

Mindfulness Meditation May Lessen Anxiety, Promote Social Skills, and Improve Academic Performance Among Adolescents With Learning Disabilities

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Students with learning disabilities (LD; defined by compromised academic performance) often have higher levels of anxiety, school-related stress, and less optimal social skills compared with their typically developing peers. Previous health research indicates that meditation and relaxation training may be effective in reducing anxiety and promoting social skills. This pilot study used a pre–post no-control design to examine feasibility of, attitudes toward, and outcomes of a 5-week mindfulness meditation intervention administered to 34 adolescents diagnosed with LD. Postintervention survey responses overwhelmingly expressed positive attitudes toward the program. All outcome measures showed significant improvement, with participants who completed the program demonstrating decreased state and trait anxiety, enhanced social skills, and improved academic performance. Although not directly assessed, the outcomes are consistent with a cognitive-interference model of learning disability and suggest that mindfulness meditation decreases anxiety and detrimental self-focus of attention, which, in turn, promotes social skills and academic outcomes.

Keywords: *achievement; anxiety; learning disability; meditation; social skills*

A small but growing body of literature in the area of complementary and alternative health treatments has demonstrated that meditation and relaxation training may be effective for reducing anxiety (Barnes, Davis, Murzynowski, & Trieber, 2004; Manocha, Marks, Kenchington, Peters, & Salome, 2002), enhancing social skills (Ganguli, 1988), and improving self concept (Swanson & Howell, 1996). High levels of anxiety and school-related stress have been associated with learning disabilities (LD), which is defined exclusively in terms of academic difficulties (Fisher, Allen, & Kose, 1996; Gresham & Elliott, 1987). To our knowledge, no published research to date has examined the effects of meditation on anxiety levels, social skills, and academic performance of adolescents and none has investigated meditation and relaxation training as a means for promoting the psychological, social, and academic functioning of individuals with LD. This study addressed these gaps in the literature. The following literature review describes research on anxiety and social skills

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among students with LD, a few common approaches to meditation and relaxation training, and the potential for meditation to reduce anxiety and promote social functioning.

Anxiety and Social Skills Among Children and Adolescents With LD

Much research has demonstrated increased anxiety levels among children with LD (e.g., Fisher, et al., 1996; Margalit & Zak, 1984); however, the origin of the anxiety and the nature of its relation to LD remain a topic of debate. More specifically, some researchers have proposed a “deficit in study skills” model (e.g., Paulman & Kennelly, 1984). According to this view, anxiety is a byproduct of deficient knowledge and the awareness that one is unprepared. In contrast, others have advocated for a “cognitive-interference model” (e.g., Wine, 1971, 1982) to explain decrements in the academic performance of individuals with LD. From this perspective, the poor performance of anxious individuals is a result of problems with attentional focus, concern about competence, and a preoccupation with self-oriented and negative thoughts (Swanson & Howell, 1996; Wine, 1971, 1982).

In an effort to inform this controversy, Swanson and Howell (1996) examined the relative influence of cognitive interference and study habits on test anxiety and academic achievement of 82 adolescents with LD. Swanson and Howell concluded that both study skills and cognitive interference are involved, with cognitive interference being the most powerful predictor of anxiety. Clearly, these factors need not be mutually exclusive, and although directions of influence are difficult to clarify, the processes may be most accurately conceptualized as dynamic and transactional (Kurosawa & Harackiewicz, 1995). Nonetheless, given the important, potentially causal role of cognitive interference, it is worthwhile to explore methods that have the potential to diminish cognitive interference, such as meditation and relaxation training, which may, in turn, lead to decreases in anxiety and improved academic outcomes.

We were also interested in exploring the potential of meditation and relaxation training to enhance the social competence of individuals with LD. Indeed, social competence, social cognition, social behavior, social relationships, peer status, self-concept, interpersonal skills, social adjustment, classroom behavior, and communicative competence are areas of potential social difficulty for students with LD (Kavale & Mostert, 2004). Generally speaking, the social skills deficits characteristic of LD have been conceptualized as social manifestations of disorganized auditory and visual-spatial functions. To the degree that meditation and relaxation training may reduce anxiety and promote attentional factors, these changes may be accompanied by enhanced social skills.

