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The Nondiscriminating Heart: Lovingkindness Meditation Training Decreases Implicit Intergroup Bias

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Although meditation is increasingly accepted as having personal benefits, less is known about the broader impact of meditation on social and intergroup relations. We tested the effect of lovingkindness meditation training on improving implicit attitudes toward members of 2 stigmatized social outgroups: Blacks and homeless people. Healthy non-Black, nonhomeless adults ($N = 101$) were randomly assigned to 1 of 3 conditions: 6-week lovingkindness practice, 6-week lovingkindness discussion (a closely matched active control), or waitlist control. Decreases in implicit bias against stigmatized outgroups (as measured by Implicit Association Test) were observed only in the lovingkindness practice condition. Reduced psychological stress mediated the effect of lovingkindness practice on implicit bias against homeless people, but it did not mediate the reduced bias against Black people. These results suggest that lovingkindness meditation can improve automatically activated, implicit attitudes toward stigmatized social groups and that this effect occurs through distinctive mechanisms for different stigmatized social groups.

Keywords: meditation, lovingkindness, compassion, implicit bias, prejudice

Various forms of meditation are gaining mainstream popularity in Western therapeutic and health professions (Bishop et al., 2004). More than 20 million American adults, about one out of 11, meditated in 2007 (Barnes, Bloom, & Nahin, 2008). This widespread interest is fueled by empirical evidence on meditation supporting enhanced individual well-being, including reduction of stress (Astin, 1997), anxiety (Evans et al., 2008), and depression (Teasdale et al., 2000); improvement of mood (Fredrickson, Coffey, Pek, Cohn, & Finkel, 2008); and even enhancement of academic performance (Hall, 1999). Although meditation practice has a variety of benefits associated with personal well-being, evidence of its broader implications on interpersonal and intergroup outcomes is limited (cf. Hutcherson, Seppala, & Gross, 2008). The present study aimed to expand the current breadth of investigation that is largely limited to meditation effects within individuals and to examine the impact of meditation across individuals. Specifically, we examined changes in implicit intergroup attitudes using lovingkindness meditation.

Lovingkindness meditation is intended to cultivate warm and friendly feelings toward the self and others (Hutcherson et al., 2008). In practice, individuals contemplate warm feelings they have toward a person they care about the most (e.g., a family member). They then extend these positive thoughts first to themselves and then to a growing circle of others, eventually to all sentient beings. In support of the view that lovingkindness meditation may enhance interpersonal connectedness, Fredrickson et al. (2008) demonstrated that participants who attended a 7-week lovingkindness meditation course, relative to waitlisted controls, reported greater increases in social support and positive relations with close others. Hutcherson et al. (2008) obtained further support for the idea that lovingkindness meditation can change general interpersonal orientations, such that a 7-min lovingkindness meditation increased explicit positivity toward the self, close others, and unacquainted individuals, and increased implicit positivity toward the self and close others but not unacquainted others. In the present research, we investigated whether practicing lovingkindness meditation could influence attitudes at an intergroup level, specifically implicit prejudice.

Traditionally, prejudice has been measured explicitly using self-reports, which are subject to deliberate, and often strategic, control in their expression. By contrast, implicit attitudes, which are typically measured with response-latency techniques such as the Implicit Association Test (IAT; Greenwald, Poehlman, Uhlmann, & Banaji, 2009), represent automatically activated associations. Because people typically adjust their explicit expressions to appear unbiased, implicit attitudes are often better predictors of subsequent behavior in socially sensitive domains (Greenwald et al., 2009). Also, because of the speed and ease with which evaluative

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judgments are activated, almost a century's worth of empirical investigation has led to the consensus that implicit group attitudes are extremely difficult to control. However, some findings suggest that it is possible for people to inhibit implicit biases longer term through the development of automatic goals—goals that are pursued with sufficient frequency that they become chronically accessible (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trotschel, 2001; Moskowitz & Ignarri, 2009). Lovingkindness meditation establishes a deep sense of positive interconnectedness to others, regardless of their group membership, that is incompatible with social biases and thus can potentially inhibit automatically activated biases. Consistent with the idea that it is extended *practice* of lovingkindness meditation that is required to inhibit implicit intergroup biases, Hutcherson et al. (2008) found that a 7-min lovingkindness meditation was not sufficient to reduce implicit bias toward unacquainted others.

