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### Effectiveness of a School-Based Yoga Program on Adolescent Mental Health, Stress Coping Strategies, and Attitudes Toward Violence: Findings From a High-Risk Sample

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# **Effectiveness of a School-Based Yoga Program on Adolescent Mental Health, Stress Coping Strategies, and Attitudes Toward Violence: Findings From a High-Risk Sample**

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*This study aimed to assess the effectiveness of a universal yoga-based social-emotional wellness promotion program, Transformative Life Skills, on indicators of adolescent emotional distress, prosocial behavior, and attitudes toward violence in a high-risk sample. Participants included 49 students attending an alternative education school in an urban inner-city school district. Results indicated that students who participated in the Transformative Life Skills program demonstrated significant reductions in anxiety, depression, and global psychological distress. Significant reductions in rumination, intrusive thoughts, physical arousal, and emotional arousal were reported as well. Students exposed to Transformative Life Skills reported being significantly less likely to endorse revenge-motivation orientations in response to interpersonal transgressions and reported overall less hostility than did students in the comparison condition. No significant improvements in somatization or general affect were found. Results of this pilot study provide evidence of the potential for Transformative Life Skills to influence important student social-emotional outcomes among high-risk youth. Limitations and suggestions for future research are discussed.*

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Successful schools work to ensure that all students are able to master basic academic skills such as reading, writing, and math. Strong leadership, an engaging curriculum, challenging academic standards, effective instruction, and a positive school climate are the hallmarks of effective schools (Lezotte & McKee-Snyder, 2011; Marzano, 2003). When children are unable to succeed in regular school settings, voluntary or involuntary placement in alternative education settings is common. Students attending alternative schools represent a population of growing significance of youth at risk. Most recent estimates suggest there are more than 10,000 public alternative schools and programs for at-risk students in the United States (Carver, Lewis, & Tice, 2010). This represents a near 300% increase since 1997 (Hoffman, 2001), and likely underestimates the actual number of schools and programs in operation today. More than 48 states have adopted specific legislation related to the operation of alternative schools (Lehr, Lanners, & Lange, 2003), suggesting a long-term commitment to the institutionalization of alternative education structures into the public education system. Demand exceeds capacity in more than 54% of districts offering alternative school options; most districts have active waiting lists for their programs and services (Kleiner, Porch, & Farris, 2002).

Systematic reviews reveal wide variation in how alternative schools have been defined (Lange & Sletten, 2002). The U.S. Department of Education's National Center on Education Statistics has defined an *alternative school* as a public elementary/secondary school that: (1) addresses the needs of at-risk students that typically cannot be met in a regular school, (2) provides non-traditional education, (3) serves as an adjunct to a regular school, or (4) falls outside of the categories of regular, special education, or vocational education (U.S. Department of Education, 2011). Other programmatic attributes frequently cited include: a focus on serving the needs of students at risk for school failure, variable admission criteria, relatively low student enrollment, increased one-on-one interaction between teachers and students, and an emphasis on creating maximally supportive student environments (Aron, 2006; Barr, 1981, Cox, 1999; Foley & Pang, 2006; Gold & Mann, 1982; Morley, 1991; Raywid, 1994; Tobin & Sprague, 2000; Youngs, Rathge, Mullis, & Mullins, 1990). Although these characteristics are generally agreed upon as being present in most alternative schools, program emphasis can vary widely. However, it is important to know that most alternative school students are not served by special education. Most recent studies suggest that alternative schools are most commonly used to serve students who have been suspended or expelled for disruptive classroom behavior (Lehr, Tan, & Ysseldyke, 2009). Estimates concerning the number of alternative school

students with disabilities have ranged from 12% to 19%, with more than half of those students classified as emotionally disturbed (Gorney & Ysseldyke, 1993; Lehr, Moreau, Lange, & Lanners, 2004). Rates of special education students attending alternative schools (12%) are not significantly different from those observed in traditional school settings (13%; Kleiner, Porch, & Farris, 2002).