Meditation and Relaxation Training

During the past 25 years, the emergence of complementary and alternative medicine therapies as useful and effective therapeutic tools in conventional medicine has led to the exploration of meditation for treating and managing a variety of illnesses. There appears to be growing acceptance of the therapeutic effects of meditation as a functional treatment modality that may be due, in part, to evidence-based experimental studies documenting the positive effects of meditation on various physiological and psychological conditions

(Barnes, Treiber, & Davis, 2001; Davidson et al., 2003; DeBerry, Davis, & Reinhard, 1989; Grossman, Niemann, Schmidt, & Walach, 2004; Koszycki, Bengler, Shlik, & Bradwejn, 2007; Sephton et al., 2007; Teasdale et al., 2002). One factor that complicates the application and contribution of these studies is the wide variation in the meditation techniques employed across studies.

Meditation is associated with numerous techniques in a range of disciplines and falls into the category of *mind–body medicine*, a term that refers to a “collection of treatments that recognize the bidirectional nature of psyche and soma” (Monti & Yang, 2005, p. 227). For example, one approach to meditation and relaxation is a traditional system of movement meditation based on yoga-type principles (Manocha et al., 2002), which incorporate muscle relaxation, breath control, and mental focus on particular body movements and postures. Although not a meditation technique, progressive muscle relaxation training is an approach that integrates some similar principles, including relaxed posture, controlled breathing, and attention to feelings and sensations that accompany the relaxation phase, while incorporating the systematic innervation and relaxation of certain muscle groups (Ewart, 1987; Schneider et al., 1995).

Another popular approach is transcendental meditation, a technique that typically uses a standard seven-step protocol involving regular and frequent sessions, sitting comfortably with eyes closed, consultation with a meditation instructor, and repetition of an individual mantra. The goals of this technique are to achieve restful alertness (i.e., a state of increased awareness during deep relaxation), eliminate stress, increase creativity and intelligence, and promote happiness and fulfillment (Russell, 1976). There has been much research illustrating the effectiveness of transcendental meditation on both physical and mental health, including improved performance in various cognitive and affective functions, decreased anxiety levels, as well as changes in neural regulation (Infante et al., 1998; So & Orme-Johnson, 2001).

A particularly relevant approach for the present purposes is a technique known as mindfulness meditation (MM), a basic sitting meditation technique believed to help stabilize the mind and “develop the capacity for relaxed, choiceless awareness in which conscious attention moves instantly and naturally among the changing elements of experience” (Germer, Siegel, & Fultun, 2004, p. 16). In MM training, the breath or another object is used as a reference point for being mindful in the present moment. Thoughts, emotions, and sensations that may arise are neither judged nor engaged but simply experienced, acknowledged, and released. The result is increased present-moment awareness and greater acceptance of oneself (Germer et al., 2004; Kabat-Zinn, 1994; Kabat-Zinn et al., 1998). Crucially, a longitudinal and experimentally controlled examination of MM indicated that it can be effective for treating anxiety disorders and can have long-term beneficial effects (Miller, Fletcher, & Kabat-Zinn, 1995).

Studies of Anxiety and Meditation

State and trait anxiety is a distinction first proposed by Spielberger, Gorsuch, and Lushene (1970) that has proven useful for understanding the construct of anxiety as well as the links from anxiety to behavior and learning (Heinrich & Spielberger, 1982). As Spielberger et al. (1970) explain,

State anxiety may be conceptualized as a transitory emotional state or condition . . . that varies in intensity and fluctuates over time. This condition is characterized by tension and apprehension, and activation of the autonomic nervous system . . . Trait anxiety refers to relatively stable individual differences in anxiety proneness, that is, to differences between people in the tendency to respond to situations perceived as threatening with elevations in [state-anxiety] intensity (p. 3).