In the present research, we examined the broad potential of lovingkindness meditation, practiced more extensively, to have additional significant social impact on improving implicit negative attitudes toward members of culturally stigmatized groups. In the present study, 101 participants were randomly assigned (a) to practice lovingkindness meditation for 6 weeks (lovingkindness practice), (b) to discuss ideas about lovingkindness meditation for 6 weeks (lovingkindness discussion), or (c) to participate in lovingkindness meditation at a later date (waitlist control participants). Participants completed measures of implicit attitudes toward Blacks and homeless people, assessed with IATs (Greenwald et al., 2009), at the beginning and end of the study period.

We selected Blacks and homeless people as the target groups to examine the breadth of impact of lovingkindness meditation. Implicit prejudices toward Blacks and homeless people are both strong and pervasive and may both involve affective regulatory processes. In general, feelings of fear and vulnerability underlie prejudice against Blacks (e.g., Rudman & Lee, 2002), whereas biases against homeless people often involve disgust and contempt, which may lead to dehumanization (Harris & Fisk, 2006). Therefore, increased social perception, or humanization, may play a more important role in bias reduction toward homeless people than toward Blacks. In addition, the social norms about the expression of bias toward these groups (and thus explicit attitudes) differ (Crandall, Eshlemen, & O'Brien, 2002). Because of the historical, political, and social emphasis on the immorality and illegality of racial discrimination, there are generally strong forces against prejudice toward Blacks, present even in early socialization (Olson, Dweck, Spelke, & Banaji, 2011). By contrast, prejudice against homeless people is more normatively acceptable (Crandall et al., 2002). Therefore, cognitive factors, such as cognitive control that relates to recognition of societal and personal standards of egalitarian treatment toward Blacks (Crandall et al., 2002), may play a more central role in implicit bias against Blacks than against homeless people.

Thus, in the present research, we had three objectives. First, we sought to investigate whether lovingkindness meditation could reduce implicit bias toward a stigmatized group. Second, we tested whether such an effect would be generalizable across two different target groups: Blacks and homeless people. And third, we examined potentially different mechanisms that contribute to reductions in implicit biases toward these two groups: cognitive control and stress.

Based on research demonstrating how implicit biases can be inhibited through extensive practice creating strong incompatible associations (Kawakami, Dovidio, Moll, Hermsen, & Russin, 2000) or goals (Bargh et al., 2001; Moskowitz & Ignarri, 2009), we hypothesized that only those who actively engage in lovingkindness meditation practice—and not those in the discussion or waitlist control—would show reduced bias in implicit attitudes toward Blacks and homeless people.

We also hypothesized that the effect of lovingkindness meditation on implicit attitudes toward Blacks and homeless people may involve distinct mechanisms, and accordingly we tested two potential underlying mechanisms that may account for the hypothesized effects for both groups (Kang, Gruber, & Gray, 2012). Specifically, we predicted that decreases in bias would be mediated by increased cognitive control and decreased psychological stress. First, extended meditation practice (Tang et al., 2007) or even a shorter term 3-day lovingkindness practice (Hunsinger, Livingston, & Isbell, 2012) can enhance individuals' cognitive control. Cognitive control is generally thought to be important in regulating automatic intergroup bias, and practice in exerting cognitive control over biases through meditation may enable people to inhibit the activation of implicit biases against outgroup members (Monteith, Arthur, & Flynn, 2010). Second, lovingkindness meditation may reduce bias by changing more affective, stress-related reactivity. Stress can promote cognitive biases such as stereotyping (e.g., Baron, Inman, Kao, & Logan, 1992; Friedland, Keinan, & Tytun, 1999) or implicit prejudice (Frantz, Cuddy, Burnett, Ray, & Hart, 2004; Terbeck et al., 2012). Given that lovingkindness meditation decreases stress (Carson et al., 2005) and increases positive emotions (Fredrickson et al., 2008) associated with adaptive stress coping (Fredrickson, Tugade, Waugh, & Larkin, 2003), lovingkindness meditation may reduce bias by decreasing stress.

