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Promoting Prosocial Behavior and Self-Regulatory Skills in Preschool Children Through a Mindfulness-Based Kindness Curriculum

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Self-regulatory abilities are robust predictors of important outcomes across the life span, yet they are rarely taught explicitly in school. Using a randomized controlled design, the present study investigated the effects of a 12-week mindfulness-based Kindness Curriculum (KC) delivered in a public school setting on executive function, self-regulation, and prosocial behavior in a sample of 68 preschool children. The KC intervention group showed greater improvements in social competence and earned higher report card grades in domains of learning, health, and social-emotional development, whereas the control group exhibited more selfish behavior over time. Interpretation of effect sizes overall indicate small to medium effects favoring the KC group on measures of cognitive flexibility and delay of gratification. Baseline functioning was found to moderate treatment effects with KC children initially lower in social competence and executive functioning demonstrating larger gains in social competence relative to the control group. These findings, observed over a relatively short intervention period, support the promise of this program for promoting self-regulation and prosocial behavior in young children. They also support the need for future investigation of program implementation across diverse settings.

Keywords: mindfulness, executive function, prosocial behavior, preschool, early childhood

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Social, emotional, and cognitive functioning are deeply intertwined throughout the life span. As such, self-regulatory skills are increasingly recognized as important contributors to school success. The capacity to regulate attention and emotion are forms of self-regulation that provide a foundation for school readiness by supporting dispositions conducive to learning and maintaining positive social relationships (Blair, 2002). The importance of developing such competencies early in life is underscored by longitudinal research demonstrating that self-regulation in childhood predicts health, financial stability, and educational attainment into adulthood (Moffitt et al., 2011). There is particular interest in training during early childhood, given the malleability and plasticity associated with this period of development. Furthermore, economists have demonstrated that investments in early childhood education pay for themselves, yielding a return of 7% or more (Heckman, 2011). Investment in early education, therefore, has the potential to increase health and reduce risk behaviors over the life span, thus reducing overall societal costs.

Healthy functioning across academic and social contexts requires exercising self-regulatory ability in the pursuit of short- and long-term goals. Self-regulation involves modulating feelings, thoughts, and behavior, and is associated with academic achievement and social competence, both concurrently and prospectively (Eisenberg, Spinrad, & Smith, 2004; Spinrad et al., 2006). In a classic delay of gratification paradigm, self-regulatory ability at age 4 (indexed by waiting a longer time for a reward) predicts attentional capacity, self-control, and frustration tolerance years later during adolescence (Eigsti et al., 2006; Mischel, Shoda, & Peake, 1988; Shoda Mischel, & Peake, 1990). Furthermore, children who are better able to delay also score higher on the SAT and are perceived as more interpersonally competent by parents and peers (Mischel, Shoda, & Rodriguez, 1989). In contrast, deficits in self-regulation can significantly interfere with learning (Barkley, 2001). Thus, the ability to enhance and strengthen attention and emotion regulatory resources warrants further investigation.

Attention and executive functioning play a key role in effective self-regulation. Executive functions (EFs) refer to an array of related, yet distinct cognitive processes, such as cognitive flexibility, inhibitory control, and working memory, which impact all

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areas of functioning (Anderson, 2002; McCloskey, Perkins, & Van Divner, 2009; Miyake et al., 2000; Zelazo, Carlson, & Kesek, 2008). The development of prefrontal cortical (PFC) regions are linked to attention and EFs, abilities which are present in a rudimentary form at the beginning of life and undergo rapid development, congruent with brain growth during the childhood years (Diamond, 2002). EFs are a fundamental component of school success and predict academic performance above and beyond general levels of intelligence (Blair & Razza, 2007). Therefore, early childhood is an opportune period of development for training such skills.

Despite evidence highlighting the importance of such self-regulatory skills to academic and life success, these skills are not often explicitly taught in school. Rather, instruction tends to emphasize academic knowledge and performance on standardized tests. There has been a surge in interest among educators, parents, and policymakers in addressing children's social and emotional development in addition to academic skills but, as yet, no clear consensus exists on what constitute the best strategies and methods for cultivating these positive qualities in young children (Greenberg et al., 2003). Emerging scientific evidence supports the training of these skills in children through a variety of modalities including mindfulness-based practices (Diamond & Lee, 2011).