Much enthusiasm has surrounded the use of meditation for treating anxiety but relatively few studies have been published in the peer-reviewed literature; those reports are typically (but not uniformly) favorable. For example, in efforts to discriminate demand from therapeutic effects, Smith (1976) randomly assigned study participants into a transcendental meditation group, a periodic somatic inactivity group (which involved simply sitting without meditation guidelines—a control intervention designed to be equivalent to meditation in terms of both expectations and the repeated quiet sitting involved in meditation), or a no-treatment control group. Results indicated that both the meditation and periodic somatic inactivity groups improved in state and trait anxiety relative to the no-treatment control. However, participants in the meditation group enjoyed no benefits beyond those in the periodic somatic inactivity group. Smith concluded that the beneficial effects of meditation were a product of expectations, sitting, or both and not a result of attentional processes.

In response to the Smith study, Zuroff and Schwartz (1978) used transcendental meditation with college students who had no prior meditation training of any kind. To isolate the effects of cognitive and physiological factors, participants were assigned to a meditation group, a muscle relaxation group, or a no-treatment control group, each lasting 9 weeks. In contrast to Smith (1976), results indicated reductions in self-report measures of trait anxiety among participants in the meditation group (state anxiety was not assessed). Zuroff and Schwartz argued that the gradual reductions in anxiety observed for the meditation group were consistent with a true treatment effect.

In a related vein, DeBerry et al. (1989) conducted a 10-week experiment using 32 participants, aged between 65 and 75 years, who complained of anxiety, nervousness, tension, insomnia, and depression. When compared with a cognitive therapy group and a pseudotreatment control group (where participants were only offered information about anxiety and opportunities to discuss anxiety), the meditation group demonstrated a significant decrease in state anxiety; however, no significant treatment effect was observed for trait anxiety. The authors concluded that “it is easier to reduce anxiety on a short-term basis by producing a pleasant mental state than it is to change a belief system that has been defensively entrenched for years” (p. 244).

Although there have been several studies examining the effects of meditation on anxiety, there has been little research with regard to specific anxiety disorders. Koszycki et al. (2007) examined the effectiveness of mindfulness-based stress reduction (MBSR) in treating individuals with generalized social anxiety disorder (SAD). The study examined 53 participants diagnosed with SAD who were assigned to either an 8-week MBSR program (27.5 hr of treatment) or a 12-week cognitive-behavioral group therapy (CBGT) program (30 hr of treatment). Results indicated that both MBSR and CBGT serve as effective treatment modalities for social anxiety. Although the CBGT participants demonstrated greater reductions in fear of interacting with others and in clinician-rated avoidance of social phobic situations, MBSR did show improvements in social anxiety symptoms and was equally effective in decreasing

self-rated depression and improving quality of life, indicating that MBSR may be potentially useful as an alternative intervention for individuals with SAD.

The aforementioned studies yielded mixed results, which may be due in large part to the nature, intensity, and length of treatment; the populations surveyed; and the types of outcome measures used to assess anxiety. Although there is some evidence to support the notion that meditation is effective for reducing anxiety, it is unclear whether state or trait anxiety is the most appropriate target for this type of intervention.

Studies of Social Skills and Meditation

We are aware of only one peer-reviewed study that has specifically examined the effectiveness of meditation in the development of social skills. Using a qualitative approach, Ganguli (1988) examined the impacts of meditation on the social skills of 230 adults (133 males, 97 females). The meditation training consisted of a 4-day large-group training program focusing on inner visualization, followed by weekly workshops with smaller groups that centered on more specific themes such as pain control and creative visualization. Participants were asked to self-monitor whether they experienced gains across several dimensions, including their social and interpersonal relationships, which were based on perceived quality of their social skills (e.g., appropriate expressions of feelings, appropriateness of their verbal and nonverbal behaviors, and aspects of communication such as facial expression, posture, intonation, and gesture). Content analysis of the responses indicated improvement in interpersonal relations in 100% of participants, demonstrating a positive effect of meditation training on social functioning. The design and data collection procedures did not allow for inferences of causality. At present, the assertion that meditation powerfully influences social skills, although plausible, must be viewed as tentative.