Method

Participants

Healthy non-Black, nonhomeless adults ($N = 107$) who had no previous experience with lovingkindness meditation were recruited for compensation (up to \$130). Participants were recruited using flyers advertising for a study on "the effect of meditation on cognitive and affective functioning" posted in New Haven and surrounding communities. Participants were randomly assigned to one of three conditions: lovingkindness practice, lovingkindness discussion, or waitlist control. Six participants (three from the lovingkindness practice, two from the lovingkindness discussion, and one from the waitlist control condition) did not complete the study. The final sample consisted of 101 participants (65 women; mean age = 25.20 years, $SD = 5.20$; 22 Asian, 62 White, six Hispanic, one Middle Eastern, and 10 other; see Table 1).

Procedure

Participants completed a pretest within 7 days prior to the intervention, learned their random condition assignment, attended the intervention, and completed the posttest within 7 days after the conclusion of the intervention. Approximately 1 week past the posttest, lovingkindness meditation courses were offered to all lovingkindness discussion and waitlist control participants. Tests

Table 1
Participant Demographics, Baseline Characteristics, and Intervention-Related Statistics

Variable	Lovingkindness practice (<i>n</i> = 35)	Lovingkindness discussion (<i>n</i> = 33)	Waitlist control (<i>n</i> = 33)	Statistic
Demographic				
Age in years (<i>SD</i>)	25.69 (5.17)	24.42 (5.06)	25.45 (5.45)	<i>F</i> = 0.55
Female (%)	57.1	63.6	72.7	χ^2 = 1.81
White (%)	60.0	57.6	66.7	χ^2 = 3.73
Education in years (<i>SD</i>)	17.37 (2.47)	16.82 (2.70)	16.67 (2.12)	<i>F</i> = 0.79
Baseline characteristics				
Cognitive control–MSIT (<i>SD</i>)	314.52 (65.28)	288.94 (94.33)	309.24 (95.06)	<i>F</i> = 0.84
Psychological stress–PSS (<i>SD</i>)	40.23 (7.53)	38.76 (8.09)	37.70 (8.81)	<i>F</i> = 0.83
Intervention-related				
Class attendance	4.86 (1.44)	4.91 (1.18)	—	<i>F</i> = 0.03
Meditation minutes	553.84 (239.56)	—	—	—
Interaction with others	2.29 (0.80)	2.03 (0.67)	—	<i>F</i> = 1.98
Overall experience	5.38 (0.92)	5.20 (0.89)	—	<i>F</i> = 0.65

Note. Mean values are displayed with standard deviations in parentheses where applicable. MSIT = multisource interference task; PSS = Perceived Stress Scale.

* $p < .05$.

were administered in a psychology laboratory, and the intervention classes were held in a classroom.

The lovingkindness practice intervention consisted of six weekly lovingkindness meditation classes. Each class lasted for an hour, with 17–19 participants per group. Each meditation class included 30-min sitting meditation (modified from Carson et al., 2005; Fredrickson et al., 2008), checking on participants' progress and answering questions, followed by open discussion. Participants also were assigned to practice lovingkindness meditation at home using a guided meditation mp3 file (http://marc.ucla.edu/mpeg/05_Loving_Kindness_Meditation.wma) at least 20 min per day, 5 days per week.

The lovingkindness discussion intervention was closely matched to the lovingkindness practice condition and was conducted in an identical classroom setting. The lovingkindness discussion intervention consisted of six weekly discussion classes. Each class lasted for 40 min, with 17–19 participants per group. Prior to attending each class, participants received reading materials on the ideas behind lovingkindness meditation. Each discussion included a brief presentation of the reading material, open discussion, and question-and-answer sessions. The lovingkindness meditation practice and discussion materials are available by request from Yoona Kang.¹ Discussion participants were explicitly told not to do any meditation practice throughout the period of intervention. Neither the lovingkindness practice nor discussion class involved attempts to negate or inhibit the original negative group associations, which may ironically enhance bias (Legault, Gutsell, & Inzlicht, 2011). Instead, participants learned to extend lovingkindness to all beings without explicitly invoking specific social groups as target for the loving feelings.

Participants in the waitlist control did not have any further contact with the instructor or course materials until the posttest.

