Journal of School Psychology 50 (2012) 149–166

Contents lists available at SciVerse ScienceDirect

Journal of School Psychology

journal homepage: www.elsevier.com/locate/jschpsyc

Reducing developmental risk for emotional/behavioral problems: A randomized controlled trial examining the Tools for Getting Along curriculum

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ARTICLE INFO

Article history:
Received 8 December 2009
Received in revised form 1 September 2011
Accepted 12 September 2011

Keywords:
Cognitive–behavioral intervention
Social problem solving
Executive function
Aggression
Anger control
Prevention

ABSTRACT

Researchers have demonstrated that cognitive–behavioral intervention strategies – such as social problem solving – provided in school settings can help ameliorate the developmental risk for emotional and behavioral difficulties. In this study, we report the results of a randomized controlled trial of Tools for Getting Along (TFGA), a social problem-solving universally delivered curriculum designed to reduce the developmental risk for serious emotional or behavioral problems among upper elementary grade students. We analyzed pre-intervention and post-intervention teacher-report and student self-report data from 14 schools, 87 classrooms, and a total of 1296 students using multilevel modeling. Results (effect sizes calculated using Hedges' g) indicated that students who were taught TFGA had a more positive approach to problem solving ($g = .11$) and a more rational problem-solving style ($g = .16$). Treated students with relatively poor baseline scores benefited from TFGA on (a) problem-solving knowledge ($g = 1.54$); (b) teacher-rated executive functioning ($g = .35$ for Behavior Regulation and .32 for Metacognition), and proactive aggression ($g = .20$); and (c) self-reported trait anger ($g = .17$) and anger expression ($g = .21$). Thus, TFGA may reduce risk for emotional and behavioral difficulties by improving students' cognitive and emotional self-regulation and increasing their pro-social choices.

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ACTION EDITORS: Craig Albers and Robin Codding.

0022-4405/$ – see front matter
doi:10.1016/j.jsp.2011.09.003

1. Introduction

A significant number of students in today's schools exhibit problematic behaviors, such as disruption, defiance, and aggression, that can be severe and pervasive (Connor & Barkley, 2002; Morrison & Skiba, 2001; Rappaport & Thomas, 2004; Tulley & Chiu, 1995). Students with or at risk of developing these behaviors often experience difficulty in meeting academic and social demands (Lochman, Dunn, & Klimes-Dougan, 1993), frequently are rejected by peers (Coie, Dodge, & Kupersmidt, 1990; Coie, Underwood, & Lochman, 1991), and often are referred for special education services (Kauffman, 2009). Moreover, researchers cite longitudinal evidence that links early maladaptive behaviors with later life difficulties that include delinquency, substance abuse, and school dropout (Giancola & Tarter, 1999; Moffitt, 1990; Moffitt & Lynam, 1994). For decades, studies have consistently indicated that 20% to 25% of students in school settings may be considered at risk for developing some kind of behavioral difficulty (e.g., Duchnowski, Kutash, & Friedman, 2002; Rubin & Balow, 1978). Given that schools are a primary environment for students' social and emotional development, such estimates highlight the importance of early school-based identification and preventive intervention.

Years of research have supported the use of applied behavioral strategies, including stimulus control, contingent reinforcement, and behavior reduction procedures, to reduce problematic behavior and strengthen prosocial behavior among school-aged children and youth (e.g., Alberto & Troutman, 2008; Cooper, Heron, & Heward, 2007). Although many behavioral strategies are empirically validated, they may not adequately foster the development of self-regulatory processes if used as the primary mechanism for behavior change (Polsgrove & Smith, 2004). Wehmeyer, Agran, and Hughes (2000) suggested that the practice of teaching students to control their own behavior to facilitate their success in educational settings is largely underutilized. Thus, researchers have investigated the use of cognitive–behavioral interventions (CBI) to supplement behavioral approaches and counter the development of emotional and behavioral difficulties that include aggression and disruption (Conduct Problems Prevention Research Group (CPPRG) [CPPRG], 1999; Daunic, Smith, Brank, & Penfield, 2006; Frey, Hirschstein, & Guzzo, 2000; Lochman & Wells, 2004). Based on the work of cognitive theorists from the early 1970s through the present (e.g., Kendall & Braswell, 1985; Lochman, Whidby, & Fitzgerald, 2000; Mayer, Lochman, & Van Acker, 2005; Robinson, Smith, Miller, & Brownell, 1999), cognitive–behavioral therapies rest on the premise that social cognitions, in conjunction with and influenced by reinforcement history, play a critical role in determining behavior (Meichenbaum, 1977; Vygotsky, 1962). Consequently, maladaptive social cognitions are hypothesized to contribute significantly to emotional and behavioral problems (Dodge, Laird, Lochman, Zelli, & the Conduct Problems Prevention Research Group, 2002; Smith, Graber, & Daunic, 2009).

Consistent with social–cognitive theory, emerging studies of children's executive function (EF; Graziano, Reavis, Keane, & Calkins, 2007; Hughes, Dunn, & White, 1998; Rueda, Posner, & Rothbart, 2005) provide a constructive framework for understanding the connections among cognitions, emotions, and behavior. Although researchers have debated the specific skills involved (Barkley, 1997; Carlson, 2005; Garon, Bryson, & Smith, 2008; Gioia, Isquith, Retzlaff, & Espy, 2002), most agree that EF comprises a collection of interrelated cognitive processes that include inhibition, attentional flexibility, emotion control, working memory, planning, and monitoring (Blair, Zelazo, & Greenberg, 2005; Carlson, 2005; Gioia, Isquith, Retzlaff, & Espy, 2002). As such, EF has been linked to children's ability to (a) attend to relevant emotion-laden language and environmental stimuli, (b) identify one's own and others' experiences and expressed emotions, (c) distinguish context-appropriateness, and (d) recognize interpersonal causes and consequences (e.g., Eisenberg, Hofer, & Vaughan, 2007; Saarni et al., 1998; Vohs & Ciarocco, 2004), all of which are consistent with components of social information processing. Further, EF skills are integral to successful goal-pursuit, emotion regulation, and problem solving processes and critical to establishing and maintaining positive social relations through effective self-regulation (Karoly, 1993; Rueda et al., 2005; Vaughn & Hogan, 1990; Vohs & Baumeister, 2004). Conversely, deficiencies in EF are hypothesized to contribute to emotional and behavioral difficulties (Hughes, 2002; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005). Aggression, for example, has been associated with deficiencies in response inhibition and planning (Ellis, Weiss, & Lochman, 2009).