Mindfulness Training and Education

Mindfulness training enhances attention and EF by bringing awareness to a particular attentional object, whether it is the breath, external stimuli, thoughts, or emotions. It entails noticing when the mind has wandered from its object of attention (monitoring) and returning attention back to the chosen object (shifting/cognitive flexibility). Training increases the ability to maintain engagement of self-regulatory neural circuits (PFC), resulting in improved sustained attention and emotion regulation (Lutz, Slagter, Dunne, & Davidson, 2008; MacLean et al., 2010).

Through the training of attention, the qualities of kindness and care toward oneself and others can be cultivated implicitly and explicitly. Young children, for instance, engage in setting daily intentions and age-appropriate practices to extend care and well wishes. A similar form of mental training is associated with increased activity in cortical areas responsible for empathy and compassion among adults (Lutz, Brefczynski-Lewis, Johnston, & Davidson, 2008) with measurable change in altruistic behavior and corresponding neural activity in as few as two weeks (Weng et al., 2013). Thus, these practices may effect changes induced through neural plasticity that support prosocial behavior and academic success (Davidson et al., 2012; Davidson & McEwen, 2012).

While the popularity of mindfulness programs for children has increased rapidly, there is a paucity of empirical research on the effects of such practices. Initial studies of mindfulness training with children show promising effects (e.g., Flook et al., 2010; Napoli, Krech, & Holley, 2005) and a review of meditation-based interventions among youth reported a median effect size between .27 to .70 for psychological and behavioral outcomes (Black, Milam, & Sussman, 2009). With some exceptions, existing research is primarily limited by a lack of randomized controlled trials and reliance on questionnaire measures. The present study uses a randomized controlled design to assess the effects of a mindfulness-based prosocial skills training curriculum on a range of cognitive and behavioral outcomes in preschool children. In addition, we examine moderators of the intervention effect with the hypothesis that those who are lower in prosocial skills and EF as assessed behaviorally at baseline will improve most in terms of teacher ratings of their social-competence over time.

Method

Participants

Seven classrooms were recruited from six different elementary schools within a public school district in a medium-sized Midwestern city. Within these schools, 37.9% of children are considered socioeconomically disadvantaged. A total of 99 children were invited to participate and parents of 68 indicated they wished to enroll their child in the study (acceptance rate = 68.7%). The sample included 40 White (58.8%), 8 Hispanic (11.8%), 4 African American (5.9%), 7 Asian/Pacific Islander (10.3%), 8 "Other"/mixed ethnicity children (11.8%), 34 girls (50.0%) and 33 boys (48.5%), with a mean age of 4.67 years ($SD = .27$). Of the parents, 49 (72.1%) were 4-year college graduates and 18 (26.5%) were not (demographic data were missing for one parent and child).

Participants were randomly assigned by classroom to either a mindfulness-based "Kindness Curriculum" (KC) intervention or a wait-list control group ($n = 30$ from three classrooms and 38 from four classrooms, for KC and control group respectively). Participants were assessed in individual testing sessions before and after the training period. All procedures for this study were approved by both the university and school district research review boards.

Kindness Curriculum (KC) Intervention

The intervention group received a 12-week mindfulness-based prosocial skills training designed for preschool-age children (see supplemental material for sample lessons). The foundation of the KC is mindfulness practice, aimed at cultivating attention and emotion regulation, with a shared emphasis on kindness practices (e.g., empathy, gratitude, sharing). The preschool KC is progressive in nature and incorporates children's literature, music, and movement to teach and stabilize concepts related to kindness and compassion. The curriculum was taught by experienced mindfulness instructors in a secular manner and was provided universally to children as part of their standard classroom instruction during regular school hours. Student training in the KC consisted of two 20–30 min lessons each week over a 12-week period, totaling approximately 10 hrs of training.