An accredited meditation instructor with an extensive experience with practicing and teaching lovingkindness meditation for over 30 years led all lovingkindness practice and discussion sessions. He was unaware of the study hypotheses and received monetary compensation for his time. He orally reported that both discussion and meditation sessions would be beneficial for the

participants, consistent with the Buddha's teachings. Class attendance was monitored in each class. Each day using a secure online website, lovingkindness practice participants reported the minutes of meditation they had engaged in since the last report. In addition, we controlled for potential differences in class interaction by having those in the lovingkindness practice and discussion groups report how much (from 1 = *not at all* to 5 = *extremely often*) they had interacted with other participants in class. Participants also rated their overall experience in class (from 1 = *extremely negative* to 7 = *extremely positive*).

Measures

Implicit attitudes, explicit attitudes, cognitive control, and stress were assessed at the beginning and end of the study period. All participants provided demographic information upon completion of the posttest.

Standard IAT procedures were used to assess implicit attitudes toward two stigmatized outgroups, Blacks (vs. Whites) and homeless persons (vs. college students). The materials and procedure for the race IAT were based on the task used by Nosek & Smyth (2007); the materials for the homeless IAT were based on previous work by Harris and Fiske (2006). IATs were administered using the DirectRT program (Empirisoft, New York, NY) on a PC desktop and were scored following the guidelines of Greenwald, Nosek, and Banaji (2003). In addition, we assessed the favorability of participants' *explicit attitudes toward homeless people*, among other groups, with a feeling thermometer (from 0 = *extremely negative* to 100 = *extremely positive*).

Cognitive control, one of the potential mediators, was assessed using the multi-source interference task (MSIT; Bush & Shin, 2006; see Shehzad, DeYoung, Kang, Grigorenko, & Gray, 2012, for materials and procedural details; $\alpha = .75$ in present study). We measured psychological stress, a second potential mediator, using the 14-item perceived stress scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). Participants reported their experience of

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stress in the past week (from 0 = *never* to 4 = *very often*). Internal consistency scores across the experiment were high ($\alpha_{\text{mean}} = .89$; $\alpha_{\text{range}} = .88-.89$).

Results

Lovingkindness practice, discussion, and waitlist control participants did not significantly differ with respect to age, gender, ethnicity, or education ($ps > .40$; see Table 1), nor in baseline measures of cognitive control and psychological stress ($ps > .40$). Participants in the lovingkindness practice and discussion conditions did not significantly differ in their average attendance ($p = .872$), the degree to which they interacted with other participants in class ($p = .165$), or the ratings of their overall experience in class ($p = .424$).

First, we examined the impact of practicing lovingkindness mediation on explicit attitudes toward Blacks and homeless people. For all participants, pre- and posttest explicit attitude scores were significantly correlated ($rs = .569$ and $.604$ for Blacks and homeless, respectively, $ps < .001$). We predicted that those who practiced lovingkindness meditation for 6 weeks would show a significant improvement in explicit attitudes toward Blacks and homeless people, while those in the other two control conditions, lovingkindness discussion and waitlist controls, would not (see Table 2 for means). To test this prediction, we compared posttest explicit attitude ratings across conditions for both race and homeless, separately, while treating pretest explicit attitude ratings as covariates. We tested two planned comparison orthogonal contrasts. First, we contrasted the meditation practice condition versus

the average of the lovingkindness discussion and waitlist control conditions (weighted coefficients = +2, -1, -1), and second, we contrasted the lovingkindness discussion and waitlist control conditions (weighted coefficients = 0, +1, -1). There was no significant effect for explicit attitudes toward Blacks ($ps > .50$) or homeless people ($ps > .50$). Across all conditions, explicit attitudes toward homeless people were more negative than those toward Blacks at both pretest, $M = 52.96$, $SD = 23.83$, versus $M = 65.20$, $SD = 18.23$, $t(100) = 5.185$, $p < .001$, and posttest, $M = 53.64$, $SD = 21.26$, versus $M = 65.47$, $SD = 20.21$, $t(99) = 5.601$, $p < .001$. Additionally, we computed explicit attitude difference scores by subtracting explicit attitude scores for Blacks from Whites and homeless people from college students, separately for pre- and posttests. When we compared posttest difference scores across conditions while treating pretest difference scores as covariates, there was no significant effect for explicit attitudes toward Blacks minus Whites ($ps > .30$) or homeless people minus college students ($ps > .60$).