1.1. Evidence for effectiveness of school-based CBIs

Historically, CBIs have been used to intervene with various emotional and behavioral problems, such as anxiety, fears, phobias, aggression, and conduct disorder (Mayer et al., 2005). As cognitive–

behavioral theorists contend that social cognitions can be modified through self-talk (Kendall, Ronan, & Epps, 1991; Meichenbaum, 1977), cognitive–behavioral intervention approaches potentially prevent or ameliorate emotional and behavioral difficulties by increasing adaptive self-statements and thereby strengthening emotional and behavioral self-regulation (Bennett & Gibbons, 2000; McCart, Priester, Davies, & Azen, 2006; Robinson, Smith, & Miller, 2002). Research conducted in school settings for over 25 years has shown that school-based CBIs, including self-talk focused on social cognition, effectively reduce student aggression, hyperactivity, and impulsivity (see Robinson et al., 1999). To illustrate, Coping Power, an intensive small-group CBI that addresses risk factors associated with conduct disorder and focuses on goal-setting, anger management, perspective taking, and problem solving, has been shown to enhance school functioning as rated by teachers and reduce students' self-reported substance abuse and other negative behaviors (Lochman & Wells, 2004; Smith, Lochman, & Daunic, 2005) when compared to a high-risk control condition.

When cognitively based interventions that promote successful emotional and behavioral development are implemented at a universal (i.e., class-wide) level, students with emerging destructive or maladaptive behaviors are able to observe and be supported by the problem-solving strategies of socially appropriate peers (Walker, Colvin, & Ramsey, 1995). For example, class-wide discussions about social situations provide opportunities for students to consider multiple interpretations of environmental social stimuli, constructive interpersonal interactions, and socially adaptive response selections in emotionally charged situations (CPPRG, 1999, 2004; Smith et al., 2009). Thus, students who have difficulty constructing appropriate social responses can benefit from exposure to the perceptions, goals, and choices of more socially competent peers. To illustrate, the universally implemented K to 6 grade CBI Promoting Alternative Thinking Strategies (CPPRG, 1999, 2004) promotes development of feeling identification, impulse control, stress reduction, self-awareness, and social problem solving. An initial analysis of Promoting Alternative Thinking Strategies effects revealed improvements in peer-rated aggression and disruptive behavior and in observer ratings of classroom atmosphere. In sum, the Coping Power and Promoting Alternative Thinking Strategies studies provide indications that school-based CBIs can be effective for reducing risk factors related to emotional and behavioral problems in student populations (see Smith et al., 2009), and there is emerging evidence that EF may play a mediating role in reducing these risk factors (e.g., Riggs, Greenberg, Kusche, & Pentz, 2006).

1.2. Tools for Getting Along

Tools for Getting Along (TFGA) is a CBI implemented at the universal level and is designed to prevent or ameliorate emotional and behavioral problems by teaching students to use social problem solving in emotionally-charged situations (Daunic et al., 2006; Smith et al., 2005; Smith et al., 2009). TFGA's most salient characteristic is the structured focus on learning, rehearsing, reviewing, and practicing cumulative steps in a problem-solving sequence. Through instructional strategies that include direct instruction, teacher modeling, and role-plays with explicit self-talk, TFGA is delivered at a universal level so that students who are beginning to exhibit emotional or behavioral risk can benefit from participating in discussions and activities with typically developing peers.

The TFGA curriculum is based directly on Crick and Dodge's (1994) model of social information processing to account for the role that social cognition plays in the development of aggression. The model consists of 6 steps: (a) encoding of external and internal cues, (b) cue interpretation and mental representation, (c) clarification or selection of a goal, (d) response access or construction, (e) response decision, and (f) behavioral enactment. According to Crick and Dodge, children who lack or do not execute the skills required to understand others' intentions and to generate and select appropriate social responses, particularly in emotionally charged situations, are more likely to exhibit aggression (Dodge & Somberg, 1987; Dodge et al., 2002). These children attribute hostile intent to others, even when given evidence to the contrary, and display limited social problem-solving ability (Lochman & Lampron, 1986; Rubin, Bream, & Rose-Krasnor, 1990). Thus, the problem-solving sequence imbedded in TFGA lessons includes six steps that parallel Crick and Dodge's model. Steps 1 and 2 involve recognizing a social problem situation and calming down to engage cognition, parallel to the processes of encoding, interpretation, and mental representation of environmental cues. Step 3 involves defining a social problem in terms of goals and barriers, parallel to goal clarification or selection. Step 4 consists of brainstorming possible solutions, parallel to response access or construction. Steps 5 and 6 involve selecting, enacting, and evaluating a response choice, parallel to the response decision and behavioral enactment steps in the Crick and Dodge model.

Findings from two preliminary studies of TFGA showed positive treatment effects on knowledge of problem-solving concepts and variables associated with risk for behavioral difficulties, namely, teacher-rated aggression (Daunic et al., 2006), self-reported approach to problem solving, and peer sociometric ratings for girls (see Daunic et al., 2007). These studies were limited, however, by relatively small samples and primarily indirect measures of treatment fidelity. Thus, the current study investigated whether TFGA, when implemented with adequate fidelity, ameliorated risk associated with the development of significant emotional and behavioral problems. Given that the curriculum is grounded in the cognitive–behavioral approach, linked to EF through its focus on using self-statements to promote self-regulation, and based on a model of social information processing, it was hypothesized that TFGA would reduce risk for emotional and behavioral difficulties by (a) improving student knowledge about problem solving, (b) improving teacher-reported student behaviors consistent with EF skills, (c) improving teacher-rated student social–emotional adjustment and aggression, (d) positively affecting self-rated anger control/expression, and (e) positively affecting self-rated social problem solving.

One issue in measuring the effects of a preventive, universally delivered intervention is that classrooms contain students who exhibit little or no signs of emotional and behavioral difficulties in addition to students who are at risk but have not yet been identified formally. This study explored whether instruction by teachers in typical elementary classrooms containing diverse students ameliorated risk for emotional and behavioral problems before additional resources or more expensive pullout programming was indicated. We did not identify a subgroup of students at the outset by using a composite risk score, but we included the pretest and the pretest-by-condition interaction for each outcome variable in our model. This procedure allowed us to determine possible benefits to all students (i.e., main effects), as well as to determine the potential influence of pretest risk on specific measures (i.e., interaction effects).

We also controlled for student characteristics that have been associated with risk for emotional and behavioral difficulties and thus might affect scores on outcome measures; these characteristics include gender (e.g., Card, Hodges, Little, & Hawley, 2005; Crick & Grotpeter, 1995), race/ethnicity (Donovan & Cross, 2002; Downey & Pribesh, 2004), and socio-economic status as indicated by free or reduced-price lunch (FRL; Donovan & Cross, date; Skiba et al., 2008). We used the Florida Comprehensive Achievement Test (FCAT) verbal and math test scores to control for academic competence. FCAT scores indicate assessed student knowledge and skills in math and reading according to designated state standards and range from 1 (*inadequate level of success with the challenging content of the State Standards*) to 5 (*mastery of the most challenging content of the State Standards*). The FCAT fulfills Florida's compliance with the federal No Child Left Behind Act (2001) that requires states to develop academic assessment under the Act's accountability provisions. Thus, the FCAT has met rigorous national standards for use in statewide student assessment (FCAT, 2005).