Statement of the Problem

Based on prior research linking learning disabilities to anxiety, social skills, and academic outcomes, and in light of some evidence for the benefits of meditation for reducing stress and enhancing social functioning, we hypothesized that meditation designed to mitigate cognitive interference would be associated with a range of positive outcomes. Specifically, this study assessed anxiety (state and trait), social skills (from students' and teacher's perspectives), and academic performance among adolescents with learning disabilities, with measures taken before and after 5 weeks of an MM intervention. MM was chosen because it is designed to reduce stress, promotes self-understanding and acceptance, discourages preoccupying negative self-evaluations (i.e., cognitive interference), and cultivates a stable and nonreactive present-moment awareness.

Method

Participants

Participants were recruited from four high school classes (class size ranged from 8 to 12 students in each) in a private residential school in Vermont specializing in serving students

who have a primary diagnosis of LD. The participants were 34 students (age range, 13 to 18 years; mean, 16.61 years) diagnosed with LD and two of their teachers. Twenty-nine percent of these students were female and 71% were male. Of the two participating teachers, one was male and one female. The teachers had 9 years of combined teaching experience specific to this population of students and neither had any prior meditation training. Responses to a brief anonymous questionnaire indicated that 53% of students previously had some experience with meditation and/or relaxation training. No data were collected to assess the socioeconomic and educational backgrounds of the students, the teachers, or the students' families.

Measures

Social Skills Rating System (SSRS). The SSRS (Gresham & Elliot, 1990) is a standardized measure designed to assess the perceived frequency and importance of behaviors influencing student functioning. The SSRS uses a multirater approach comparing student, teacher, and parent ratings to national norms compiled from a sample of more than 4,000 children. The SSRS teacher form contains three subscales to assess social skills, problem behaviors, and academic performance, whereas the student form focuses solely on perceived social skills. The SSRS has demonstrated acceptable internal consistency and test–retest reliability across all forms as well as adequate criterion-related construct validity.

The State–Trait Anxiety Inventory (STAI). The STAI (Spielberger et al., 1970) is a self-report measure designed to assess state and trait anxiety. For the purposes of this study, the STAI adult form was used, as it is designed for norm groups that include high school students. The STAI is a well-validated and widely used measure of state and trait anxiety that has demonstrated adequate test–retest reliability and criterion-related validity.

Attitudinal questions. Students also completed informal, anonymous postintervention questionnaires, containing three Likert-type scale questions (e.g., 1 = *strongly agree*, 5 = *strongly disagree*), to assess their own focus in class, rate their enjoyment of the intervention, and to assess the likelihood of continuing to use MM on their own. In addition, students were asked two open-ended questions addressing what, if anything, they enjoyed or would change about the MM exercises.

Design and Procedure

This pilot study used a pre–post no-control design. Oversight for this study was conducted by the Institutional Review Board at the University of Vermont. Additionally, permission to conduct the study was granted by school officials. Parents and students were notified and provided an explanation of the study and research methods, and parents were asked to sign permission forms prior to student participation. Of the 44 students invited to participate, 34 returned signed slips indicating permission to participate (77% response rate). Thus, MM was optional for students (based on student and parental consent), and those opting not to participate were offered alternative, nondisruptive in-class activities (e.g., silent reading or in the case of the more lengthy initial training, permission to go to the library).