Next, we examined the impact of practicing lovingkindness mediation on implicit attitudes toward Blacks and homeless people. Implicit and explicit intergroup attitudes were not correlated (rs at pre- and posttest between implicit attitude scores and explicit scores for Blacks = $.176$, $.172$, homeless people = $.056$, $.133$, for Blacks minus Whites = $.050$, $.048$, and college students minus homeless people = $.010$, $.026$, $ps > .08$). Across all participants, implicit attitudes toward Blacks and homeless people were positively correlated at both the pretest, $r(101) = .587$, $p < .001$, and at posttest, $r(101) = .690$, $p < .001$. Initially, at the time of the

Table 2
Descriptive Statistics for the Study Variables

Variable	Lovingkindness practice ($n = 35$)	Lovingkindness discussion ($n = 33$)	Waitlist control ($n = 33$)
Implicit bias (IAT): Blacks			
Pre	-0.012 (0.29)	0.062 (0.31)	0.092 (0.20)
Post	-0.163 (0.33)	0.050 (0.31)	0.096 (0.20)
Statistic	$F = 12.692^{**}$	$F = 0.077$	$F = 0.021$
Implicit bias (IAT): Homeless			
Pre	0.128 (0.23)	0.109 (0.23)	0.173 (0.23)
Post	-0.021 (0.29)	0.056 (0.31)	0.149 (0.31)
Statistic	$F = 12.442^{**}$	$F = 2.086$	$F = 0.352$
Explicit attitude: Blacks			
Pre	61.91 (19.73)	65.91 (17.18)	68.45 (17.59)
Post	64.00 (19.81)	65.97 (19.04)	66.55 (22.18)
Statistic	$F = 0.645$	$F = 0.000$	$F = 0.271$
Explicit attitude: Homeless			
Pre	56.29 (26.58)	47.44 (22.39)	54.73 (22.18)
Post	56.29 (20.45)	51.03 (22.26)	53.36 (21.42)
Statistic	$F = 0.000$	$F = 0.886$	$F = 0.139$
Cognitive control (MSIT)			
Pre	314.523 (65.28)	288.934 (94.33)	309.237 (95.06)
Post	314.067 (70.99)	295.534 (88.98)	292.776 (93.48)
Statistic	$F = 0.002$	$F = 0.261$	$F = 1.069$
Psychological stress (PSS)			
Pre	40.229 (7.53)	38.758 (8.09)	37.700 (8.81)
Post	36.314 (8.45)	39.061 (7.51)	40.576 (8.86)
Statistic	$F = 6.281^*$	$F = 0.059$	$F = 2.959$

Note. Mean values are displayed with standard deviations in parentheses where applicable. IAT = Implicit Association Test; PSS = Perceived Stress Scale; MSIT = multisource interference task.

* $p < .05$. ** $p < .01$.

pretest, participants across groups tended to have negative implicit attitudes toward Blacks, $M = 0.046$, $t(100) = 1.72$, $p = .089$, and homeless people, $M = 0.136$, $t(100) = 6.00$, $p < .001$. There were no differences across the three experimental conditions on either the race ($p = .271$) or the homeless ($p = .510$) pretest IATs.

We predicted that those who practiced lovingkindness meditation for 6 weeks would show a significant decline in implicit prejudice toward Blacks and homeless people, while those in the other two control conditions, lovingkindness discussion and waitlist controls, would not. To test this, we compared posttest IAT d scores across three conditions, while treating pretest IAT d scores as covariates. Two planned comparison orthogonal contrasts, as was used in the explicit attitude analyses, were conducted for both race and homeless IAT d scores, separately. For race IAT, implicit bias against Blacks decreased as a function of lovingkindness meditation practice, as predicted. Regression analyses revealed that those in the lovingkindness practice condition showed significantly less bias against Blacks at posttest ($M = -0.16$, $SD = 0.33$), compared with those in the lovingkindness discussion ($M = 0.05$, $SD = 0.31$) or waitlist conditions ($M = 0.10$, $SD = 0.20$), $\beta = -.270$, $t(98) = -3.769$, $p < .05$. Race IAT scores at posttest for those in the lovingkindness discussion and waitlist control conditions did not differ, $\beta = -.032$, $t(98) = -0.417$, $p = .677$.

