

Table 1. Fixed effects of concurrent mind wandering on caring behaviors, controlling for baseline mind wandering and time elapsed.

	Caring for self		Caring for others	
	Estimate (γ)	Odds ratio (95% CI)	Estimate (γ)	Odds ratio (95% CI)
Concurrent effects				
Intercept	1.38[**]	–	0.72[*]	–
MW Pleasant[a]	0.33	1.40 (0.97, 2.01)	0.22	1.25 (0.93, 1.68)
MW Unpleasant[a]	−0.69[**]	0.50 (0.35, 0.72)	−0.58[*]	0.56 (0.44, 0.71)
MW Neutral[a]	−0.37[*]	0.69 (0.50, 0.95)	−0.27[*]	0.76 (0.62, 0.94)
Baseline MW	1.08	–	1.00[*]	–
Time	0.0002	–	0.0021	–

Note: Unstandardized estimates are reported. MW = mind wandering.
[*]$p < .05$; [**]$p < .01$.
[a]Outcomes are binary, so the fixed effect estimates reflect log-odds ratios. Traditional odds ratios (e^{β}) are reported in the text.

Table 2. Direct (a, b_1, b_2) and indirect (ab_1, ab_2) effects of meditation practice on caring behaviors via mind wandering to any topic, pleasant, unpleasant, and neutral.

Mediator	a path	b_1 path	b_2 path	Caring for oneself ab_1 [95% CI]	Caring for others ab_2 [95% CI]
MW to any	−0.08	−0.29**	−0.30**	0.02 [−0.02, 0.08]	0.03 [−0.02, 0.09]
MW pleasant	0.24*	0.51**	0.40**	0.12* [0.02, 0.27]	0.10* [0.01, 0.21]
MW unpleasant	−0.22*	−0.72**	−0.47**	0.16* [0.02, 0.32]	0.10* [0.01, 0.22]
MW neutral	−0.11	−0.19	−0.14	0.02 [−0.01, 0.07]	0.02 [−0.01, 0.05]

Note: Unstandardized estimates are displayed. Confidence intervals are based on the Monte Carlo method (available at http://www.quantpsy.org).
*$p < 0.05$; **$p < 0.01$.

In partial support of our first hypothesis (H1), in general (when collapsing across neutral, pleasant, and negative topics), mind wandering decreased from week-to-week and overall from pre- to post-CCT. When examining the specific topics, frequency of mind wandering to neutral topics significantly decreased, though the frequency of mind wandering to pleasant and unpleasant topics did not decrease significantly (see Figure 3). Although the literature on mind wandering to neutral topics is relatively sparse, it is possible that mind wandering to neutral topics may be less effortful to modify (i.e. notice and re-direct attention). In terms of caring behaviors, caring behaviors towards *oneself* significantly increased, though a positive but non-significant trajectory was observed for caring behaviors towards *others*. Interestingly though, individuals who reported less caring behaviors pre-CCT yielded steeper increases in caring behaviors towards others overtime.

Prior studies (e.g. Condon et al., 2013) have linked meditation training programs to prosocial behaviors, which by definition, are behaviors that are directed towards the other. The results from this study suggest that CCT may in fact have an important impact on caring behaviors directed towards oneself. Although there is an emphasis in the literature on caring behaviors directed towards others, this study begins to suggest that CCT might first increase caring behaviors towards oneself and perhaps only subsequently lead to caring behaviors for others. This finding is perhaps paradoxical to the notion that it is relatively more difficult to change behaviors directed towards oneself versus another; however, many express a desire to become more caring and compassionate towards themselves first, as a means of being more caring and compassionate towards others. These patterns of behavioral findings should be examined within a community sample of adults more generally (absent of a meditation program).

In partial support of our hypotheses (H2), when controlling for time and baseline mind wandering, mind wandering to unpleasant and neutral topics predicted *less* caring behaviors towards *oneself*. Participants were half as likely to display a caring behavior for oneself when their minds wandered to unpleasant topics. Interestingly,

mind wandering to positive topics had no effect on caring behaviors for oneself. When examining the effects of mind wandering on caring behaviors for *others*, results indicated similar patterns, mind wandering to unpleasant and neutral topics predicted *less* caring behaviors towards *others*. Again, mind wandering to positive topics had no effects on caring behaviors for others (see Table 1).