### Prevalence of Risk Factors among Alternative School Students

The sheer number and severity of long-term risk factors faced by alternative schools students is staggering. National surveillance studies conducted by the Centers for Disease Control and Prevention have found that alternative school students are twice as likely to be involved in a gang (Fulkerson, Harrison, & Hedger, 1999a), three times more likely to carry a gun to school, and approximately 60% had been in a physical fight within the past year (Centers for Disease Control and Prevention, 1999; Grunbaum et al., 2000). Subsequent studies confirmed that students self-report an average of 11.8 aggressive acts per week, with 6.5% incurring significant injuries due to fighting in a 12-month period (Escobar-Chaves, Tortolero, Markham, Kelder, & Kapadia, 2002).

Recent literature reviews have revealed alternative school students faced several social and environmental risk factors for poor physical and mental health outcomes (Johnson & Taliaferro, 2011). Alternative high school students are also more likely to suffer from one or more mental health concerns, have lower self-esteem, and are at significantly higher risk for suicide (Centers for Disease Control and Prevention, 1999; Cocozza & Skowyr, 2000; Dugger & Dugger, 1998; Grunbaum, Lowry, & Kann, 2001; Fulkerson, Harrison, & Hedger, 1999b). Female alternative school students are disproportionately more likely to have a history of sexual abuse (Fulkerson et al., 1999b). All alternative school students (regardless of gender) are more likely to engage in risky sexual behaviors, placing them at higher risk of having an unwanted pregnancy, contracting HIV or other sexually transmitted diseases (Centers for Disease Control and Prevention, 1999).

Alternative school students are also at higher risk for developing chronic diseases related to alcohol, drug, or tobacco use, and engaging in unhealthy dieting practices that can lead to illness or obesity (Grunbaum et al., 2001). Compared with traditional high school students, students attending alternative schools are less likely to engage in vigorous physical activity or participate in school/community sports teams (Grunbaum et al., 2001). Alternative school students are more likely to socialize in deviant peer groups, have disruptive home environments (WestEd, 2008), and live with parents experiencing substance abuse problems (Fulkerson et al., 1999b).

Many of these students have very few community, peer, or family-based supports for their learning. It is not surprising that alternative school students are significantly more likely to have developed an external locus of control with regard to academic performance (Miller, Fitch, & Marshall, 2003), and fewer positive academic coping skills (e.g., asking for help) as compared with mainstream education students (Wiest, Wong, Cervantes, Craik, & Kreil, 2001). Chronic school failure is common (often times a prerequisite condition) among students attending alternative schools (Gagnon & Bottge, 2006; WestEd, 2008). Poor grades, suspension, credit deficiencies, and chronic truancy are *normative* among this student population (Kleiner et al., 2002; WestEd, 2008). The experience of stressors such as these has been consistently associated with psychological, social, and behavioral problems, such as depression, anxiety, aggression, substance use, difficulties forming and maintaining positive interpersonal relationships (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001; Grant et al., 2003; Siddique & D'Arcy, 1984; van Praag, de Kloet, & van Os, 2004; WestEd, 2008). It is not surprising that many students who have been transferred to alternative school settings arrive with a long and troubled history of negative interactions with teachers and other school staff (Loutzenheiser, 2002). When students with similar psychosocial histories are aggregated into a single setting, as is commonly the case in alternative school settings, establishing and maintaining a positive school climate can be challenging.

### Effects of Chronic Stress on Development and Learning

On average, students attending alternative schools have more frequent and severe exposure to cumulative and less access to social supports and effective coping strategies. While a certain amount of stress within the context of stable and supportive relationships is part of healthy development (Thompson, 2009), unmitigated stress influences physical and mental health, which, in turn, affects how students think, feel, and act. Chronic stress is associated with physical and mental disorders such as depression, binge drinking, eating disorders, insomnia, and underdevelopment of the brain (Benson et al., 2000; Deckro et al., 2002; Sapolsky, 1998). In addition, mounting evidence indicates that students' health status and academic achievement are deeply connected, with excess stress posing a significant barrier to student learning (Hanson, Austin, Lee-Bayha, 2004; Murray, Low, Hollis, Cross, & Davis, 2007). Chronic stress can impair a learner's ability to pay attention, use short-term, long-term, and declarative memory, and determine what is (and is not) important (Boals, Rubin, & Klein, 2008; Chen, Dube, Rice, & Baram, 2008; Gazaniga, 1988; Jacobs & Nadel, 1985; Hancock & Desmond, 2001; Newcomer et al., 1999; Sapolsky, 1998).