Prior to student MM training, the principal investigator and classroom teachers received training by an expert in MM in preparation for student instruction. Training took place during a single session in one of the participating teacher's classrooms and lasted approximately 2 hr. The training was provided by an MM instructor and included an explanation of the mindfulness approach, benefits of the technique, key principles to emphasize when instructing the others in the use of MM, opportunities to engage in MM, and a question and answer period. As such, training included direct instruction, modeling, and practice. Additionally, participating teachers were provided with audio tapes of *Wherever You Go There You Are* (Kabat-Zinn, 1994) as an educational tool to enhance understanding and reinforce principles articulated in direct instruction by the MM instructor.

The initial MM training for students lasted approximately 45 min and was conducted during two separate sessions led jointly by the primary investigator and the classroom teacher. Although no formal script was used during student instruction, a standard procedure was employed to ensure that the training of the two groups was equivalent and consistent in content with the original training of the primary investigator and the teachers. Specifically, students were first asked to sit and were given the option of keeping eyes open or closed. Then, students were instructed to initially focus attention on their breathing by following their breath as it entered in through the nose and was released slowly out through the mouth, in an effort to develop calmness and stability. After successfully developing a sense of calm, students were encouraged to note thoughts and feelings as they occur, thereby increasing awareness. Consistent with MM training, MM was modeled and students were provided opportunities to practice MM and pose questions. In line with the MM literature (Kabat-Zinn, 1994; Koszycki et al., 2007), the goals of intentionally observing thoughts or feelings and nonjudgmental attention were made explicit. If students sensed that they became engaged or somehow enmeshed in thoughts, feelings, or sensations, they were encouraged to silently identify and acknowledge these experiences in a nonjudging way.

After completing the initial training, the classroom teacher continued to lead the ensuing sessions and was instructed to reinforce the content of the students' original training in MM as needed. According to the two teachers, the need for additional reinforcement was minimal. The intervention consisted of meditation sessions for 5 to 10 min at the beginning of each class period 5 days per week for 5 consecutive weeks.

Results

Data were submitted to a series of related-sample *t* tests to make comparisons between pretests and posttests. Each comparison employed an α level of .05. Trait anxiety scores were significantly higher at pretest ($M = 42.56$) compared with posttest ($M = 39.68$), $t(33) = 2.88$, $p < .05$. Similarly, state anxiety scores were significantly higher at pretest ($M = 38.21$) compared with posttest ($M = 32.59$), $t(33) = 4.88$, $p < .05$.

The student SSRS forms yielded a single composite standard score for students' self-reported social skills. These data showed significant improvements from pretest ($M = 95.68$; percentile rank = 31) to posttest ($M = 100.06$; percentile rank = 43.5), $t(33) = 3.11$, $p < .05$. The teacher SSRS forms yielded three separate standard scores in accord with the three subtests designed to assess social skills, problem behaviors (reverse scored), and academic

achievement. A significant difference emerged for teacher ratings of students' social skills such that student social skills showed improvement from pretest ($M = 86.65$; percentile rank = 18.5) to posttest ($M = 94.41$; percentile rank = 55.5), $t(33) = 3.35$, $p < .05$. Teacher ratings of students' problem behaviors also showed significant improvement, decreasing from pretest ($M = 116.06$; percentile rank = 85.5) to posttest ($M = 105.74$; percentile rank = 66), $t(33) = 4.95$, $p < .05$. Finally, teacher ratings of students' academic achievement showed significant improvements from pretest ($M = 87.56$; percentile rank = 28.6) to posttest ($M = 92.68$; percentile rank = 33.6), $t(33) = 4.84$, $p < .05$.

To learn more about their attitudes toward MM, students were asked to complete a brief, anonymous questionnaire posttest. Using a Likert-type scale (1 = *strongly agree*, 5 = *strongly disagree*), students were asked to respond to three statements. When provided the statement "I enjoyed the meditation and relaxation training," the mean student response was 1.5 (between *strongly agree* and *somewhat agree*). Using the same response scale, students were given a statement representing the degree to which the meditation training helped them focus better in class, resulting in a mean score of 1.5, as well as a statement indicating the likelihood of continuing meditation and relaxation practice on their own ($M = 1.8$).