Taken together, these results suggest that there may be differential effects on behavior depending on the specific content of mind wandering. It has been suggested that negative moods cause mind wandering (Smallwood, Fitzgerald, Miles, & Phillips, 2009), and that mind wandering is often the cause (rather than the consequence) of negative affective states (Killingsworth & Gilbert, 2010). Thus it is also possible that mind wandering to negative topics keeps an individual in the negative affective state and prevents one from engaging in caring behaviors for oneself or others. It is unclear whether this might be a matter of not recognizing the opportunity for the behavior, or whether the opportunity is recognized and yet accompanied with a lack of motivation to perform a caring behavior. It is possible that a similar pattern of behavior occurs when mind wandering to neutral topics. With regards to positive topics, prior studies of community samples of adults have indicated that mind wandering to pleasant topics is the most frequent form of mind wandering (Killingsworth & Gilbert, 2010). Future research should examine the function of mind wandering to pleasant topics, as preliminary data suggests that mind wandering to pleasant topics does not make individuals happier (when compared to merely engaging in the current activity) (Killingsworth & Gilbert, 2010), and yet with regards to compassion, positive emotion or affect is considered to be an important resource for the emergence of compassion (e.g. Fredrickson et al., 2008; Halifax, 2012). Relatedly, future research should consider whether current mood (positive and negative) influences mind-wandering across these various domains. Controlling for current mood would allow for greater clarity around the notion that mind-wandering is a mechanism.

With respect to a dose-effect, in partial support of our hypotheses (H3), when participants engaged in formal compassion meditation practices they reported less mind wandering to unpleasant topics and more mind wandering to pleasant topics (no change in neutral topics). Mind wandering to unpleasant topics was linked to a reduced likelihood of caring behaviors for oneself and others while mind wandering to pleasant topics was linked to an increased likelihood of caring behaviors for oneself and others. Furthermore, the effect of compassion meditation practice was indirectly linked to caring behaviors via mind wandering to pleasant and unpleasant topics. Compassion meditation practice decreased mind wandering to unpleasant topics which increased the likelihood of engaging in caring behaviors towards oneself. Interestingly, engaging in compassion meditation practice also increased mind wandering to pleasant topics which in turn increased the likelihood of caring for oneself (there was no corresponding indirect effect via mind wandering to neutral topics) (see Table 2).

These findings highlight the importance of subtypes of mind wandering and the potential differential effects on behavior. Furthermore, these results indicate an important relationship between the frequency of compassion meditation practice and the effects on mind wandering and subsequent caring behaviors. As it is 'reasonable to postulate that as meditation experience accumulates, the repeated engagement of various cognitive functions and associated brain networks induces neuroplastic changes that mediate positive outcomes' (Hasenkamp & Barsalou, 2012, p. 1). These findings build upon prior studies (e.g. Fredrickson et al., 2008; Pace et al., 2009) that suggest that for compassion meditation, out of class home practice is an important component. Taken together, it is possible that mind wandering may be a key mechanism for how meditation works – an area for continued research to explore.

Although not a direct hypothesis of this study, preliminary analyses of caring behaviors between self and others from baseline to post-CCT yielded an interesting finding worth noting. Theoretically and empirically consistent with prior work (e.g. Figley, 1995), at baseline, caring behaviors towards oneself and others was not correlated; however, these two constructs were positively correlated following the CCT intervention (a significant increase in this association from baseline to post-CCT). These results suggest that these two constructs do not necessarily travel together (e.g. Gilbert, McEwan, Matos, & Rivis, 2010), though often the assumption is made that they do. These results also suggest that compassion training encourages both self and other caring behaviors and is not focused solely on enhancing self-caring behaviors or only enhancing other caring behaviors. It also opens up the question of the potential implications for broader personal well-being (e.g. Alkema, Linton, &

Davies, 2008), an area for future research to explicitly examine.

Limitations and future directions

This study utilized daily experience sampling to examine the effects of mind wandering on caring behaviors following a compassion training course. The low number of baseline sampling instances is a limitation in that it may not provide a reliable estimate of the relationship between a person's mind-wandering and caring behavior. Future studies examining this topic would benefit from extended baseline measurement (e.g. 14 observations) in order to capture a more accurate and reliable estimate of this relationship. This study also provided flexibility to the participants (since not all participants had access to an iPhone device) and allowed for responses to be made via email (via a non-iPhone smartphone device or computer) rather than through the application developed for this study. This flexibility also allows for response biases to be introduced (e.g. participants only responding when they are lest distracted, in a better mood, etc.). Future studies examining this topic would benefit from utilizing one method of data collection and further limiting the window of time during which the pings are sent and how long the participant has to respond (e.g. within 30 min in order to be considered a valid response).