## Emotion Regulation as a Mediator of Stress-Related Outcomes

Adolescents' ability to modulate their emotional responses to stress is increasingly being recognized as an important skill for ensuring mental health, academic success, and healthy transition into adulthood (Eisenberg, Spinrad, & Eggum, 2010). This ability, referred to as *emotion regulation*, has been defined as the capacity to regulate emotional arousal levels so that an optimal intensity of engagement with one's environment is achieved (Cicchetti, Ganiban, & Barnett, 1991). Emotion regulation skills enable adolescents to control impulsive behaviors and negative reactions in order to meet situational demands and achieve personal goals (Gratz & Roemer, 2003). Across multiple studies, emotion regulation has been found to be a factor mediating the relationship between situational stress and maladaptive behaviors and developmental outcomes (Granic, Meusel, Lamm, Woltering, & Lewis, 2012; Wolchik, Tein, Sandler, & Ayers, 2006). Given the critical role of emotion regulation in mitigating the negative effects of stress on development, systematic training in skills that assist in youth in regulating affect and stress responses is a logical strategy to help promote successful transitions to adulthood. Many highly effective social-emotional learning programs (SEL) intentionally target emotion regulation skills for this very reason (Domitrovich, Moore, Thompson, and the CASEL Preschool to Elementary School Social and Emotional Learning Assessment Workgroup, 2012). However, less than 13% of available SEL programs are available for use with high school age students (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2008). Providing age-appropriate and socially relevant opportunities to high-school age students to develop these skills is a challenge in program design.

## Yoga as a Universal Prevention and Emotion Regulation Promotion Program

Yoga is increasingly being used in classrooms across the United States as a way to enhance students' behavioral and academic functioning (Galantino, Galbavy, & Quinn, 2008). Yoga is classified as a mind-body intervention by the National Center for Complementary and Alternative Medicine (2011) and is often considered a complimentary class of therapy— particularly effective in alleviating stress-related symptoms. Yoga is a discipline developed in India that incorporates postures (*asanas*), controlled breathing techniques (*pranayama*), and meditation practices designed to promote physical and psychological well-being.

Research on the effects of yoga and meditation in school settings is in its infancy, however, emerging evidence suggests that these practices may hold promise (Greenberg & Harris, 2012). Unlike traditional school-based

interventions which may rely on operant principles to effect behavioral change, yoga and meditation focus on helping youth develop essential emotion regulation skills that can be applied across contexts. These simple practices have been found to reduce stress and tension, dissipate excess energy, relieve tiredness, strengthen children's attention span concentration (Abadi, Madgaonkar, & Venkatesan, 2008; Jensen, 2004; Kalayil, 1989; Peck, Kehle, Bray, & Theodore, 2005; Venkataramana, Poomalil, & Shobhasree, 2008), and help students cultivate better interpersonal relationships (Peck et al., 2005; Seiler & Renshaw, 1978; Telles, Narendran, Raghuraj, Nagarathna, & Nagendra, 1997; Wood, 1993; Woolery, Myers, Sternlieb, & Zeltzer, 2004). Concurrent improvements in students' general memory span (Anantharaman & Kabir, 1984), spatial memory (Manjunath & Telles, 2004; Naveen, Nagarathna, Nagendra, & Telles, 1997), visual perception (Manjunath & Telles, 1999), general intelligence (Uma, Nagendra, Nagarathna, Vaidehi, & Seethalakshmi, 1989), complex learning skills (Sahasi, 1984; Zipkin, 1985), and performance on standardized achievement tests (e.g., Scholastic Assessment Test; Barnes & Nagarkar, 1989) have been observed as well.

Although research on the effectiveness of yoga with youth is promising, the current literature suffers from several limitations regarding study design, sample size, lack of systematic intervention protocol, and absence of comparison groups (Galantino et al., 2008). Still, evidence obtained from well-designed pilot studies is beginning to emerge.