Measures

Teacher-rated social competence (TSC). Teacher's ratings of their student's social competence were obtained using items from the Teacher Social Competence Scale (Conduct Problems Prevention Research Group, 1995). The measure (overall $\alpha = .94$) was comprised of two subscales: a prosocial behavior subscale (seven items, showing empathy and compassion for others' feelings, $\alpha = .95$) and an emotion regulation subscale (five items, e.g., stopping and calming down when excited or upset, $\alpha = .82$). Items were rated on a 6-point Likert-type scale with higher scores indicating greater social competence.

Sharing task. This task was designed for use in the current study and consisted of four separate trials in which children distributed stickers between themselves and a target recipient. The four target recipients included a most- and least-liked peer (identified by the participant) from their class, an unfamiliar child, and a child who was sick. In each of the four trials, children were presented with an envelope for themselves labeled "me" and an envelope with a picture of the designated target recipient.

Children were given 10 stickers at the beginning of each trial and told they could keep as many as they would like for themselves and give as many as they would like to the other person. Scores were computed for each trial along with a total average score that reflected the number of stickers put in the "me" envelope across all four trials.

Delay of gratification. The delay of gratification task was based on Prencipe and Zelazo's (2005) procedure. The task included nine test trials requiring a choice between having a smaller reward "now" (one item) or a larger reward "later" (two, three, or five items). In the present study, rewards included food, crayons, and tokens (which could be exchanged for a variety of small toys). Scores were computed for all trials and each contingency representing the mean number of times the child chose the delay condition.

Dimensional change card sort task (DCCS). A computerized version of the dimensional change card sort (DCCS) task was used to assess cognitive flexibility, a core aspect of executive function (Garon, Bryson, & Smith, 2008). This task was taken from the National Institute of Health (NIH) Toolbox Cognitive Function Battery (Zelazo et al., 2013). The task requires participants to sort bivalent test cards first by one dimension (e.g., shape) and then sort the same cards by a second dimension (e.g., color).

The DCCS consists of three test blocks—preswitch, postswitch, and mixed. Practice trials (four trials for each dimension), are followed by the preswitch block (five trials). The postswitch block (five trials) requires sorting by the second dimension. The mixed block (40 trials) includes shifting between sorting dimensions.

Scoring followed recommended procedures (Zelazo et al., 2013), including the computation of a composite score that allows an equal contribution for accuracy and reaction time (RT). Composite scores were calculated for all trials as well as for only postswitch trials. Although the scoring procedures recommend using only the mixed block, the postswitch block was used given the large percentage of participants not receiving the mixed block due to low accuracy (the task ends if accuracy cut-off is not met). This postswitch block was seen as the next best proxy for cognitive flexibility since it still requires a shift in sorting dimension.

Flanker task. A computerized Flanker task, also from the NIH Toolbox Cognitive Function Battery (Zelazo et al., 2013), was used to measure inhibitory control, another core aspect of executive function (Garon et al., 2008). In this task, participants were presented with a row of five stimuli (either fish or arrows) and pressed one of two buttons indicating the direction the middle stimulus (either a fish or arrow) is pointing. During congruent trials all the stimuli are pointing the same direction while in the incongruent trials the flanking stimuli are pointing the opposite direction from the middle stimulus.

The Flanker task included three blocks: practice (four trials), fish (20 trials), and arrows (20 trials). Scoring followed recommended procedures (Zelazo et al., 2013), including the computation of a composite score that reflects equal contributions of accuracy and RT.

Both the Flanker and DCCS tasks have demonstrated excellent test–retest reliability (ICC = .92 for both tasks) as well as good convergent and discriminant validity (Zelazo et al., 2013).

School grades. Children's grades reflecting performance for the second half of the academic year were obtained from school records. Teachers assigned grades in five different domains using a 4-point scale with higher scores indicating the child met or exceeded expectations: Approaches to Learning (three items, persists with self-initiated activities, $\alpha = .76$), Cognition and General Knowledge (seven items, sorts and/or describes objects by size, shape, color, or use, $\alpha = .72$), Health and Physical Development (five items, demonstrates balance and strength, $\alpha = .77$), Language Development and Communication (nine items, retells a familiar story in sequence, $\alpha = .87$), Social and Emotional Development (seven items, displays age appropriate self-control, $\alpha = .86$).