The questionnaire also asked students to offer a brief written response to two open-ended questions. Scrutiny of the responses revealed a limited number of themes and attitudes. The nature and number of coding categories were determined by generating a list of the primary attitudes expressed so that responses could be grouped and quantified. One question asked what they liked best about the meditation and relaxation training. Of the 88.24% of students who responded to this question, 100% reported positive feelings about the meditation and expressed that the meditation led to feelings of calm, quiet, relaxation, peacefulness, or better overall feelings. A second open-end question asked if there was anything that they would recommend having changed about the MM experience. Of the 73% of students who responded, 64% reported they would change nothing, 20% reported that they would make the meditation sessions longer, and 16% reported that they would make the sessions shorter. No other attitudes were expressed in response to these open-ended questions.

In addition, anecdotal reports from students, teachers, and parents were uniformly positive, and no concerns or dissatisfaction were expressed with the intervention at any time. Anecdotal reports from teachers also indicated no tensions (e.g., teasing, boredom) regarding nonparticipating students, suggesting feasibility for this intervention when applied in a classroom setting where not all students (or their parents) provided their explicit permission to join in the meditation. The attrition rate for this study involving a 5-week intervention was 0%.

Discussion

This pilot study provides feasibility and preliminary outcomes data regarding the effectiveness of meditation and relaxation training as an intervention to reduce anxiety and promote the social functioning and academic performance of adolescents with LD. We hypothesized that MM would be instrumental in decreasing anxiety (and minimizing cognitive interference), which would, in turn, yield positive outcomes across the targets surveyed. Although anecdotal reports from several students support the notion that decreases in

cognitive interference indeed occurred, cognitive interference was not directly assessed in this study, making inferences about its role tentative. At present, our findings merely demonstrate a relationship between MM and all of our outcome measures. In line with our expectations, state and trait anxiety as indexed by self-report scales decreased significantly from pretest to posttest. In addition, social skills assessed on the basis of students' and teachers' reports demonstrated improvements, as did academic performance according to teachers' ratings. Our findings are consistent with previous research supporting the effectiveness of meditation and relaxation training as an intervention for both physiological and psychological functioning across populations (Barnes et al., 2001, 2004; Ewart, 1987; Keefer & Blanchard, 2001; Manocha et al., 2002; Miller et al., 1995).

The present results are consistent with the cognitive-interference model (Wine, 1971), which emphasizes the nature of the attentional focus thought to be accompanied by anxiety. Internal focus on self-evaluative and self-deprecatory thoughts may negatively influence the performance of LD individuals (Swanson & Howell, 1996; Wine, 1971, 1982; Kurosawa & Harackiewicz, 1995). In line with Smith (1976) but contrary to DeBerry et al. (1989), who observed only changes in state anxiety, we observed significant effects for both state and trait anxiety. DeBerry et al. (who employed the same measures of anxiety used presently) concluded that their 10-week meditation and relaxation training with older people produced immediate and context-dependent effects but was insufficient to "change a belief system that has been defensively entrenched for years" (p. 244). Of course, the variation in the results may be because of the nature and duration of the training as well as the population targeted. Indeed, it is highly plausible that belief systems may be more firmly "entrenched" in a geriatric population. An alternative explanation of the variability in results, however, involves not the degree to which an attitude has been established but differences in the nature of the stressors experienced by adolescents with LD. In describing the characteristics of a situation that closely resemble descriptions of cognitive interference as well as the stressors often cited in the anxiety and LD literature, Heinrich and Spielberger (1982) explain that "differences in performance on learning tasks for subjects differing in trait anxiety have been observed primarily when . . . conditions involve some form of psychological stress, such as direct or implied threats to self-esteem, ego-involving instructions, or failure feedback" (p. 148).