For example, an early trial conducted by Chan, Cheung, and Sze (2008) found significant reductions in withdrawn and attention-related behavior problems in low-achieving children following participation in a yoga intervention. Mendelson and colleagues (2010) conducted a randomized control trial study mindfulness and yoga intervention with elementary age-students in a high-poverty urban setting. Findings from this study revealed significant reductions rumination, intrusive thoughts, and emotional arousal after 12 weeks of participation in the yoga program. A more recent study conducted by Khalsa, Hickey-Schultz, Cohen, Steiner, and Cope (2011) suggested yoga may provide a protective benefit against normative decreases on several indicators of mental health and well-being seen in middle-school age students. Working with a clinical population, Carei, Fyfe-Johnson, Breuner, and Brown (2010) found significant reductions in eating disorder symptoms among a clinical sample of adolescents following an 8-week trial of yoga.

### Mechanisms of Effectiveness

Although the mechanisms of action are not fully understood, it appears that yoga and meditative practices evoke a calming effect, which helps students get into a frame of mind conducive to learning and distinctive from the effects of physical exercise alone.

The beneficial effects of these practices have been demonstrated among students from a wide variety of backgrounds, including those with cognitive



disabilities (Pathak & Mishra, 1984; Zipkin, 1985), and emotional-behavioral difficulties (e.g., attention deficit hyperactivity disorder, depression, anxiety; Powell, Gilchrist, & Stapley, 2008; Woolery et al., 2004; Stueck & Gloeckner, 2005) making them particularly promising for use in diverse school settings.

### Transformative Life Skills: Core Components and Processes

Transformative Life Skills (TLS) is a universal classroom-based program for use with adolescents in middle or high school settings (Frank et al., 2012). The TLS program provides students with sequenced instruction and applied experience in using yoga postures, breathing techniques, and centering meditation in order to reduce stress and promote social-emotional health and physical wellness. The intervention is secular and does not use terminology or practices that would be considered religious or unusual in most U.S. public school contexts.

The TLS curriculum is manualized, and provides a detailed set of lesson-based scripts to facilitate implementation. Lessons are divided into four units focusing on stress management, body and emotional awareness, self-regulation, and building healthy relationships. Each unit includes 12 lessons which can be delivered in approximately 15-, 30-, or 60-min segments (see Figure 1). Each lesson is designed to teach specific skills connected to the overarching unit theme. TLS lessons follow a predictable instructional sequence consistent with best practices in student pedagogy. Before beginning each lesson, behavioral expectations are reviewed and the agenda for the day's lesson is reviewed. Then, instructors attempt to activate student background related to the topic in question, and may engage in brief conversation with the group to stimulate interest.

Subsequently, students engage in the Action-Breathing-Centering Activities (referred to as the *ABCs*) which provides students experience in engaging in yoga postures, focused breathing, and centering meditation. Across sessions, ABC sequences become progressively more challenging. At the end of each lesson, instructors are asked to complete a fidelity checklist documenting that each lesson component was implemented, rate the overall level of student engagement, and reflect on the quality of lesson implementation. At the end of each unit, instructors are asked to review their implementation data to plan a reteaching lesson during which they repeat coverage of content within the last content unit that was poorly covered or had limited student engagement.

### Focus of the Present Study

The purpose of the present study is to evaluate the feasibility and potential effectiveness of TLS on indicators of emotional distress, stress symptomology, prosocial behavior, and attitudes toward violence in a high-risk sample of student educated in an alternative public high school setting.