Data Analysis

Independent *t* tests were conducted to compare groups at baseline. Repeated measures analysis of variance (RMANOVA) analyses were conducted with baseline scores entered as covariates to assess for group by time interactions. Subsequent RMANOVA models also included child gender and age as covariates. Paired *t* tests were used post hoc to examine change from pre- to post-test within intervention and control groups separately in cases where the omnibus *F* value from the RMANOVAs showed a significant effect (i.e., a significant group by time interaction effect controlling for baseline levels). For data only reported at post-test (i.e., school grades), independent *t* tests were used comparing groups postintervention. In addition, given the exploratory nature of this study and the relatively small sample size, we conducted both formal significance testing (using RMANOVAs and *t* tests) as well as generated effect sizes reflecting group differences. For measures assessed at both pre- and post-, we computed both within-group pre/post effect sizes (Cohen's *d*, using pooled pre- and post-test standard deviations) and between-groups effect sizes (computed as the difference between within-group *d*s, with KC *d* minus control group *d*, equivalent to Becker's *del,* 1988). For outcomes assessed only at post-test (school grades), only a between-groups *d* was computed, also using a pooled standard deviation. Effect sizes were interpreted based on Cohen's (1988) guidelines.

In order to assess for individual differences in response to intervention, ANOVA models were constructed, examining baseline by group interactions as a predictor of change. The small number of level two units (i.e., classrooms) precluded the possibility of modeling treatment effects in multilevel models (Snijders & Bosker, 2012). Intraclass correlation coefficients (ICCs) were computed to index the amount of variance in outcomes attributable to classrooms.

Results

There were no significant differences at baseline on any demographic variables or other measures assessed at baseline (i.e., delay of gratification, sharing task, TSC, DCCS, Flanker; $p > .05$).

Teacher-Rated Social Competence (TSC)

A significant group by time interaction was found in RMANOVA analyses (controlling for baseline levels) for TSC total score, $F(1, 63) = 6.78$, $p = .011$ as well as the prosocial behavior, $F(1, 63) = 4.37$, $p = .041$ and emotion regulation subscales, $F(1, 63) = 10.12$, $p = .002$. Results from all RMANOVA analyses along with group means and SDs are reported in Table 1. Significant pre/post change with large effect sizes was found for both groups in post hoc paired *t* tests for TSC total score (KC: $t(28) = 8.06$, $p < .001$, $d = 1.31$; control: $t(36) = 8.79$, $p < .001$, $d = 1.05$) as well as prosocial behavior (KC: $t(28) = 8.03$, $p < .001$, $d = 1.27$; control: $t(36) = 8.51$, $p < .001$, $d = 0.98$) and emotion regulation subscales (KC: $t(28) = 6.81$, $p < .001$, $d = 1.22$; control: $t(36) = 6.25$, $p < .001$, $d = 0.97$). A small between-groups *d* (computed as the difference between within-group *d*s) was found favoring the KC group for TSC total score ($d = 0.26$) as well as for the prosocial behavior ($d = 0.29$) and emotion regulation subscales ($d = 0.25$). RMANOVA analyses including gender and age did not change significance tests for the TSC total score or emotion regulation subscales; the RMANOVA including prosocial behavior was no longer significant, $F(1, 60) = 2.71$, $p = .105$.

Sharing Task

A significant group by time interaction was found with the RMANOVA analysis for sharing (total stickers kept for self), indicating that the control group kept significantly more for themselves over time relative to the KC group, $F(1, 58) = 6.53$, $p = .013$; Figure 1. This result remained significant when controlling for gender and age. Paired *t* tests conducted post hoc revealed a significant increase in stickers kept for self in the control group, $t(33) = 2.28$, $p = .029$, $d = 0.48$ but not in the KC group, $t(26) = 0.51$, $p = .613$, $d = 0.15$. The between-groups effect ($d = -0.33$) was small.