We utilized twice daily samples of affective and behavioral experience over the course of 9 consecutive weeks. It is possible that the sheer anticipation of the prompt to report on caring behaviors activated some sort of social norm or social desirability with regards to how the participant 'should' be responding and behaving, given that s/he is enrolled in a compassion course. Furthermore, because sampling was done twice a day, it is possible that the initial morning ping served as way to prime participants into behaving more compassionately throughout the day. In other words, it is possible that the sampling procedure itself was a form of an intervention. Future studies examining daily experience must employ a waitlist control condition of individuals who are not partaking in the CCT course in order to better evaluate the effects of the CCT intervention on mind wandering and caring behaviors.

Similar to the majority of the existing literature, in this paper we largely conceptualized mind wandering as being a potentially maladaptive cognitive process. We did not further examine whether there were any actual or perceived benefit of mind wandering or if there was a perceived importance of the current/primary task during which the mind wandering took place. Ostensibly, mind wandering is not necessarily an entirely maladaptive process, it only becomes maladaptive when it fails to serve its function or turns into a health risk factor due to being inflexible and rigid (Ottaviani et al., 2013). Further, it

has been suggested that 'mind wandering may be distinguishable into separate types or forms, and that while some types of mind wandering may be disruptive, others may provide some benefit' (p. 14) and that mind wandering may occur as a function of an evaluation of how important the current task is to the individual (Mooneyham & Schooler, 2013). Suggesting that perhaps mind wandering exists on a continuum and there may be a balance between engaging mindfully in a task and intentionally allowing the mind to wander. In addition to continuing to examine the valence of mind wandering, future research may benefit from examining the dimensional nature of mind wandering and based on the results from this study, specifically examining the effects of positively valenced mind wandering. Future studies would also benefit from understanding the importance of the primary task to the participant and whether there are any actual and perceived 'benefits' of engaging in mind wandering. It has been argued that such benefits may include future thinking (e.g. 'anticipation or planning of personally relevant future goals' (Mooneyham & Schooler, 2013, p. 14)) or creative thinking.

Lastly, future research may choose to collect data with regards to the exact nature and context of the caring behavior (rather than a binary yes/no data), including quantity/frequency of the behavior, and further examining whether the effects from this study persist longitudinally beyond the 9-week intervention (accounting for continued meditation practice). These future studies may also benefit from examining a variety of moderating factors that may influence caring behaviors including social desirability, religious convictions, and personality factors.

Concluding comment

The present study is the first to provide initial support that formal compassion training can reduce mind wandering and elicit caring behaviors for oneself and others. Although it has been well documented that there are many costs associated with a wandering mind (for a review see Mooneyham & Schooler, 2013), this is the first study to suggest a relationship between a wandering mind and caring behaviors for oneself and others. Furthermore, similar to mindfulness practices, the practice of compassion meditation may be a powerful antidote to mind wandering. The results from this study also suggest that perhaps not all mind wandering is problematic (at least in relation to caring behaviors for self and others) – unlike mind wandering to negative or neutral topics, we did not find changes in caring behaviors for self or other when mind wandering to positive topics. The present findings suggest that more a nuanced understanding of mind wandering might elucidate when this psychological phenomenon presents as adaptive or maladaptive.