<p><b>Unit 1. The Stress Response</b></p> <p>1.1: Understanding What Stress Is About            1.2: Recognizing Stress in Your Body            1.3: Knowing What Stresses You            1.4: How Stress Affects Your Breath            1.5: Using Your Breath as a Tool            1.6: How Stress Affects Your Ability to Learn            1.7: Clearing Your Mind, Calming Your Body            1.8: Feeling Tired vs. Feeling Relaxed            1.9: How Stress Affects the Choices We Make            1.10: Releasing Stress            1.11: Long-term Benefits of Managing Stress            1.12: Review and Re-teaching</p> <p><b>Unit 2. Physical and Emotional Awareness</b></p> <p>2.1 Understanding Self-awareness            2.2: Building Body Awareness            2.3: Being Aware of Your Body When You Move            2.4: Building Awareness of the Breath            2.5: Recognizing How Your Emotions Affect Your Breath            2.6: Using the Breath to Manage Emotion            2.7: Building Awareness of Thought Patterns            2.8: Thoughts and Feelings Always Change            2.9: Watching your Thoughts            2.10: Focusing Inward vs. Focusing Outward            2.11: Choosing Where to Focus Your Mind            2.12: Review and Reteaching</p>	<p><b>Unit 3. Self-Regulation</b></p> <p>3.1: Your Environment Affects Your Thoughts and Feelings            3.2: You Can Manage Your Thoughts and Feelings            3.3: Centering Yourself            3.4: Your Thoughts and Feelings Affect Your Actions            3.5: The Importance of Being Centered when You Act            3.6: Acting vs. Reacting            3.7: Your Actions Affect Your Brain            3.8: Using Tools to Calm Down            3.9: Using Tools to Energize            3.10: Practicing Making Choices            3.11: Imagining Possibilities            3.12: Review and Reteaching</p> <p><b>Unit 4. Healthy Relationships</b></p> <p>4.1: Your Behavior Affects Your Environment            4.2: Understanding Your Habits            4.3: Building Healthy Relationships            4.4: What Does "Karma" Mean to You?            4.5: Your Role in Creating Your School Culture            4.6: Sharing What You Learn            4.7: Recognizing That You Are Complete            4.8: Connecting with Your Best Self            4.9: Seeing the Good in Yourself and Others            4.10: We Are All Connected            4.11: Strengthening Yourself to Strengthen Your Community            4.12: Review &amp; Reteaching</p>
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**FIGURE 1** Transformative Life Skills (TLS) curriculum scope and sequence.

Consistent with the findings of similar studies exploring the effectiveness of with at-risk populations, we hypothesized that students exposed to the TLS program would report significant reductions in indicators of emotional distress, involuntary stress responses (e.g., rumination), and have a less favorable toward violence after completed the program. We also hypothesized that these changes would be accompanied by overall increases in student report of positive affect and decreases in negative affect.

## METHOD

### Participants

Participants included students attending a single alternative school for at-risk youth in California. Students attending the alternate school were referred by their home schools because of faculty concerns regarding the presence of one or more risk factors for academic failure including poor grades, truancy,

**TABLE 1** Participant Demographic Characteristics

	<i>n</i>	%
Gender		
Male	22	44.9
Female	27	55.1
Race		
Native American	2	4.2
Hispanic	16	33.3
Black	16	33.3
Asian	3	6.2
White	1	2.1
Mixed	10	20.8
Household		
Two parents	13	34.2
Single parent	22	57.8
Group home	1	2.6
Other	2	5.3

disruptive behavior, repeated suspension, or expulsion. The study sample consisted of 49 in 9th (12.2%), 10th (22.4%), 11th (57.1%), and 12th grade (8.2%) students taught in mixed-grade classrooms. Approximately 54.4% of the sample was female (see Table 1). With regards to race, the sample was highly diverse with 33.3% of the sample identifying as Black, 33.3% as Hispanic, 4.2% as Native American, 6.2% as Asian, 2.1% as White, and 20.8% identified as having a mixed racial background. Approximately 45% of the sample reported living in a two-parent household, 41.3% lived in a single-parent home, 5% lived in a group home setting, and 8.7% reported living with other relatives (e.g., grandmother, aunt, siblings). Students were quite heterogeneous academically. Median grade point average among participating students was 2.61 ( $SD = 0.55$ , range = 1.60 to 3.74).

## Procedure

A quasi-experimental control group pretest–posttest design was used. Active parental consent and student assent was obtained before beginning study activities. Student assessments were administered in small group settings proctored by a trained research assistant. To accommodate students with low literacy levels, each questionnaire item was read aloud and students marked their responses to each item after hearing the question orally. Once assigned, TLS lessons were integrated into first-period homeroom classes 3–4 days per week during the first semester of the school year. Each instructional session lasted approximately 30 min and occurred in the regular classroom setting. All instructors were certified yoga teachers who received specialized training and certification in TLS administration from program developers. Fidelity

of implementation was monitored through regular supervision of instructors implementing TLS by program developers, regular review of implementation checklists, and observation. All lessons were implemented with greater than 80% fidelity.