For homeless IAT, there was a significant effect of lovingkindness meditation practice on implicit bias against homeless people. Regression analyses revealed that those in the lovingkindness practice condition showed less bias against homeless people at posttest ($M = -0.02$, $SD = 0.29$) compared with those in the lovingkindness discussion ($M = 0.06$, $SD = 0.31$) or waitlist conditions ($M = 0.15$, $SD = 0.31$), $\beta = -.173$, $t(98) = -2.314$, $p < .05$. Homeless IAT scores at posttest for those in the lovingkindness discussion and waitlist control conditions did not differ, $\beta = -.050$, $t(98) = -0.647$, $p = .519$.

We next tested whether the effect of lovingkindness meditation on implicit biases against Blacks and homeless people was explained by two potential mediators: cognitive control and psychological stress. Across conditions, greater increases in cognitive control were associated with less implicit bias only toward Blacks at posttest compared with at pretest, $r(101) = .202$, $p = .043$, but not significantly so with implicit bias toward homeless people, $r(101) = .087$, $p = .389$. Contrary to prediction, however, when the lovingkindness practice condition was contrasted with the lovingkindness discussion and waitlist control conditions, there was no difference in cognitive control at posttest, controlling for pretest, as a function of meditation conditions, $\beta = .062$, $t(98) = 0.761$, $p = .448$. Thus, cognitive control was not plausibly a mediator of the effect of the intervention on implicit attitudes toward Blacks and homeless people.

Next, we tested the indirect effect from lovingkindness meditation to improved implicit attitudes toward Blacks and homeless people with psychological stress as a mediator. There was a significant effect of lovingkindness meditation practice on stress reduction, such that controlling for pretest stress ratings, those in the lovingkindness practice condition reported decreased stress at posttest ($M = 36.31$, $SD = 8.45$), compared with those in the lovingkindness discussion ($M = 39.06$, $SD = 7.51$) or waitlist conditions ($M = 40.58$, $SD = 8.86$), $\beta = -.249$, $t(98) = -2.766$, $p < .05$. Psychological stress at posttest for those in the loving-

kindness discussion and waitlist control conditions did not differ, $\beta = -.094$, $t(98) = -1.020$, $p = .310$.

For the race IAT, the effect of lovingkindness practice on bias reduction was not mediated by decreased stress. When changes in psychological stress, condition, and pretest race IAT scores were considered simultaneously as predictors of implicit attitudes at posttest, the effect of condition on bias reduction stayed significant, $\beta = -.266$, $t(97) = -3.547$, $p = .001$, and changes in stress did not predict the bias at posttest, $\beta = .016$, $t(97) = 0.214$, $p = .831$. For the homeless IAT, supportive of the hypothesized mediation, when changes in psychological stress, condition, and pretest homeless IAT scores were considered simultaneously as predictors of implicit attitudes at posttest, condition no longer predicted improved implicit attitudes, $\beta = -.128$, $t(97) = -1.668$, $p = .099$, while changes in psychological stress did, $\beta = .156$, $t(97) = 2.024$, $p < .05$ —with decreased stress predicting decreased bias. Results from the bootstrapping procedure (Figure 1) supported our prediction: The indirect effect from lovingkindness meditation to decreased stress to reduced implicit bias against homeless people was, as predicted, significant (bias-corrected confidence interval $[-.8360, -.0138]$, which does not contain 0).²

Discussion

Practicing lovingkindness meditation significantly decreased implicit bias toward Blacks and homeless people, whereas discussing lovingkindness in a similar group setting did not. Although previous studies have demonstrated the effect of lovingkindness meditation on increased explicit positivity toward close others (Fredrickson et al., 2008) and strangers (Hutcherson et al., 2008), explicit attitudes toward Blacks and homeless people did not improve as a function of lovingkindness meditation in the current study. Because lovingkindness meditation practice does not relate directly to intergroup relations, participants might not have recognized the relevance to their conscious attitudes toward such strong and highly acceptable form of social bias. Another possibility is that explicit attitudes toward more categorically distinct groups, such as racial minorities and homeless people, may be more resistant to change than groups that are more open to decategorization or recategorization (Nier et al., 2001) such as unacquainted others. On the positive side, however, the lack of change in explicit attitudes suggests that participants' responses were not determined by demand characteristics, evaluation concerns, or experimenter expectancy effects. Explicit measures are particularly susceptible to these influences, and explicit intergroup attitudes did not change.