Delay of Gratification

No significant RMANOVA analyses were noted for the delay of gratification task (all trials: $F(1, 59) = 1.39$, $p = .244$, one vs. two: $F(1, 59) = 0.02$, $p = .901$, one vs. three: $F(1, 59) = 1.93$, $p = .170$, one vs. five: $F(1, 59) = 2.47$, $p = .121$). Within-group *d*s reflected small- to hyphenate increases in the KC group (*d*s = 0.42, 0.16, 0.47, and 0.48 for all trials, one vs. two, one vs. three, and one vs. five, respectively) and small increases in the control group (*d*s = 0.19, 0.20, 0.18, and 0.11 for all trials, one vs. two, one vs. three, and one vs. five, respectively). Examining between-groups *d*s, a small effect size was noted across all trials ($d = 0.23$), in one versus three ($d = 0.29$), and in one versus five ($d = 0.37$) trial types in the direction of more delay in the KC group relative to the control group. A very small effect size ($d = -0.04$) was noted favoring the control group on one versus two trials.

Dimensional Change Card Sort Task (DCCS)

No significant RMANOVA analyses were noted for the DCCS task (all trials: $F(1, 53) = 0.08$, $p = .785$, postswitch trials: *F*(1,

Table 1
Pre- and Post-Test Means and Standard Deviations for Behavioral Tasks and Teacher Report

Variable	Kindness curriculum			Wait-list control			Between-group *d*	*F*-value	*t*-value	*p*-value
	n	Post-test *M* (*SD*)	Post-test *M* (*SD*)	*n*	Pre-test *M* (*SD*)	Post-test *M* (*SD*)				
TSC—Total	29	3.23 (1.01)	4.32 (0.61)	37	3.10 (0.77)	3.91 (0.79)	0.26	6.78		.011*
TSC—PB	29	3.06 (1.11)	4.25 (0.72)	37	3.02 (0.91)	3.91 (0.93)	0.29	4.37		.041*
TSC—ER	29	3.46 (0.98)	4.43 (0.54)	37	3.22 (0.76)	3.91 (0.68)	0.25	10.12		.002**
Self Stickers	27	4.84 (2.15)	5.13 (1.78)	34	5.42 (1.90)	6.20 (1.33)	−0.33	6.53		.013*
Delay—all trials	27	1.47 (0.35)	1.61 (0.33)	35	1.44 (0.33)	1.50 (0.35)	0.23	1.39		.244
Delay—1 vs. 2	27	1.49 (0.37)	1.56 (0.39)	35	1.45 (0.36)	1.52 (0.40)	−0.04	0.02		.901
Delay—1 vs. 3	27	1.44 (0.36)	1.62 (0.38)	35	1.41 (0.37)	1.48 (0.38)	0.29	1.93		.170
Delay—1 vs. 5	27	1.47 (0.41)	1.65 (0.36)	35	1.47 (0.38)	1.51 (0.38)	0.37	2.47		.121
DCCS—All trials	24	4.75 (1.57)	5.73 (1.89)	32	4.66 (1.57)	5.84 (1.79)	−0.13	0.08		.785
DCCS—Post-switch	20	5.08 (1.83)	6.52 (1.44)	24	5.19 (1.48)	5.92 (1.86)	0.43	1.54		.222
Flanker	25	4.94 (1.78)	5.80 (1.90)	34	5.30 (1.64)	6.29 (1.46)	−0.17	0.62		.434
Grades—Learning	25		3.55 (0.36)	34		3.33 (0.42)	0.54[a]		2.05	.045*
Grades—Health	25		3.60 (0.28)	34		3.40 (0.41)	0.56[a]		2.23	.030*
Grades—Social/Emotional	25		3.51 (0.38)	34		3.16 (0.35)	0.97[a]		3.69	<.001***
Grades—Cognition	25		3.35 (0.43)	34		3.47 (0.33)	−0.30[a]		−1.14	.260
Grades—Language	25		3.50 (0.41)	34		3.46 (0.45)	0.09[a]		0.35	.728