## Measures

### GENERAL AFFECT

The Affect Valence Scale is a nine-item scale that is based on Diener and Emmons' (1984) study of the independence of positive and negative affect, which was used by Brown and Ryan (2003) in a study of mindfulness as a predictor of day-to-day self-regulation and well-being. It contains positive (happy, worried/anxious, pleased, enjoyment/fun, unhappy, and joyful) and negative (worried/anxious, frustrated, angry/hostile, unhappy, and depressed/blue) emotional adjectives. Participants graded these adjectives on a 100-mm visual analog scale to indicate their emotional state "over the past week." Observed pretest scale reliabilities for the negative ( $\alpha = .84$ ) and positive affect ( $\alpha = .86$ ) were acceptable.

### EMOTIONAL DISTRESS AND WELL-BEING

The Brief Symptom Inventory-18 (BSI-18) is a well-validated measure of psychological distress and psychiatric disorders in clinical and community populations (Derogatis, 2001). The inventory is appropriate for use with adolescent populations and includes items measuring the severity of somatization, depression, and anxiety symptoms, in addition to a general global clinical symptoms index. This study included the addition of five items measuring hostility from the full BSI inventory. Observed pretest scale reliabilities for depression ( $\alpha = 0.88$ ), anxiety ( $\alpha = 0.77$ ), and hostility ( $\alpha = 0.91$ ), and global symptom index ( $\alpha = 0.89$ ), scales of the BSI were acceptable. The somatization subscale demonstrated low-moderate reliability in this sample ( $\alpha = 0.64$ ).

### STRESS SYMPTOMOLOGY

The Responses to Stress Questionnaire is a well-validated measure of coping and involuntary stress responses designed to assess personal coping strategies and involuntary stress-reactions appropriate for use with adolescent populations (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). For the purposes of this study, we examined subscales comprising the involuntary engagement factor that includes stress-related responses such as

rumination, intrusive thoughts, physiological arousal, emotional arousal, and involuntary action, which have been empirically linked to internalizing and externalizing dimensions of the youth- and parent-report versions of the Child Behavior Checklist and heart-rate reactivity during laboratory tasks (Connor-Smith et al., 2000). Observed pretest scale reliabilities for rumination ( $\alpha = 0.79$ ), intrusive thoughts ( $\alpha = 0.85$ ), emotional arousal ( $\alpha = 0.74$ ), and involuntary action ( $\alpha = 0.83$ ). The three-item physiological arousal scale demonstrated low-moderate reliability in this sample ( $\alpha = 0.65$ ). The full involuntary engagement composite demonstrated high reliability ( $\alpha = 0.91$ ).

#### ATTITUDES TOWARD VIOLENCE AND VENGEANCE

The Transgression-Related Interpersonal Motivations Scale-12-Item Form (TRIM-12) is a short inventory assessing the motivations assumed to underlie instances of interpersonal forgiving and vengeance. Developed by McCullough and colleagues (1998), the inventory items were preceded in this study by a small free-writing prompt asking students to “describe a recent situation where someone made you angry, hurt you, or betrayed you, and why you think this situation happened.” The revenge subscale of the inventory was used in this study, which is a five-item measure of the propensity with which an individual is motivated to see revenge against a transgressor following an event (e.g., “I’ll make him or her pay”). The reliability and construct validity of the TRIM-12 has been established through confirmatory factor analysis, and the measure has been shown to correlate with measures of offense-specific rumination, empathy, and relational closeness (McCullough et al., 1998). The five-item revenge subscale of the TRIM-12 demonstrated acceptable pretest reliability in this sample ( $\alpha = 0.81$ ).