Our data indicated, though, that lovingkindness meditation had greater impact on implicit attitudes, which are automatically activated, rather than explicit attitudes, which are more controlled by conscious categorization processes. Implicit and explicit intergroup attitudes are only weakly correlated generally (Greenwald et al., 2009) and in the present study, and rely on different cognitive

² Changes in bias did not mediate the effect of meditation on stress reduction. When changes in homeless IAT scores, condition, and pretest stress ratings were considered simultaneously as predictors of post stress ratings, the effect of Condition on bias reduction stayed significant, $\beta = -.240$, $t(97) = -2.598$, $p < .05$, and changes in homeless IAT scores did not predict the posttest stress ratings, $\beta = .050$, $t(97) = 0.525$, $p = .601$.

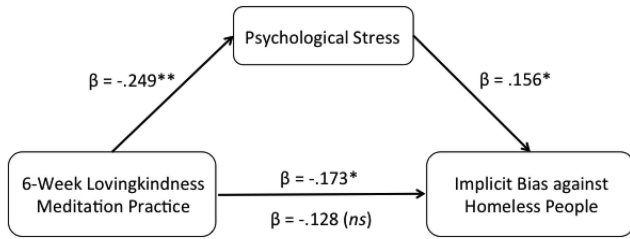


Figure 1. Meditation model. Psychological stress mediated the effect of 6-week lovingkindness meditation practice on implicit bias against homeless people, * $p < .05$, ** $p < .01$.

processes (Gawronski, Peters, Brochu, & Strack, 2008; Rydell & McConnell, 2006). We posit that extended practice in lovingkindness meditation that increases connectedness to others generally may have directly addressed some of the foundations of implicit bias against culturally stigmatized groups.

In addition, we found on both the explicit and the implicit (IAT) measures that bias was stronger against homeless people than Blacks. Perhaps because of the difference in cultural forces concerning bias against these two groups and the preexisting characteristics of those who are interested in meditation (Tanner et al., 2009), implicit bias against Blacks was only marginally significant for all participants at the time of pretest in the present study. Thus, there may have been more room for attitude change for implicit bias against homeless people than against Blacks, and the change from pretest to posttest for the lovingkindness practice condition was from essentially neutral to positive for implicit attitudes toward Blacks and from negative to neutral for homeless people. Nevertheless, we note that the magnitude of impact of practicing lovingkindness meditation for improving implicit attitudes was similar for the two groups (η^2 for the change from pretest to posttest for the race IAT = .272 and for the homeless IAT = .268).

Although implicit intergroup attitudes are difficult to change, growing evidence shows implicit bias reduction through unconscious and effortless activation of countergoal (Sassenberg & Moskowitz, 2005) or conscious and effortful affirmations of counterstereotypes (Kawakami et al., 2000). However, counterstereotypes affirmation training to explicitly motivate prejudice reduction can sometimes ironically increase prejudice (Legault et al., 2011). Lovingkindness meditation may offer an effective alternative that may embed improved intergroup attitudes along with a host of other personal benefits such as stress reduction (Astin, 1997) or mood improvement (Fredrickson et al., 2008), sustaining improved intergroup orientations without arousing rebound or backlash effects. We note, however, that we only tested for reduced implicit bias shortly after the completion of the study period. Therefore, the current study does not demonstrate the durability of the effect of lovingkindness meditation.

We further tested two potential mechanisms of such effect, using psychological stress and cognitive control as potential mediators. Previous research has revealed that IAT scores can be artificially elevated by stress and anxiety (Frantz et al., 2004; Terbeck et al., 2012). Thus, one way that practicing lovingkindness meditation might reduce implicit bias is by diminishing stress. Indeed, decreases in stress mediated the effect of lovingkindness meditation on implicit bias toward the homeless people, as we

predicted. However, although implicit bias toward homeless people and Blacks were significantly correlated, decreases in stress did not mediate reductions in implicit bias toward Blacks. Thus, alternatives to lovingkindness meditation, such as mere relaxation exercises, are unlikely to have the robust and generalized effect for bias reduction that we observed for lovingkindness meditation. However, the precise mechanism by which practicing lovingkindness meditation reduced implicit bias toward Blacks remains unclear.

