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The Role of Mentoring in Fostering Executive Function, Effort, and Academic Self-Concept

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Abstract

This exploratory study examined the impact of an in-school intervention program that blends peer mentoring with executive function strategy instruction for at-risk learners. More specifically, the study focused on evaluating the effects of the SMARTS Executive Function and Mentoring intervention on students' strategy use, effort, academic self-concept, and resilience. The final sample consisted of 34 at-risk students in grades 9 and 10 from an urban high school. Findings showed that students in engaged peer mentoring relationships demonstrated significantly higher levels of effort and used more executive function strategies in their classwork, homework, and studying. Findings provide preliminary support for blending peer mentoring with executive function strategy instruction for at-risk learners in schools.

Students who are at risk for academic failure, including those diagnosed with learning disabilities (LD), often struggle to complete their work and to perform at a level that reflects their ability and their range of knowledge in the classroom. These weaknesses become increasingly evident in the higher grades when academic performance depends more heavily on students' use of executive function strategies as well as their ability to maintain the motivation, effort, and persistence needed to master and implement executive function strategies (Meltzer, 2010, 2014; Meltzer & Krishnan, 2007). In addition to their academic struggles, many of these students have limited self-understanding and low self-concept so that they feel isolated from their peers as well as their school communities. For these struggling students, peer support and peer-assisted programs often improve their self-concepts, motivation, attitudes, and academic performance (Fuchs, Fuchs, & Burish, 2000; Mastropieri et al., 2001; Rhodes, 2008; Rhodes, Reddy, Roffman, & Grossman, 2005). School-based peer mentoring programs that are structured and blended with executive function strategy instruction, therefore, provide a potentially powerful approach to improving students' metacognitive awareness and teaching them executive function strategies that are critically important for the demands of 21st-century classrooms.

This exploratory study was designed to investigate the effects of an in-school intervention program that blends peer mentoring and executive function strategy instruction and its impact on students' strategy use, effort, academic self-concept, and resilience. This intervention, known as the SMARTS Executive Function and Mentoring program, promotes five core outcomes for students: Strategies, Motivation, Awareness, Resilience, Talents, and Success (Meltzer, Reddy, Kurkul & Greschler, 2013). The goal of SMARTS is to initiate a cycle of success through peer mentoring so that students are motivated to make the effort to use executive function strategies in their schoolwork and to persist in order to make academic gains.

Theoretical Framework

Executive function. Over the years, a broad range of definitions and models have been proposed to explain executive function (Denckla, 2007; Gioia, Isquith, Kenworthy, & Barton, 2002; Goldstein & Naglieri, 2014; Meltzer, 2010). In general, theorists and researchers agree that executive function is an all-encompassing construct or "umbrella term" for the complex cognitive processes that underlie flexible, goal-directed responses in novel or difficult situations (Anderson, 2002).

In the present study, we defined executive function in terms of the cognitive processes underlying goal-directed behavior, namely, goal-setting, organizing, prioritizing, shifting approaches flexibly, accessing information in working memory, and self-monitoring (Meltzer, 2007, 2010, 2014). These executive function processes become increasingly important in middle and high school, when the curriculum content constrains students' interests and

challenges them at a higher level (Hidi, Renninger, & Krapp, 2004). Many bright and talented students, especially those with learning and attention difficulties, no longer make the effort needed to master the academic load and consequently become less productive or drop out of school (Denckla, 2007).

However, success can be attainable when students use executive function strategies to set realistic goals, focus their effort on reaching those goals, and self-regulate their cognitive, attentional, and emotional processes appropriately (Dawson & Guare, 2010; Denckla, 2007). All students, particularly students with learning difficulties, therefore, need to become strategic learners with strong metacognitive awareness who understand how they think and how they learn (Scruggs, Mastropieri, Berkeley, & Graetz, 2010; Swanson, 2001). They need to be taught executive function and learning strategies explicitly and systematically in the context of reading, writing, math, and the content areas (Deshler, Ellis, & Lenz, 1996; Mastropieri, Scruggs & Marshak, 2008; Meltzer & Basho, 2010; Swanson, 2001).