Note. Smaller sample size (*n*) for DCCS postswitch trials due to children not performing at preswitch accuracy cut-off. TSC = Teacher Social Competence; PB = prosocial behavior subscale; ER = emotion regulation subscale; Self Stickers = stickers kept for self during Sharing Task; Delay = delay of gratification; DCCS = dimensional change card sort computer task; DCCS—All trials = composite score across all trials; DCCS—Post-switch = composite score across post-switch trials only; Learning = Approaches to Learning; Health = Health and Physical Development; Social/Emotional = Social and Emotional Development; Cognition = Cognition and General Knowledge; Language = Language Development and Communication; *d* = between-group Cohen's *d* computed as the difference (KC minus control) between within-group pre/post *d*s (within-group *d*s computed using an *SD* pooled between pre- and post-*SD*); *F* value = from group by time interaction term in RMANOVA analyses controlling for baseline levels; *t*-value = from between-group independent *t*-test for school grades which were only assessed at post-test.
[a] = Between-group *d* computed using means and *SD*s at post-test only for school grades.
* $p < .05$. ** $p < .01$. *** $p < .001$.

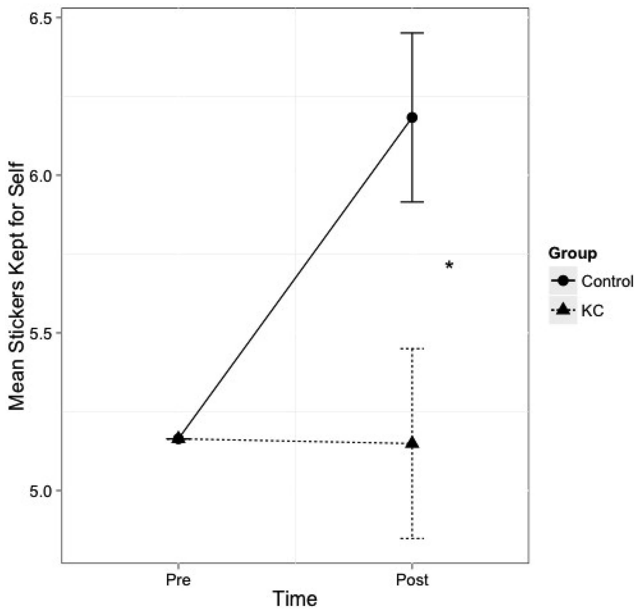

Figure 1. Treatment effects on sharing behavior. Over time, the control group kept more stickers for themselves (shared less with others), on average, across all trials relative to the KC group. Standard error bars are displayed. Plot displays results of RMANOVA analysis controlling for sharing at baseline.

41) = 1.54, p = .222). Medium to large effects were found pre/post for both the KC group (ds = 0.57 and 0.87, for all trials and postswitch, respectively) and control group (ds = 0.70 and 0.44, for all trials and postswitch, respectively). Examining between-groups ds, a small to medium effect size was noted in postswitch trials (d = 0.43) in the direction of improved cognitive flexibility in the KC group relative to the control group. A very small effect size favoring the control group was noted across all trials (d = −0.13).

Flanker Task

The RMANOVA analysis was not significant for the Flanker task, $F(1, 56) = 0.62$, p = .434. The pre/post within-group effect size was medium sized in both groups (ds = 0.47 and 0.64, for KC and control groups, respectively). The between-groups effect size was small in magnitude (d = −0.17) in the direction of improved inhibitory control performance in the control group relative to the KC group.

School Grades

Independent t tests revealed group differences on end of year school grades (see Figure 2). The KC group earned higher grades than the control group in Approaches to Learning, $t(57) = 2.05$, p = .045, d = 0.54, Health and Physical Development, $t(57) = 2.23$, p = .030, d = 0.56 and Social and Emotional Development, $t(57) = 3.69$, $p < .001$, d = 0.97. There were not differences between groups on Cognition and General Knowledge or Language Development and Communication ($p > .10$, ds = −0.30 and 0.09 for Cognition and Language, respectively).