2. Method

2.1. Setting and participants

2.1.1. Recruitment

The findings we report in this study are based on data aggregated across two years of treatment implementation, but a distinct group of schools composed the sample for each year (i.e., schools were recruited to participate in the study for one year only). All recruitment and study procedures met university Institutional Review Board standards. From a total of 54 elementary schools in North Central Florida that (a) were at a reasonable distance from the research site to allow for regular involvement by the researchers and (b) had at least 60% of students on free or reduced price lunch (FRL), we rank ordered schools prior to first year recruitment by percentage of students qualifying for FRL beginning with the highest percentage and then by distance from the research site. After contacting targeted school districts during the summer prior to each school year to obtain support for conducting the study, we telephoned school principals and followed up with face-to-face meetings to solicit their involvement. Using this procedure, we contacted a total of 32 schools by phone across the two years, with 23 school principals agreeing to meet in person with project staff. Out of the 23 contacts, 14 principals agreed to participate. In each of the 14 schools, we met directly with 4th- and 5th-grade teachers to explain our research design, how and when assignment to treatment or control condition would take place, and the requirement that at least 75% of the teachers must agree to participate prior to random assignment. Each of the 14 schools met this criterion. With 14 schools and an expectation of 88 classrooms and 25 students per class, and with ICCs of .10 at both the school and the classroom level (i.e., schools and classes account for 20% of the total variance), an effect size of .50 would provide power of .75 for the study (Optimal Design for Multi-Level and Longitudinal Research software version 2.0.1; Liu, Spybrook, Congdon, Martinez, & Raudenbush, 2009).

2.2. Random assignment and sample characteristics

Immediately following the recruitment process, we matched schools on percent of students receiving FRL, and using the random number generation procedure in MAPLE (version 13) software, the project statistician randomly assigned members of each matched pair to the treatment condition or a "business-as-usual" control condition. The project director informed schools about their participation in either the treatment or the control group only after all schools in a given year were assigned. (Note that schools assigned to the control condition were informed that they would be offered the intervention, training, and materials following their participation in the study.) The 14 schools included 87 classrooms (44 treatment, 43 control) consisting of 1775 potential student participants; 65% to 90% of students across schools qualified for FRL.

We solicited active consent from the parents and guardians of students in participating classrooms in both conditions, obtaining consent from 1341 students, which constituted 75.5% (treatment, 80.4%; control, 70.3%) of possible participants across the two years. Our final sample for data analyses consisted of 1296 participants; 45 students were excluded because they were missing demographic data, achievement data, or a combination of such data. Race was designated as a binary variable (African American vs. White/Hispanic/Other) due to the predominance of African American and White students and the low number of Hispanics and students with other ethnicities. This classification allowed us to examine the impact of African American status on outcome measures, as African American students are over-identified for classrooms for students with emotional or behavioral disorders (Cullinan & Kauffman, 2005). In the control group, 86.7% of students received FRL, whereas 70.3% of students in the treatment group received FRL. Boys and girls were evenly represented across groups, with boys constituting 49.4% of the final sample and girls constituting 50.6% of the final sample. A total of 34.8% of participants were African American, 53.9% were White, 7.4% were Hispanic, and 3.8% were classified as other. Treatment and control groups did not differ significantly on gender, race, or FCAT scores, but they differed on FRL status, $\chi^2 = 46.11$, $p < .001$, odds ratio (OR) = 2.8. There was an overall 7.79% attrition rate among participants. Attrition was 9.08% in the treatment condition and 6.21% in the control condition, resulting in a differential of 2.87%, which was not significant, $\chi^2 = 3.676$, $p = .06$.

2.3. Intervention

TFGA is a classroom-based intervention of 27 lessons aligned with the Crick and Dodge (1994) social information-processing model. As described in the Introduction, lessons focus on a step-by-step problem solving strategy to use in emotionally charged social situations. Five strategically placed role-play lessons provide practice opportunities. Instructional strategies include cognitive modeling, role-plays, small group activities, and explicit application of strategies to real life social scenarios. Following the initial 21-lesson core, 6 booster lessons provide review, practice, and opportunities to generalize learned skills through student constructed role-plays and real-life problem solving.

2.4. Assessment of treatment efficacy

2.4.1. Problem-solving knowledge questionnaire (KQ)

Developed to assess student knowledge of concepts and information taught explicitly in TFGA, the KQ serves as an indirect check of treatment exposure. For the first 11 items, only one answer among several alternatives is appropriate; items 12–14 require students to "check all that apply" (e.g., *Check* *all the ways your body may feel when you are angry*). Two additional items require students to supply curriculum-specific information (e.g., *What are three levels of anger, from lowest to highest?*). The maximum total scale score is 24. Item analyses and pilot administration were conducted prior to its use in the current study (see Daunic et al., 2006). Reliability estimates using current full sample yielded a Cronbach's alpha for the total scale score of .48 at pretest and .67 at posttest. Low reliability at pretest can be explained by restricted variability in knowledge scores prior to intervention.

2.4.2. Behavior rating inventory of executive function teacher form (BRIEF)

The Teacher Form of the BRIEF is a standardized instrument consisting of 86 items that contribute to 8 clinical scales. Respondents use a Likert scale ranging from 1 (*never*) to 3 (*often*) for each item. The scales form two broad indices, the Behavioral Regulation Index (BRI) and the Metacognition Index (MI), and a Global Executive Composite (GEC) score (see Gioia, Isquith, Guy, & Kenworthy, 2000). The BRI is composed by the Inhibit, Shift, and Emotional Control scales and measures the ability to use inhibitory control to shift cognitive set and manage emotions and behavior. The MI is composed by the Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor scales and measures the ability to self-manage tasks and monitor performance. Scores on the BRI, MI, Global Executive Composite and associated subscales demonstrated adequate reliability and construct validity evidence (see Gioia, Isquith, Kenworthy, & Barton, 2002). Our sample Cronbach's alphas for raw scores on the BRI, MI, and GEC were .88, .95, and .95, respectively, at pretest and .92, .96, and .96, respectively, at posttest. Sample Cronbach's alphas for the 8 individual subscales ranged from .92 to .96 at pretest and from .93 to .97 at posttest.