We hypothesized that lovingkindness meditation would improve implicit attitudes toward Blacks by increasing cognitive control, and as predicted, increases in cognitive control were correlated with reductions in implicit bias toward Blacks but not toward homeless people. However, cognitive control did not increase with meditation practice and thus did not qualify as a mediator of the lovingkindness meditation effect. The lack of increase in cognitive control as a function of lovingkindness meditation is in contrast with the previous finding that showed enhanced cognitive control with lovingkindness meditation practice (Hunsinger et al., 2012). Attending a 3-day lovingkindness meditation course improved performances in Stroop task. It is, however, important to note that the participants' cognitive control was measured immediately following the lovingkindness meditation practice in the previous study, likely to have measured more state-like changes in cognitive control. By contrast, the present study assessed changes in cognitive control 3–7 days after the completion of lovingkindness courses, likely to have measured more trait-like changes that are more stable over time.

Although mindfulness meditation has been shown to increase cognitive control (Tang et al., 2007), lovingkindness meditation likely involves relatively more affective (vs. cognitive) modes of processing. Mindfulness meditation and lovingkindness meditation may differentially influence cognitive and affective downstream consequences, which then may result in different benefits in the context of social relations. For example, Desbordes et al. (2012) reported that mindfulness meditation decreases overall emotional reactivity to all positive, negative, and neutral stimuli, indexed by generalized decreases in activity within the right amygdala. In contrast, compassion meditation, a close sibling of lovingkindness meditation, increased emotional sensitivity, indexed by heightened amygdala activity, to stimuli depicting human suffering, a pattern of response previously associated with empathic concern and social emotions. These results suggest that in the context of social relations, benefits of mindfulness meditation may be the increased cognitive control over negative emotional reactivity, whereas lovingkindness meditation may cultivate feelings of connectedness by creating new positive associations. Because implicit biases toward homeless people have particularly strong affective components such as disgust (Harris & Fiske, 2006), increasing affective (stress) control may play a particularly strong role in reducing implicit bias toward them. Cognitive factors, perhaps related to recognition of societal and personal egalitarian goals regarding Blacks (Crandall et al., 2002), may play a larger role in implicit bias against Blacks, but our measure of cognitive control may not represent the most pertinent type of cognitive activity that is central to this process. Cognitive control is a multifaceted phenomenon, and MSIT, like the Stroop task, may measure only one aspect of cognitive control related to automatic response inhibition (Bush & Shin, 2006). Indeed, while

several plausible processes have been hypothesized, direct evidence of processes that mediate implicit bias, and particularly changes in implicit bias, is currently limited (Rudman, 2004). Therefore, we recommend those conducting future studies to use different measures of cognitive control that assess not only the ability to inhibit undesirable reactions but also the capacity to allocate attention as intended.

Future research might also consider the generalizability and longer term psychological and behavioral consequences of these effects of practicing lovingkindness meditation. In addition, in order to test whether these implicit changes will have any important real-life consequences, future studies may utilize more robust sets of behavioral indicators that assess the benefits of lovingkindness meditation in actual intergroup behaviors, such as positivity of nonverbal behavior in interracial interactions. Furthermore, in theory, lovingkindness meditation is intended to cultivate feelings of lovingkindness for all beings, including one's enemies. Therefore, in future studies, researchers may also use other motivationally relevant target groups and examine the effects of lovingkindness meditation on attitude changes among Israelis toward Palestinians, or use reviled social groups that involve strong negative associations, such as terrorists or pedophiles. Finally, because lovingkindness meditation involves complex processes, future studies might focus on other potential mechanisms such as positive emotions, cognitive flexibility, self-compassion, interpersonal security, empathy, perspective taking, and changes in individuals' notions of ingroup as a function of lovingkindness meditation. Nevertheless, the current research offers direct evidence that lovingkindness meditation can be used as a powerful tool not only for promoting personal health but also as an intervention for promoting healthy intergroup relations.

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