Moderators of Treatment Effect

Moderators of the treatment effect were tested with ANOVA, using change in social competence total score as the outcome variable. In these models, baseline levels of social competence (total score: $F(2, 62) = 5.45$, p = .023 and prosocial behavior subscale: $F(2, 62) = 8.36$, p = .005), cognitive flexibility (DCCS, all trials: $F(2, 55) = 7.25$, p = .009), and inhibitory control (Flanker: $F(2, 55) = 14.72$, $p < .001$; Figure 3) significantly interacted with group to predict change in social competence. No other significant interactions were found ($p > .10$). Children in the KC group with lower levels of social competence and executive functioning at baseline showed larger improvements in social competence over time relative to the control group.

Intraclass Correlation Coefficients

Intraclass correlation coefficients (ICCs) were computed to index the amount of variance in outcomes attributable to classrooms (see the supplemental material, Table 2). As expected, ICCs were larger for teacher-reported outcomes (ICCs = .19 to .35 for TSC baseline and difference scores, ICCs = .17 to .48 for end-of-year grades). ICCs were close to zero (ICC < .02) for most behavioral tasks (baseline and difference scores) with the exception of the sharing task at baseline (ICC = .10 for self stickers), inhibitory control at baseline (ICC = .23 for Flanker), and change in delay (ICC = .05 for one vs. three trial types). Although there was a range of ICCs, classroom effects alone do not explain the pattern of results. However, the sizable ICCs for some teacher-rated outcomes highlights potential limitations of relying solely on teacher-based measures when conducting research in schools. This accentuates the need for including larger numbers of teachers and

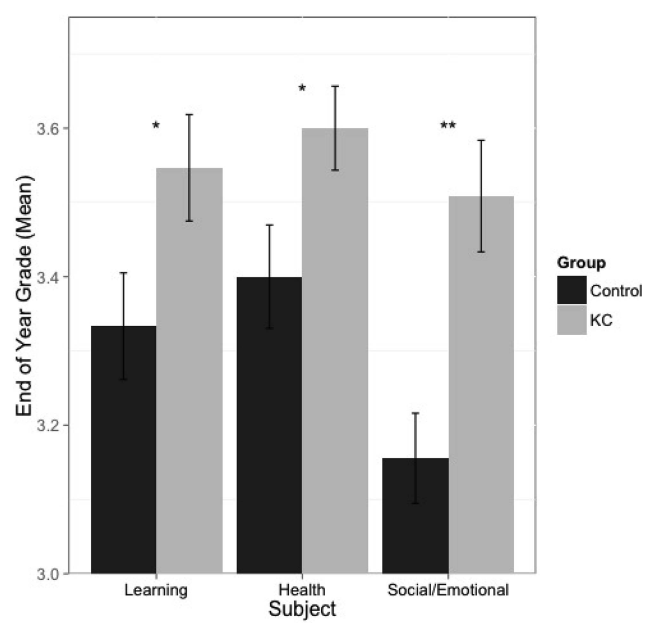

Figure 2. Group differences in end of year school grades. Kindness Curriculum group earned higher marks than control group across three subject areas.

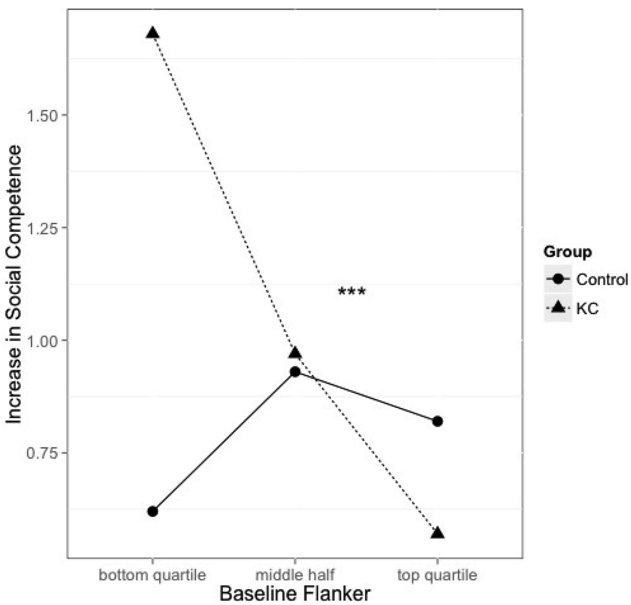

Figure 3. Individual differences in baseline inhibitory control predict response to intervention. Baseline inhibitory control (Flanker) predicts change (post/pre) in social competence. Mean change in social competence is displayed separately for KC and control group for bottom quartile, middle half, and top quartile performance on Flanker at baseline (quartiles computed for display purposes only). Children with lower inhibitory control in the KC group increased more in social competence compared to the control group. Interaction significant at $p < .001$.

classrooms in designs that can adequately model informant response biases in future work.