2.4.3. Clinical assessment of behavior teacher rating form (CAB-T)

The CAB-T is a behavior scale consisting of 70 questions that constitute a range of clinical, adaptive, and educationally related scales. Likert scale item responses range from 1 (*always or very frequently*) to 5 (*never*). CAB-T subscale scores from previous studies have yielded internal reliability coefficients that range from .94 to .97 for clinical scales and .80 to .99 for adaptive scales (Bracken & Keith, 2004). The CAB-T also demonstrates evidence of validity based on test content, factor-analytic studies, and convergent, discriminant, and concurrent validity studies across clinical groups such as conduct disorders and other disruptive behavior disorders (Bracken & Keith, 2004). Cronbach's alpha estimates for raw scores on the four subscales used in our analyses at pretest and posttest, respectively, were .93 and .93 for Internalizing, .97 and .98 for Externalizing, .55 and .54 for Social Skills, and .64 and .66 for Competence. Based on these low values for Social Skills and Competence, these variables were omitted from analysis.

2.4.4. Reactive–proactive aggression scale (R/P)

The R/P includes 19 questions to teachers about student behavior in which six items that assess aggression are embedded. Three items compose a Reactive Aggression subscale (e.g., *When this child has been teased or threatened he/she gets angry easily and strikes back*), and three items compose a Proactive Aggression subscale (e.g., *This child gets other children to gang up on a peer that he/she does not like*). All item responses are on a Likert scale and range from 1 (*never true*) to 5 (*always true*), such that total scores for each subscale range from 3 to 15. The R/P has demonstrated construct validity evidence for the two personality-related constructs and high internal consistency (see Dodge & Coie, 1987). For our sample, Cronbach's alpha reliability estimates were .90 and .91 at pretest and .91 and .92 at posttest for Reactive Aggression and Proactive Aggression, respectively.

2.4.5. Anger expression scale for children (AESC)

Modeled after the extensively used and well-validated State-Trait Anger Expression Inventory (Speilberger, 1988), the AESC is a 30-item self-report measure with Likert scale responses ranging from 1 (*almost never*) to 4 (*almost always*). Four subscales were derived from factor analyses: (a) Trait Anger, 12 items; (b) Anger-Out, 6 items; (c) Anger-In, 6 items; and (d) Anger Control, 6 items (Phipps & Steele, 2002). Initial factor analyses conducted by the instrument developers indicated that Trait Anger and Anger-Out items formed a broader subscale, with higher scores indicating more generalized feelings of anger and a greater tendency to display it outwardly (e.g., *I get in a bad mood when things don't go my way*; Phipps & Steele, 2002). Anger-In and Anger Control items also formed a broader subscale, with higher scores indicating more effort to prevent outward displays of anger or to minimize the experience of anger (e.g., *I feel [anger] inside but I don't show it*). We used the 4-factor model, however, as recommended by recent confirmatory factor analyses (Steele, Legerski, Nelson, & Phipps, 2009). Correlational analyses indicate that AESC subscales demonstrate good convergent validity with other measures of anger and hostility (Steele et al., 2009). Reliability estimates from sample data using Cronbach's alpha were .77, .79, .43, and .81 for Trait Anger, Anger-Out, Anger-In, and Anger Control, respectively, at pretest, and .77, .81, .47, and .81, respectively, at posttest. Based on these low values for Anger-In, this variable was omitted from analysis.

2.4.6. Social problem-solving inventory-revised (SPSI-R)

The SPSI-R is based on a two-component model of problem solving: *Problem orientation* focuses on metacognitive processes that reflect general awareness and appraisals of problems encountered in everyday life, and *Problem-solving style* focuses on four complex skills necessary to solve a problem successfully: (a) problem definition and formulation, (b) alternative solution generation, (c) decision making, and (d) implementing a solution and evaluating its outcome (see D'Zurilla, Nezu, Maydeu-Olivares, & 11-27, 2004). These skills closely parallel those taught explicitly in TFGA and addressed by Dodge's social information processing model (Dodge, 1986). The SPSI-R includes 52 Likert scale self-report items that comprise two problem orientation scales, Positive Problem Orientation (5 items) and Negative Problem Orientation (10 items) and three problem-solving style scales: Rational/Adaptive (20 items), Impulsive/Careless (10 items), and Avoidance (7 items). Item responses range from 1 (*not at all true*) to 5 (*extremely true*). Among diverse populations, the SPSI-R has shown strong internal consistency and stability over time, and it has evidenced strong structural, concurrent, predictive, convergent, and discriminant validity (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). Cronbach's alphas obtained from the current sample ranged from .60 (Positive Problem Orientation) to .91 (Rational Problem Solving Style) at pretest and from .64 (Avoidance Style) to .93 (Rational Problem Solving Style) at posttest.

2.5. Treatment fidelity

To assess treatment fidelity, we were able to observe 29% of all lessons taught across teachers (344/1188). Research team members' availability and teacher schedules were coordinated to determine specific teachers and lessons observed. Observers used individual lesson checklists of essential components derived from the curriculum manual and teacher training to evaluate fidelity of implementation. Observers offered teachers no formal or systematic instructional support. Pairs of observers conducted 36% of these observations to obtain inter-observer agreement.

In addition, teachers were asked to complete TFGA Curriculum Checks as lessons were taught. Teachers rated on a scale of 1 (*not at all*) to 4 (*all*) the amount of total lesson content they included, such as small group arrangement, role-play, student worksheets, and other questions specific to each lesson, and indicated approximately how much time lessons lasted, whether they were teaching one or more lessons each week, and whether they were including their own cognitive models as instructed.

Finally, the TFGA Teacher Questionnaire assessed aspects of TFGA's social validity. Eight items focused on ease of use (e.g., *The curriculum was easy to use; I completed each lesson in the time allotted*), six on appeal or utility to students (e.g., *The curriculum concepts were age-appropriate for my students*), and eight on effectiveness for reducing negative behaviors (e.g., *The curriculum improved my students' behavior*). Each Likert scale response ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

2.6. Procedures

After informing school personnel about the results of random assignment to group, we trained the treatment schools' teachers and guidance counselors in CBI strategies and TFGA implementation for 10 h over two days during the second full month of each year of the study. All pretest measures were administered in control and treatment schools – prior to treatment implementation – within two weeks of training. Teachers were instructed to read items from the self-report inventories aloud to students as a group or to closely monitor students for whom readability might be an issue. Although all student assessments were considered to be age-appropriate, we were attentive to this possibility because of the high proportion of students on FRL and the academic risk associated with this variable. The timing of pretest administration allowed teachers to become familiar enough with their students to make informed teacher-report ratings. Treatment group teachers were instructed to begin teaching TFGA lessons at the rate of 1–2 per week, on average, as soon as baseline data were collected. We conducted follow-up meetings at each treatment school in mid-year (i.e., January) to reorient teachers to TFGA goals, answer questions about implementation issues, and solicit feedback about lesson delivery and student responsiveness. Treatment group teachers were instructed to complete posttest measures within two weeks following the end of instruction, which occurred between mid-April and early May. We instructed control group teachers to complete posttest assessments within the same timeframe.