Furthermore, state and trait anxiety scales contain identical phraseology with the exception that the former asks the respondent to report how they feel "right now" whereas the latter asks how they feel "most of the time." Although this captures an important distinction, state and trait anxiety are also clearly interrelated, in that highly trait-anxious persons are more likely to respond to threatening situations with elevations in state anxiety (Heinrich & Spielberger, 1982). Thus, it is quite possible that MM may be effective at decreasing cognitive interference and that this outcome may be reflected in measures of state anxiety, which, in turn, may affect perceptions of trait anxiety. Simply put, if individuals are able to divest themselves of perseverating and negative self-evaluative thoughts, they may perceive that they less often feel anxious at any particular moment, and in turn, they might also report feeling less anxious in general.

Several limitations of this study warrant mention. A control group (or even a wait control group) was not deemed ethically or practically viable in this study, which involved a 5-week intervention focusing on a special population of students in a school setting. This makes our

pilot study vulnerable to a variety of threats to internal validity. Despite the fact that teachers and students were not informed as to the specific hypotheses of this study, it must be acknowledged that the results we observed may, to some degree, reflect an effect of response demands. Expectations of positive outcomes and related factors involving increased time and attention (as opposed to MM) to student well-being may have affected our results. On the other hand, the strong agreement between teachers and students on all measures, in combination with the students' responses to the qualitative questions regarding the MM experience, seem to diminish this likelihood. Nonetheless, future research incorporating a control intervention (e.g., a muscle relaxation group) is needed to eliminate this possibility.

Additional threats to internal validity that are posed by the lack of a control group include maturation and history. Given the relatively short duration of the intervention (i.e., 5 weeks), maturation is an improbable competing interpretation. With regard to history, we are aware of no factors operating concomitantly with the intervention that could have influenced our findings. Even so, conclusions about the nature of the relationships among MM, cognitive interference, state and trait anxiety, social skills, and academic performance remain tentative. Given previous empirical support for training in MM to reduce cognitive interference (Sarason, Sarason, Keefe, Hayes, & Shearin, 1986; Sarason & Stoops, 1978), and the close conceptual link between cognitive interference and anxiety, we propose that anxiety- and cognitive-interference-reducing properties of MM contributed to decreased anxiety and enhanced social skills and academic performance. Of course, even if decreases in cognitive interference occurred, directions of influence cannot be clarified given this study's quasi-experimental design. For instance, better social skills and academic performance have the potential to reinforce and sustain decreased cognitive interference and anxiety, and as noted previously, the nature of the relation between these factors may be most appropriately construed as dynamic and transactional. To explore the nature of these relationships directly, future research would benefit from implementation of instruments specifically designed to assess intrusive thoughts—for example, the Cognitive Interference Questionnaire (Sarason & Stoops, 1978) and the Thought Occurrence Questionnaire (Sarason, Pierce, & Sarason, 1996). When used in an experimental design, such measures have the potential to inform our proposed causal model. Clearly, a future-controlled experimental design is needed to isolate active treatment variables, eliminate threats to internal validity, and verify causality and directions of influence.

Future research may also benefit from the use of more extensive qualitative data in the form of semistructured in-depth interviews. Such data are rich and have the potential to reveal much about the subjective impressions of MM with regard to both process and outcomes and may point to additional lines of research. Finally, although previous research has revealed large and lasting benefits of MM for reducing anxiety (Miller et al., 1995), the long-term impact of this treatment on social and academic functioning remains a topic for future research using longitudinal designs.

At present, this study offers tantalizing, if tentative, support for the notion that meditation and relaxation training may contribute to better outcomes for adolescents with LD across a range of targets. In addition, when teachers and students expressed attitudes toward the intervention, they were uniformly positive and this was true for both the brief qualitative posttest questions as well as anecdotal reports. Furthermore, anecdotal evidence from teachers suggested that the intervention was feasible when conducted in a classroom populated by

students who chose to participate and not participate. Given the relatively expensive and time-consuming interventions often proposed to address the challenges faced by individuals with LD, time- and cost-effective mindfulness-based group interventions may serve an important complementary role to other treatments.

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