Discussion

This project demonstrated the feasibility and potential benefits of implementing a mindfulness-based prosocial skills training curriculum in a real world classroom setting. Results indicated improvements in response to intervention across a range of outcomes. Between-groups analyses indicated that students who participated in the Kindness Curriculum (KC) training showed larger gains in teacher-reported social competence as compared to the control group. In addition, the control group acted more selfishly (sharing fewer resources with others) over time as compared to the KC group. Comparison of end of year school records showed higher marks for children in the intervention as compared to control group on indicators of learning, social-emotional development, and health. Notably, these differences emerged for second semester report card grades assigned approximately three months after the end of the intervention. Examination of effect sizes favored the KC group on measures of cognitive flexibility, specifically, postswitch trials, and delay of gratification. Both groups showed improvement on the Flanker task, with a larger effect size observed in the control group, indicating that the intervention did not selectively improve inhibitory control. Overall, however, inspection of effect sizes lends support to a general pattern of change favoring the intervention group, even though not all outcomes were significant in the omnibus test of the group by time interaction, which highlights the need for larger samples in future studies.

Understanding differences in how individuals respond to intervention is useful, as there may be moderators of the intervention effect. Given the emphasis on prosocial skills development of this mindfulness-based curriculum, we focused on social competence as an outcome of interest, potentially moderated by individual differences. The KC intervention appears to have been particularly beneficial for some children, specifically those with lower baseline functioning. Children in the intervention group who started out with lower social competence and lower executive functioning (indexed by inhibitory control and cognitive flexibility) at baseline showed greater improvements in social competence relative to the control group. This pattern of differential treatment effects is consistent with previous research documenting larger gains among children with poorer baseline function (Diamond & Lee, 2011; Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008). Taken together, the findings from this study suggest that there are benefits for a general education classroom and that children with deficits in executive function and social competence may experience additional gains.

That these changes were observed after a relatively short intervention period with a very modest dose of the intervention supports the practicality of this approach. The training shows promise as an accessible and cost-effective strategy to promote well-being and prosocial behavior by training noncognitive skills that are also important for academic success. Taking a universal preventive approach may set children on a positive trajectory for ongoing development. As effects of self-control are found to follow a gradient, an intervention that produces even small increases in self-control could yield societal benefits by shifting the distribution of associated outcomes (Moffitt et al., 2011).

While teachers were not blind to the study condition, the present methods include objective behavioral measures along with informant report. Additionally, report card grades were assigned approximately three months after the end of the intervention and grades were not higher across all subject areas for the intervention group. This suggests that teachers did not demonstrate a systematic bias in assigning student grades. Rather, differences may reflect particular domains of performance in which intervention group children demonstrated greater competence. The findings that individual differences moderated improvement in social competence further suggest a lack of uniform bias displayed by teachers in their ratings of children in the intervention group. The current study is limited by the relatively small sample size. Larger samples that enable analyses to account for the nested structure of data and follow-up to assess longer-term effects of training at six months and beyond are needed to more rigorously assess the effects of training. Assessment would be augmented by incorporating other objective measures such as cortisol (as a biological marker of stress) and third party observations of classroom behavior. Future work should also explore ongoing supports for practice as well as adding a parent component to training as recent research indicates a stronger impact of child training when combined with parent training (Neville et al., 2013).

This study demonstrates the promise of incorporating mindfulness-based training into an early education curriculum. Overall, these results suggest that a relatively brief mindfulness-based training can enhance a range of academic and prosocial outcomes in young children. Clearly, more work is needed on the cultivation of kindness and compassion in young children and their parents and teachers. Training these skills and capacities early in life has important consequences throughout development, at both an individual and societal level.

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