2.7. Design and statistical methods

2.8. Efficacy data

To determine the effects of TFGA, we used the MIXED procedure in SAS (version 9.2) to fit a hierarchal linear model (HLM) for each outcome measure. A three-level model that included classrooms nested within school and students nested within classrooms was initially considered, but we found no significant variation due to school for any of the outcome measures. Thus, each model used to estimate treatment effects was comprised of two levels: students at Level 1 and classrooms at Level 2. (Because random assignment was at the school level, to avoid contamination [see Cook, 2005], all classrooms within each school were in the same condition.) Dependent variables were posttest scores on measured subscales; covariates included classroom and condition at Level 2 and pre-intervention subscale score, FRL, gender, race, and FCAT scores at Level 1. Including these covariates adjusts for possible non-equivalence between groups. Each model also included the condition-by-pretest subscale score interaction, because we wanted to examine the effect of pretest risk on treatment impact. Given that the interaction effect was of substantive interest in HLM analyses, we centered (within classroom cluster) continuous variables in the Level 1 model (Enders & Tofighi, 2008). The Level 1 model (child i in class j) was specified as

$$\begin{aligned} \mathrm{Y_{ij}} = {} & \beta_{0j} + \beta_{1j}(\mathrm{PRE\ SCORE})_{ij} + \beta_{2j}(\mathrm{RACE})_{ij} + \beta_{3j}(\mathrm{SEX})_{ij} + \beta_{4j}(\mathrm{FRL})_{ij} + \beta_{5j}(\mathrm{FCAT\ READING})_{ij} \\ & + \beta_{6j}(\mathrm{FCAT\ MATH})_{ij} + e_{ij}. \end{aligned} \tag{1}$$

The Level 2 (class j) model was specified as:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\mathrm{CONDITION_j} + \mathrm{u_{0j}} \tag{2}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}\mathrm{CONDITION_j} \tag{3}$$

$$\beta_{2j} = \gamma_{20} \tag{4}$$

$$\beta_{3j} = \gamma_{30} \tag{5}$$

$$\beta_{4j} = \gamma_{40} \tag{6}$$

$$\beta_{5j} = \gamma_{50} \tag{7}$$

$$\beta_{6j} = \gamma_{60}. \tag{8}$$

$\mathrm{Y_{ij}}$ represents the post intervention subscale score, β_{0j} represents the intercept, SEX is the dichotomous variable equal to 1 if the child was a girl and 0 if the child was a boy, RACE is the dichotomous variable equal to 1 if the child was AA and 0 if the child was White/Other, FRL is the dichotomous variable equal to 1 if the child received free or reduced lunch and 0 if the child paid full price for lunch, FCAT READING is the variable equal to the FCAT reading score centered within classroom cluster, FCAT MATH is the variable equal to the FCAT math score centered within classroom cluster, PRE SCORE represents the pre intervention subscale score centered within classroom cluster, and CONDITION is the dichotomous intervention variable equal to 1 for the control group and 0 for the treatment group. We assumed e_{ij} to be normally distributed with a zero mean and constant variance ($ó^2$) and the random effect u_{0j} to be normally distributed with constant variance ($\mathrm{t_{00}}$).

We used restricted maximum likelihood (REML) for parameter estimation to reduce bias (see Peugh, 2010 for a discussion of multilevel model estimation methods) and analyzed complete cases in all models. Missing data on demographics ranged from 4.1% (FCAT reading) to 5.6% (FRL) on demographic variables, 1.1% (CAB-T) to 5.1% (R/P) on pretest measures, and 9.2% (CAB-T) to 12.9% (R/P) on posttest measures. We computed intraclass correlation coefficients (ICCs) to estimate the proportion of variance in outcomes due to classroom cluster effects. We computed effect sizes for significant treatment effects for all students and for those in the upper quartile of baseline risk on each measure using (a) the pseudo-R^2 statistic (the square of the correlation between observed and predicted values; Singer & Willett, 2003) indicating the proportion of variation in outcome measure accounted for by model predictors and (b) Hedges' g effect sizes using the “continuous-difference in differences” formula (What Works Clearing House Procedures and Standards Handbook, 2008). An alpha-level of .05 was used for all testing.

We reversed scores for study subscales and individual items where a low score indicated more risk, so that all measures could be interpreted uniformly. We obtained demographic and achievement data from school districts, merged them with study measure data, and determined the quantity of missing data across data sources. In all bivariate analyses, including equivalence of treatment and control groups on covariates and pretest subscale scores, we used chi-square for binary and categorical data and Wilcoxon rank sum tests for numerical data.

2.9. Treatment fidelity and social validity data

We computed summary scores (i.e., the percent of total components observed) based on observation checklists. Through coordinating observer availability with teacher scheduling of TFGA lessons, a total of 9 observers rated a total of 38 teachers, and the number of lessons rated for each teacher ranged from 1 to 16. Overall treatment fidelity was determined by averaging observer scores across teachers. If multiple observers rated the same teacher on a particular occasion, only the primary observer rating was included for computation. To estimate agreement on treatment fidelity observations, we computed the average percent agreement between observers on lesson components checked by pairs of observers who rated the same teacher on the same occasion. The data sample for inter-observer agreement computation resulted from 42 paired observations across 15 teachers, with the number of lessons for a single teacher ranging from 1 to 5. We analyzed data from the TFGA Curriculum Checks by computing summary frequencies for TFGA lesson components, and we computed summary means and standard deviations for each of the three subscales in the TFGA Teacher Questionnaire.

3. Results

3.1. Treatment efficacy

Prior to conducting HLM analyses, we examined treatment and control group scores on each outcome measure to determine group equivalence prior to treatment. We found no between-group mean differences on any pretest scores except for two subscales on the AESC self-report measure. Prior to treatment, control group participants reported higher risk for Trait Anger, $t\ (1253) = 2.17$, $p = .03$, with an effect size of $g = .12$, and Anger Out, $t\ (1246) = 2.16$, $p = .03$, with an effect size of $g = .13$.

HLM findings for condition effects are presented in Table 1. There was a significant main effect of condition on problem-solving knowledge tempered by a significant problem-solving knowledge pretest-by-condition interaction, such that students with lower problem-solving knowledge prior to intervention benefited more than students with relatively higher problem-solving knowledge scores prior to intervention. Similarly, significant pretest-by-condition interaction effects were found for 9 outcome subscales and 2 indices, indicating that treatment group students with relatively high pretest risk had lower risk at posttest than comparable controls. Specifically, treatment diminished the relation between pretest and posttest risk on the BRIEF BRI and MI index scores (i.e. on 2 of 3 BRI subscale scores and 3 of 5 MI subscale scores) that measure EF, the Proactive Aggression subscale score, and the Anger-Out and Trait Anger subscale scores of the AESC. Thus, self-reported positive changes in level of anger and the outward expression of anger, as well as teacher-reported proactive aggression, were consistent with teacher-reported positive changes in EF-related behavior regulation and metacognition. Additionally, a significant positive main

Table 1
Hierarchical linear modeling results: pretest score, condition, and pretest score∗condition effects on outcome measures.