Notes

1. Caring behaviors is an umbrella term referring to a variety actions performed by individuals that are intended to benefit oneself or others.
2. Only participants with a 50% or greater response rate across all assessment points (2 samplings per day × 56 days = 112 potential samples) were included in these analyses, this excluded 9 participants who did not complete the intervention.
3. After being signaled to make a response, participants were instructed to make a response at that moment or if busy (e.g. driving, meditating, etc.), to make a responses as soon as possible after the current activity was completed. 88% responses were done via e-mail (both via non-iPhone smartphone devices and computers), 10% of responses were done via the iPhone application we developed (downloaded via the Apple App Store), and 2% of responses were done using a paper/pencil format (when participants were out of cell and computer access). Mind wandering and caring behavior outcomes did not differ by response format ($ps > 0.08$). Although perhaps considered a 'trend', given the sufficient power to detect differences (i.e. large sample size and large number of repeated-measurements), the lack of significance appears to be a reliable result. Aside from the mind wandering, meditation practice, and caring behaviors questions participants were also asked about emotion regulation attempts and self-efficacy (not reported here).
4. When calculating ICCs for binary outcome variables, the level-1 residual variance is estimated as $\pi^2/3$ (i.e. the standard deviation of a logit function; Snijders & Bosker, 1999).
5. The direct effect, c', was also estimated but is not relevant when testing mediation (Hayes, 2009; Rucker, Preacher, Tormala, & Petty, 2011).
6. We used Selig and Preacher's (2008) web-based utility, in which we input the unstandardized path estimates (a_1, a_2, b) as well as the corresponding slope variances and covariances (specific to mediation analyses where all variables are measured at level 1) to simulate the sampling distribution of the indirect effect. We requested a 95% confidence interval (CI) and 20,000 repetitions. If the resulting 95% CI does not include zero, the indirect effect is significant at $\alpha = 0.05$.
7. Traditional ordinary least squares regression-based methods for assessing mediation (e.g. Baron & Kenny, 1986; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002)

require the assumption of independence of observations and are appropriate when assessing single-level mediation. In the presence of multilevel data, use of these traditional methods yields downwardly biased standard errors (MacKinnon et al., 2002).

8. On average, the percentage of missing data increased slightly from week 1 (17%) to week 8 (31%); however, no common or consistent patterns of day-to-day 'missingness' were found throughout CCT.

9. Skewness values were –1.49 and –1.61 for caring for oneself and caring for others, respectively. Kurtosis values were 1.50 and 2.77 for caring for oneself and caring for others, respectively.

10. Because the time predictor reflects the number of assessments/pings during the study period, the estimated odds ratio indicates mico-level changes from one ping to the next. For interpretability, week-to-week odds ratios are reported to correspond with the weekly trajectories depicted in Figure 3.

11. Baseline ratings are minimal (from 0 to 3 ratings), so the estimated likelihood of mind wandering is heavily weighted by the Week 1 ratings (17.2% mind wandering to pleasant). This decrease (from Week 1) is depicted in Figure 3.

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Appendix 1.

Examples of kind or caring behaviors towards myself:

- Complimented myself
- Took time to do something that I enjoy (e.g. watched my favorite TV show, went to the gym, had a piece of chocolate, played with my dog, called a friend, etc.)
- Let myself 'just be' rather than be 'compelled to do'
- Gave myself a gift
- Refrained from criticizing myself
- Reassured myself that I do not need to 100% perfect in everything that I do
- Asked for help from others when I needed such help
- Let myself rest and relax – like sleeping in, getting a massage, reading a book, meditating, etc.
- When I was having a difficult situation in my life, I generated loving and caring thoughts and feelings toward myself as I would for a friend – rather than criticizing myself for the situation

- I took care of my body and ate well, slept enough, exercised, relaxed, etc.
- I spent time with loving friends and family and let myself feel their care and love for me
- I let myself have fun and went to a play, a party, sports game, dancing, etc.
- I put myself in a situation where I laughed a lot (e.g. witty friends, comedy show, rented a movie, etc.)
- I played with puppies and toddlers
- I let myself step away from work, not think about it or worry about it for a day over the weekend – and just engage
- I engaged in nourishing or soothing activities – cooking, gardening, massage, bath, listening to music, listening to a dharma talk, made love to my partner, etc.

Examples of kind or caring behaviors toward others:

- Opened a door
- Gave someone a gift
- Let someone go in front of you in the checkout line
- Gave someone a compliment
- Made conversation with a stranger

- Gave up your seat
- Smiled at a stranger
- Hugged someone
- Picked up a piece of trash and threw it away
- Let a car merge in front of you in traffic
- Donated something
- Did a favor for someone
- Bought something for someone
- Told someone you love them or care about them
- Volunteer time to someone else (5 min or 5 hours)
- Attend to the emotional and/or physical needs of another
- Giving others directions when they are lost
- Emailed or called someone to connect with them
- Tell a friend, family or co-worker what you appreciate about them
- Help someone move
- Spent time with someone when they were feeling physically ill or emotionally down
- Visited with people you don't know at a retirement home
- Give some warm food, coat or a sleeping bag to a street person
- Help a child with their homework or in learning something new