#### Analyses

We conducted a series of paired *t* tests to examine whether there was significant pre–post changes within the treated sample. To correct for Type I error resulting from multiple pairwise contrasts, *p* values were adjusted using a Benjamini-Hochberg (BH) correction (Benjamini & Hochberg, 1995). The BH method adjusts for multiple comparisons by controlling false discovery rate instead of familywise error rate which tends to result in overpenalization. Growing evidence suggests the BH method provides the best solution to the multiple comparisons problem across multiple practical applications (Williams, Jones, & Tukey, 1999). Cohen’s *d* for pairwise comparisons were calculated for each outcome measure with effect sizes of .3 or less considered small, .3 to .5 medium, and greater than .80 a large effect (Cohen, 1988).

## ATTRITION AND HANDLING OF MISSING DATA

Six students present at baseline failed to complete the full program because of midyear school transfers. No significant differences were found on any demographic or baseline measures predictive of attrition status. All missing data on outcome scales was replaced using multiple imputation using maximum-likelihood expectation maximization imputation routines.

## RESULTS

Unadjusted means and standard deviations at pre and post and tests of significance are presented in Tables 2 and 3, respectively. The results of paired  $t$  tests revealed no statistically significant pre to post differences on measures of positive affect,  $t(49) = 0.71, p = .48$ ; negative affect,  $t(49) = -4.56, p = .15$ ; or somatization,  $t(49) = -1.49, p = .15$  (see Table 3). After adjusting  $p$  values for multiple comparisons, statistically significant and substantively meaningful improvements were found on measures of student anxiety,  $t(49) = -3.51, p = .01, d = 0.23$ ; depression,  $t(49) = -3.29, p = .01, d = 0.32$ ; and global symptom index (GSI),  $t(49) = -2.69, p = .01, d = 0.40$ .

Significant and substantive improvements on several emotion regulation indicators were found as well on measures of involuntary engagement,  $t(49) = -7.23, p = .01, d = 0.89$ ; involuntary action,  $t(49) = -3.78, p = .01, d = 0.62$ ; rumination,  $t(49) = -8.18, p = .01, d = 0.81$ ; intrusive thoughts,  $t(49) = -5.91, p = .01, d = 0.83$ ; physical arousal,  $t(49) = -4.49, p = .01, d = 0.81$ ; and emotional arousal,  $t(49) = -6.88, p = .01, d = 0.97$ .

**TABLE 2** Unadjusted Pre–Post Means and Standard Deviations

	Pre $M \pm SD$	Post $M \pm SD$
Positive affect	54.02 $\pm$ 21.05	56.39 $\pm$ 23.68
Negative affect	32.53 $\pm$ 22.99	27.21 $\pm$ 18.26
Anxiety	1.55 $\pm$ 0.62	1.42 $\pm$ 0.55
Somatization	1.70 $\pm$ 0.75	1.58 $\pm$ 0.68
Depression	1.83 $\pm$ 0.82	1.59 $\pm$ 0.66
Global symptom index (GSI)	1.85 $\pm$ 0.87	1.55 $\pm$ 0.52
Involuntary engagement	1.97 $\pm$ 0.70	1.41 $\pm$ 0.40
Involuntary action	1.94 $\pm$ 0.12	1.50 $\pm$ 0.08
Rumination	2.04 $\pm$ 0.90	1.34 $\pm$ 0.53
Intrusive thoughts	2.07 $\pm$ 0.87	1.44 $\pm$ 0.49
Physical arousal	1.67 $\pm$ 0.63	1.25 $\pm$ 0.34
Emotional arousal	2.12 $\pm$ 0.82	1.42 $\pm$ 0.47
Revenge motivation	2.72 $\pm$ 0.94	2.00 $\pm$ 0.83
Hostility	2.00 $\pm$ 0.92	1.74 $\pm$ 0.75

**TABLE 3** Significance Tests of Pre–Post Differences on Outcome Measures

	<i>t</i>	<i>p</i>	Adjusted <i>p</i>	<i>d</i>
Positive affect	0.71	.48	0.48	0.11
Negative affect	−1.56	.13	0.15	0.25
Anxiety	−3.51	.01	0.01	0.23
Somatization	−1.49	.14	0.15	0.16
Depression	−3.29	.01	0.01	0.32
Global symptom index (GSI)	−2.69	.01	0.01	0.40
Involuntary engagement	−7.23	.01	0.01	0.89
Involuntary action	−3.78	.01	0.01	0.62
Rumination	−8.18	.01	0.01	0.81
Intrusive thoughts	−5.91	.01	0.01	0.83
Physical arousal	−4.49	.01	0.01	0.81
Emotional arousal	−6.88	.01	0.01	0.97
Revenge motivation	−5.05	.01	0.01	0.80
Hostility	−2.28	.03	0.03	0.30

*Note.* Adjusted *p* values were corrected for multiple pairwise comparisons using Benjamini-Hochberg (BH) correction.