Subscale	Estimate		
	Pretest score	Condition	Pretest score by condition
Problem-solving knowledge Q	0.40**	−8.35**	−0.20*
Teacher-report measures			
BRIEF			
Behavior regulation index	0.66**	0.06	0.12**
Inhibit	0.64**	0.07	0.13**
Shift	0.57**	−0.13	0.14**
Emotion control	0.65**	0.03	0.07
Metacognition index	0.61**	1.31	0.09*
Organize	0.57**	0.24	0.13**
Initiate	0.50**	0.34	0.14**
Monitor	0.59**	0.07	0.11*
Working memory	0.58**	0.24	0.05
Plan	0.55**	0.38	0.06
Clinical assessment of behavior			
Internalizing	0.59**	−0.67	0.09
Externalizing	0.73**	0.98	0.06
Proactive aggression	0.65**	0.20	0.11*
Reactive aggression	0.67**	0.30	0.06
Student self-report measures			
Anger expression scale for children			
Trait anger	0.28**	−0.06	0.17**
Anger out	0.42**	0.33	0.17**
Anger control	0.41**	0.20	0.05
Social problem-solving inventory			
Negative problem orientation	0.38**	−0.60	0.04
Positive problem orientation	0.33**	0.66*	0.01
Rational problem solving style	0.49**	2.77*	0.02
Impulsive/careless style	0.40**	0.53	−0.04
Avoidance style	0.24**	−0.57	−0.02

Note. BRIEF stands for the Behavior Rating Inventory of Executive Function.
** $p<.01$.
* $p<.05$.

effect for condition was found for two subscales of the SPSI-R: Positive Problem Orientation and Rational Problem Solving, indicating that students reported a more adaptive approach to solving social problems.

Table 2 shows ICC and effect size calculations using pseudo-R^2 statistics. As expected, teacher-report measures had higher ICC values because student self-reports were more likely to be independent of teacher and classroom influences. Pseudo-R^2 values indicating the total variance in an outcome measure that can be explained by the model (i.e., condition and covariates) was above .53 for all teacher-report measures and below .34 for student self-report measures. In addition, means, standard deviations, and Hedges' g values for the full sample for all outcomes with a significant condition effect are shown in Table 3; those for children in the upper quartile of baseline risk (see Rubin & Balow, 1978; Severson, Walker, Hope-Doolittle, Kratochwill, & Gresham, 2007) are shown in Table 4.

3.2. Effects of student characteristics

Although a focus on how demographic and achievement variables might influence treatment was beyond the scope of this study, there were significant main effects of gender, race, FRL, FCAT reading, and FCAT math scores on posttest outcome scores after controlling for treatment effects. Gender and race influenced the largest number of variables: Girls were at lower risk than boys on all measures of EF, Reactive Aggression, Internalizing, and Externalizing. African American students evidenced more risk than White/Hispanic/Other students on the BRI, Externalizing, Proactive Aggression, and Reactive

Table 2
Classroom cluster effects and model effect sizes for significant findings.

Measure	Model *ICC*	Pseudo R^2
Problem-solving knowledge Q	0.2156	0.7173
Behavior regulation index	0.4529	0.6304
Inhibit	0.3871	0.6158
Shift	0.4629	0.5585
Metacognition index	0.4666	0.6552
Organize	0.3749	0.5968
Initiate	0.4008	0.6069
Monitor	0.3890	0.6132
Proactive aggression	0.3913	0.5264
Anger out	0.0770	0.3383
Trait anger	0.0566	0.2041
Rational problem solving	0.0655	0.2933
Positive problem orientation	0.0275	0.1632

Aggression, Anger-Out, Trait Anger, Anger Control, Negative Problem Orientation, and Impulsive/Careless and Avoidance problem-solving styles.

Students on FRL evidenced higher posttest risk only on the Initiate subscale of the BRIEF. Students with higher reading scores had lower posttest risk on MI subscales, Internalizing, Externalizing, and the Avoidance problem-solving style. Students with higher math scores had less posttest risk on the Initiate, Shift, and Working Memory subscales of the BRIEF, and on Internalizing, Reactive Aggression, and Anger-Out. In addition, boys, African American students, students on FRL, and students with lower achievement scores in math and reading had lower posttest problem-solving knowledge scores. Collectively, these findings confirmed the need to control for these variables in the models we used to analyze the effects of condition on outcomes.

3.3. Treatment fidelity and social validity

The mean observer-rated treatment fidelity across teachers was 86.1% (*SD* = 9.5%, range 56.6–97.8%), indicating that most observed teachers followed the curriculum as intended. On these observations, the mean percent agreement within pairs of observers was 94.1% (*SD* = 10.0%, range 71.4–100% with a single outlier of 57.1%), indicating that observers were able to use fidelity checklists with adequate reliability.

Table 3
Means, standard deviations, and effect sizes for significant outcomes related to condition for all participants.

	Control				Treatment				Hedges' *g*
	Pretest		Posttest		Pretest		Posttest		
Measure	*N*	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*	
Problem-Solving Knowledge	566	12.16 (3.07)	512	13.02 (3.26)	681	12.46 (3.26)	626	21.70 (5.23)	1.88
Behavior Regulation	577	42.42 (15.56)	528	43.16 (14.81)	699	42.63 (14.53)	634	42.88 (14.37)	0.03
Inhibit	577	15.33 (6.27)	528	15.72 (6.13)	700	15.32 (5.85)	635	15.48 (5.71)	0.04
Shift	579	14.07 (5.22)	529	14.29 (4.97)	700	14.34 (4.69)	634	14.28 (4.87)	0.06
Metacognition	578	69.34 (23.22)	528	70.86 (22.45)	699	69.23 (23.10)	634	68.09 (22.77)	0.12
Organize	578	10.31 (3.91)	528	10.57 (3.69)	700	10.22 (4.14)	635	10.12 (4.04)	0.09
Initiate	578	11.42 (4.11)	528	11.72 (3.97)	701	11.52 (4.13)	634	11.10 (3.90)	0.18
Monitor	578	16.17 (5.64)	528	16.42 (5.43)	700	16.13 (5.40)	635	16.05 (5.40)	0.06
Proactive aggression	573	4.85 (2.49)	528	5.18 (2.62)	708	4.82 (2.48)	638	4.93 (2.42)	0.09
Anger out	564	12.02 (4.43)	523	12.00 (4.33)	684	11.47 (4.22)	612	11.64 (4.10)	0.04
Trait anger	567	19.95 (5.60)	523	19.79 (5.95)	688	19.23 (6.09)	615	19.72 (6.10)	0.11
Rational problem solving	564	59.25 (16.29)	531	62.66 (15.98)	681	58.30 (16.06)	619	59.03 (16.24)	0.16
Positive problem orientation	565	13.00 (4.38)	531	13.74 (4.49)	682	12.78 (4.38)	623	13.02 (4.28)	0.11

Note. Means are based on raw data.

Table 4
Means, standard deviations, and effect sizes for significant outcomes related to condition for participants in highest risk quartile at baseline.

	Control				Treatment				Hedges' *g*
	Pretest		Posttest		Pretest		Posttest		
Measure	*n*	*M* (*SD*)	*n*	*M* (*SD*)	*n*	*M* (*SD*)	*n*	*M* (*SD*)	
Problem-solving knowledge	114	7.82 (1.29)	99	11.34 (2.96)	101	7.36 (1.47)	87	18.34 (6.35)	1.54
Behavior regulation	148	66.00 (10.80)	121	62.85 (15.85)	180	65.40 (10.76)	158	56.89 (15.04)	0.35
Inhibit	156	24.39 (3.84)	132	23.14 (6.12)	207	23.83 (3.95)	179	21.36 (6.14)	0.20
Shift	138	22.05 (3.69)	113	20.4 (5.61)	184	21.92 (3.62)	156	18.81 (5.22)	0.28
Metacognition	155	103.35 (13.16)	126	99.59 (21.77)	167	103.46 (13.29)	139	92.53 (22.79)	0.32
Organize	159	16.32 (2.79)	131	15.56 (4.43)	191	15.74 (2.68)	163	13.28 (4.4)	0.38
Initiate	199	16.25 (2.32)	169	15.6 (3.77)	229	16.43 (2.41)	189	14.41 (3.84)	0.36
Monitor	159	23.95 (3.26)	131	22.78 (5.43)	187	23.90 (3.43)	160	21.34 (5.29)	0.26
Proactive aggression	163	8.74 (2.40)	140	8.46 (3.3)	220	7.99 (2.08)	189	7.08 (2.97)	0.20
Anger out	160	18.07 (2.62)	139	15.52 (4.84)	156	18.16 (2.69)	134	14.60 (4.72)	0.21
Trait anger	175	27.11 (2.96)	161	23.18 (5.93)	153	26.77 (3.73)	133	21.78 (6.54)	0.17
Rational problem solving	151	79.81 (8.01)	141	71.82 (13.88)	168	79.02 (7.42)	144	68.66 (14.49)	0.17
Positive problem orientation	148	18.80 (2.43)	134	15.91 (4.27)	176	18.47 (2.38)	148	15.03 (4.21)	0.13

Note. Means are based on raw data. Baseline highest risk quartile was determined from the total sample (i.e., across groups), which accounts for the differences in sample size.

Data from 31 of 44 teachers in the treatment condition who returned TFGA Curriculum Checks indicated that all respondents covered "most" or "all" lesson content, and most indicated they included all associated components such as group activities and worksheets. Lessons averaged 30 min including completion of activities. TFGA Teacher Questionnaire means computed from 43 of 44 teachers in the treatment condition were 3.8 ($SD = 0.8$), 3.8 ($SD = 0.7$), and 3.6 ($SD = 0.8$) out of 5 for Appeal, Ease of Use, and Efficacy subscales, respectively. Thus, teachers found TFGA relatively easy to implement and reported moderately positive effects on student behavior.

4. Discussion

This randomized controlled trial was designed to investigate the efficacy of TFGA, a CBI implemented at a universal level, grounded in a social information-processing model, and focused on promoting self-regulation by teaching students social problem solving. We hypothesized that the intervention would improve (a) knowledge of social problem solving; (b) teacher-reports of behaviors consistent with EF, social–emotional adjustment, and aggression; and (c) student self-reports of social problem-solving skills and anger control and expression, outcomes associated with developmental risk for significant emotional and behavioral difficulties. Data analyses using multi-level models indicated that TFGA had positive effects on knowledge of social problem solving; teacher-reported EF and proactive aggression; and student self-reports of trait anger, anger-out, approaching social problems positively, and using a rational problem-solving style. With a sample size adequate for a two-level HLM and more rigorous checks on treatment fidelity, these findings extend those from previous TFGA studies (Daunic et al., 2006; Daunic et al., 2007) and add to the growing body of evidence about the effectiveness of universally delivered cognitive–behavioral instruction (see e.g., CPPRG, 2004; Robinson et al., 1999).

4.1. Knowledge of problem solving

The significant main effect of treatment on knowledge of TFGA concepts and skills, tempered by the significant pretest-by-condition interaction, is not inconsequential, given that acquiring knowledge is fundamental to enacting the skill set taught in TFGA. For students at risk for emotional and behavioral difficulties, requisite procedural knowledge about social problem solving provides a foundation for making effective choices and enacting complex skills outside of the training environment and consequently, enhancing the probability of receiving subsequent reinforcement (Bandura, 1969, 1997).

4.2. Effects on executive function

Study findings indicated that TFGA had a positive influence on EF for students with higher initial EF risk. Thus, teacher reports of behaviors consistent with EF as measured by scores on the BRIEF indicated that TFGA affected the BRI and two of the three BRI subscales: (a) the ability to self-manage behaviors and inhibit impulses and (b) to shift cognitive set or transition as circumstances demand. Inhibiting impulsive behavior and attempting to find alternative solutions when the current solution is not working are strongly associated (a) with TFGA concepts that focus explicitly on stop-and-think mechanisms and (b) with the multiple and diverse opportunities provided in TFGA to practice problem-solving steps and consider alternatives. Moreover, we found significant positive findings on three of five MI subscales: initiating tasks or strategies, organizing materials and plans, and monitoring performance, each of which contributes to the ability to self-regulate cognitive tasks and engage in problem solving in a variety of contexts (Rueda et al., 2005). With the exception of organization, these MI skills are also addressed explicitly in TFGA.

4.3. Effects on social–emotional adjustment and aggression

While we did not find evidence that treatment affected teacher-rated internalizing or externalizing behavior (internalizing approached significance with a *p* value of .06), we found that TFGA appeared to diminish risk of teacher-reported proactive aggression, similar to the Lochman and Wells (2002) results for the Coping Power intervention. Whereas reactive aggression is associated with deficits in the early stages of the Crick and Dodge (1994) model, such as faulty interpretation of social stimuli and a hostile attribution bias (Dodge, Lochman, Harnish, Bates, & Pettit, 1997), proactive aggression is associated with deficits in the later response selection stage of the model and is characterized as instrumental and organized, with little evidence of autonomic arousal (Dodge, 1991). As such, proactively aggressive children typically have better social skills and fewer processing deficits (Orobio de Castro, Merk, Koops, Veerman, & Bosch, 2005) but have positive outcome expectancies for aggressive responses (Dodge et al., 1997). Given this context, TFGA seems to have been more effective with students who had achieved some level of impulse control and could thereby reconsider the longer-term consequences of aggressive choices. Conversely, students at risk for being reactively aggressive may not have benefited as much in the short-term, because the knowledge structures or schemas that automatically influence cue interpretation and attribution have been developed and strengthened through repeated experience and thus may be more resistant to change (see Anderson & Bushman, 2002; Ellis et al., 2009; Lemerise & Arsenio, 2000).