Finally, on indicators of propensity for interpersonal violence, significant reductions in revenge motivation,  $t(49) = -5.05$ ,  $p = .01$ ,  $d = 0.80$ ; and reported hostility,  $t(49) = -2.28$ ,  $p = .03$ ,  $d = 0.30$  were observed.

## DISCUSSION

This study aimed to evaluate the feasibility and potential effectiveness of TLS on the emotional distress, stress symptomology, prosocial behavior, and attitudes toward violence in a high-risk sample of alternative school students. Consistent with our initial hypotheses we found significant and meaningful reductions in youth reports of anxiety, depression, and global psychological distress. Although effect sizes for reductions in youth report of anxiety ( $d = 0.23$ ) and depression ( $d = 0.32$ ) were in the small to medium range respectively, these findings are comparable to average effect sizes found in meta-analytic studies of school-based programs specifically targeting anxiety and depression-related symptoms in adolescents (Corrieri et al., 2013).

Moreover, consistent with findings from previous trials involving urban elementary-age students (Mendelson et al., 2010), we also found significant and large effects on youth report of problematic involuntary stress responses such as rumination, involuntary actions, intrusive thoughts, physical and emotional arousal. Given the important link between the intensity of these stress responses and subsequent onset and progression of clinical anxiety and depression (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Segerstrom, Tsao, Alden, & Craske, 2000) and development of future health problems (Watkins, 2008) these findings suggest promise for yoga-based programs

such as TLS to positively influence the trajectory of youth mental and physical health over time.

Contrary to our initial hypotheses, we did not find any significant group differences on measures of general positive and negative affect or somatization, although the general direction of scores was in the predicted direction. Although the reasons for this are not entirely clear, related studies examining the effects of yoga on youth mental health outcomes have had similar difficulty detecting effects in general mood or affect (Khalsa et al., 2011; Mendelson et al., 2010). Future investigations may wish to explore trajectories of mood using multiple momentary sampling methods (vs. pre–post assessments), as this may perhaps provide a more sensitive measure of the actual daily variation in mood.

Finally, a particularly important finding of relevance to this population was the strong and significant reductions we found in youth report of revenge motivation and hostility. Given the heightened rates of violence noted for students attending alternative schools and high rates of violence-related injuries (Escobar-Chaves et al., 2002; Fulkerson et al., 1999a; Grunbaum et al., 2000), this finding is of particular importance.

### Limitations and Directions for Future Research

A strength of this study was the use of a manualized protocol and the use of a diverse high-risk sample. However, several limitations constraining generalizability are noteworthy. First, this study used a quasi-experimental design involving pre and post-test assessments. Although such designs are common in preliminary pilot studies such as these, the lack of a control group prohibits claims regarding causality. Second, reliance on youth self-report for most outcome measures is another methodological limitation. Although most of the general affect and mental health measures are most appropriately assessed via self-report, supporting evidence from teacher or parent report is an important direction for future research. Finally, this study used a relatively small sample of at-risk youth and thus generalizability is limited.

### Implications for Practice

This study provides additional support to previous research suggesting that yoga may be an effective approach for reducing emotional distress and promoting prosocial behavior in youth. The contribution of this study is extending these findings to demonstrate preliminary evidence for feasibility and effectiveness with a population of high-risk alternative school youth. These findings have implication for school psychologists working in alternative school settings, demonstrating that Transformative Life Skills is a



feasible and potentially effective program for building key social-emotional competencies and reducing risk among youth in these challenging settings. Although limitations of study design and size limit generalization, this investigation provides preliminary support for the effectiveness of TLS in reducing anxiety, depression, and indicators of psychological distress, and attitudes toward violence among vulnerable youth.

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