4.4. Effects on anger control and expression

In addition to lowered risk on proactive aggression, students in the treatment condition had lower posttest risk of self-reported trait anger and of expressing anger outwardly than comparable controls. TFGA's effect on this outcome was likely due to the substantive intervention focus on anger awareness, calming down techniques, and the chance to practice these skills through student role-plays in which anger is evident. This finding is promising, given that high levels of trait anger are associated with a variety of negative life outcomes including poor interpersonal relationships and increased likelihood of aggressive behavior (Wilkowski & Robinson, 2008). The fact that we did not find a relation between treatment and self-reported anger control may have resulted from TFGA instruction that encouraged students to consciously – and often outwardly – process their feelings and learn from others' experience.

4.5. Effects on social problem solving

TFGA had a positive main effect on self-reports of the tendency to approach problems positively, a motivational component of social problem solving. This finding indicates that students in the treatment group had a tendency to approach social problems as challenges, were more optimistic and confident about solving them, and understood that negative emotions (e.g., anger) could be part of that process. Aligned with explicit instruction in TFGA about what is good about problem solving, such as being able to attain social goals and be in control of actions, this finding is consistent with previous literature indicating that problem-solving instruction is more effective when training includes content on problem orientation in addition to problem-solving skills (see Malouff, Thorsteinsson, & Schutte, 2007). Treatment also positively affected self-reported use of a rational problem solving style: recognizing and defining problems, generating an array of possible solutions, evaluating the solutions through deliberative processes, and choosing a solution and designing a plan for implementation (McMurran, Nezu, & Nezu, 2008). TFGA's primary focus is on teaching students to follow these steps when faced with complex social situations and to use them as self-statements to guide decision-making until the steps become automatic.

Collectively, study findings indicate that treatment affected aspects of intra-individual self-regulation, particularly for students at risk on associated variables, as evidenced through improvements in components of EF, anger, and social problem solving, that should be generalizable to a diversity of contexts (Rueda et al., 2005; Vohs & Ciarocco, 2004). EF processes in particular are hypothesized to make interdependent contributions to goal pursuit, emotion regulation, and problem solving (Carver & Scheier, 1998; Gray, 2004; Zelazo & Cunningham, 2007) and are critical to the development of successful social–emotional functioning.

To put these findings in context, students in general education classrooms are less likely to exhibit pronounced negative behaviors than are clinical populations. For those who are “on the margins” of serious risk for behavioral difficulties (see Walker et al., 1995), even the modest effect sizes evidenced for teacher- and self-reported attitudes and behaviors could be of practical importance, as associated risk is likely to become more problematic if untreated (Durlak, Fuhrman, & Lampman, 1991). Thus, universal intervention may help prevent costly referrals to special education for students who have not yet been identified as needing further support, especially because at-risk students can benefit from learning social problem solving alongside typical peers. It would seem that the cost–benefit ratio favors universal prevention, even though the main effects in this study were limited to gains in problem-solving knowledge and a more positive and rational approach to solving social problems.

4.6. Limitations and future research

One limitation of our study is the possibility of sampling bias. Even though we randomly assigned schools to condition, the overall rate of participant consent coupled with the differential between treatment and control consent rates introduces the potential for bias (see What Works Clearing House Procedures and Standards Handbook, 2008). Given that we did not collect pretest data from non-consenting students, bias is unknown. Although we have no reason to believe that study participants differed significantly from non-participants, higher consent to participate would have lessened this possibility. Once participants were enrolled in the study, however, overall attrition and the differential between groups was well within WWC guidelines for evidence-based research. An additional limitation related to statistical inference is that we conducted multiple tests, thus inflating the possibility of experiment-wise error.

Like other studies in which teachers are primary respondents, this study is also limited by the fact that teacher bias and expectancy effects may operate when classroom teachers who complete outcome measures also implemented the intervention. These phenomena are unavoidable in classroom-based research to the extent that teacher input is considered valuable. Because teacher observations are contextualized in the realities of the classroom and occur over an extended period of time, researchers have argued that changing teacher perceptions about their students' behaviors alone is an important positive outcome (Daunic et al., 2006; Ollendick & King, 1999; Sutherland & Oswald, 2005). Data from teacher reports are strengthened, however, when coupled with other data sources.

In addition to teacher reports, we also used student self-reports, and although students constitute a second important informant source, self-report data can be influenced by individual respondent characteristics (see Phipps & Steele, 2002) and are subject to bias. Moreover, the .67 posttest reliability of the student problem-solving knowledge measure was below what is typically considered minimally acceptable for research. To counter these limitations, future studies on the effects of TFGA could include the development of a more reliable measure of student problem-solving knowledge, additional informants such as parents, and direct observations of student behavior. Adding direct observation – considered the gold standard in studies examining externalizing behaviors – to indirect measures would add to the validity of study outcomes.

An additional limitation may be our inability to distinguish between skill and performance deficits for students with higher pretest risk on particular variables. For example, the lack of positive findings for reactive aggression could have been due to persistent skill deficits related to impulse control, and the positive findings for proactive aggression to improvements in performance deficits following intervention. Particularly puzzling is the finding that treated students evidenced improvement over controls on teacher-rated EF subscales (e.g., those measuring the ability to inhibit, shift, and monitor behavior) but not on teacher-rated externalizing behavior. In any case, further investigations of the relations among these and other outcome measures associated with risk for emotional and behavioral difficulties using statistical methods such as path analysis might illuminate the role of mediating variables that include components of EF and moderating variables that include gender and cognitive ability, shedding light on the skill versus performance deficit question.

Finally, follow-up studies to determine whether TFGA effects are sustained after a year or two following treatment would provide insight into whether continued or more intensive intervention is needed to improve the social–emotional functioning of students who are behaviorally at risk. Real-life social situations require complex reciprocal cognitive and emotional processes that can challenge students to use newly acquired skills effectively without support. Future research might focus on the effects of additional social problem-solving skill development and substantive practice opportunities provided through intervention delivered in pull-out, small group (Tier II) settings. Students who are at risk for emotional and behavioral difficulties may need small group instruction to enhance skill development through the provision of continued practice, teacher modeling of appropriate behavior, and adequate reinforcement—all of which might increase treatment effectiveness and promote generalization.

Acknowledgment

This study was supported by a four-year grant from the US Department of Education, Institute of Education Sciences (# R324B06029) submitted to CFDA 84.324, National Center for Special Education Research.

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