These strategies are beneficial for all students, but they are essential for students with learning difficulties (Scruggs et al., 2010; Swanson, 2001). In fact, in their meta-analysis of studies focused on research-based strategies to support students in content-area classes, Scruggs et al. (2010) find high effect sizes for systematic teaching of learning and memory strategies, concluding that strategies help students to "think more systematically about the content to be learned."

Peer mentoring and peer-assisted learning. Students who struggle academically often have difficulty making meaningful connections within their school environments, putting them at risk for social rejection, school failure, school dropout, and delinquency (Achilles, McLaughlin, & Croninger, 2007). Many of these students also lose confidence and feel isolated, which often leads to low motivation, inconsistent effort, and poor academic performance.

Peer mentoring and peer tutoring provide a powerful forum for intervening and helping these students (Karcher, 2005; Rhodes & Spencer, 2010). Thus, numerous studies over the past decade have demonstrated the strong influence of peer support and social relationships on students' motivation, effort, and achievement (Fuchs et al., 2000; Fuchs, Fuchs, Mathes, & Martinez, 2002; Harris & Meltzer, 2015; Karcher, 2005; Regan, Evmenova, Mastropieri, & Scruggs, 2015; Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003). Specifically, findings have shown that peer mentoring influences students' self-esteem, social skills, and how connected they feel to school (Karcher, 2005, 2008, 2009). Peer mentors also help students to understand their struggles in school so that they no longer need to prove that they are "smart" (Karcher, 2005, 2008, 2009; Plata, Trusty, & Glasgow, 2005).

To date, there has been a paucity of formal mentoring programs that address the specific needs of at-risk learners or students with diagnosed learning disabilities (Meltzer, Greschler, Kurkul, & Stacey, 2015; Regan et al., 2015; Scruggs, Mastropieri, & Marshak, 2012). Therefore,

there is a need for more school-based programs that include peer mentoring to help at-risk students to become part of an accepting social community.

The beneficial effects of peer mentoring are often dependent on the quality of the mentor-mentee relationship and there has been an emphasis on the need for more studies that examine these connections (Grossman & Rhodes, 2002; MENTOR/National Mentoring Program, 2005). The limited number of studies to date have shown that youth in high-quality mentoring relationships reported significantly fewer symptoms of depression, higher self-esteem, and less substance abuse problems than youth in low-quality mentoring relationships (Whitney, Hendricker, & Offutt, 2011). Furthermore, in high-risk college students, studies have shown that mentees in positive mentoring relationships (i.e., friendly, respectful bonds and mutual agreement on goals) were more likely to participate in class, seek help from teachers, and persist in school than students with less positive mentoring relationships (Larose, Chaloux, Monaghan, & Tarabulsy, 2010).

Together, these studies suggest that the quality of mentoring relationships is critically important for intervention efficacy and that more research is needed to address this issue. The current study was designed to address this gap by measuring the quality of mentoring relationships in an in-school program and assessing the interactions among students' use of executive function strategies, level of effort, academic self-concept, and resilience.

The relationships among executive function strategies, effort, academic self-concept, academic performance, and resilience. Over the past 10 years, our understanding of students with learning difficulties has moved beyond a deficit model to one that emphasizes the importance of fostering academic success and resilience. This, in turn, has led to research focused on the intrinsic and extrinsic processes that buffer the potential impact of risk factors in students (Margalit, 2003, 2004). As a result, different research strands have identified specific internal processes (motivation, self-concept, effort) and external factors (social support, connections with peers and family, teachers' judgments, school placement) that impact academic performance and resilience in at-risk learners (Dweck & Master 2008; Dweck & Molden, 2005; Margalit, 2003, 2004; Raskind, Goldberg, Higgins, & Herman, 1999).

In our previous studies, we have investigated the interactions among self-understanding, self-concept, executive function strategies, effort (internal processes), teachers' perceptions (an external process), and academic performance (Meltzer, Katzir, Miller, Reddy, & Roditi, 2004a; Meltzer et al., 2004b; Meltzer, Reddy, Pollica, & Roditi, 2004c). Overall, our results showed that a cyclical relationship exists among academic self-concept (students' perceptions of themselves as competent learners), effort (students' willingness to work hard), executive function strategy use (students' use of strategies in their schoolwork), and academic performance (see Figure 1).

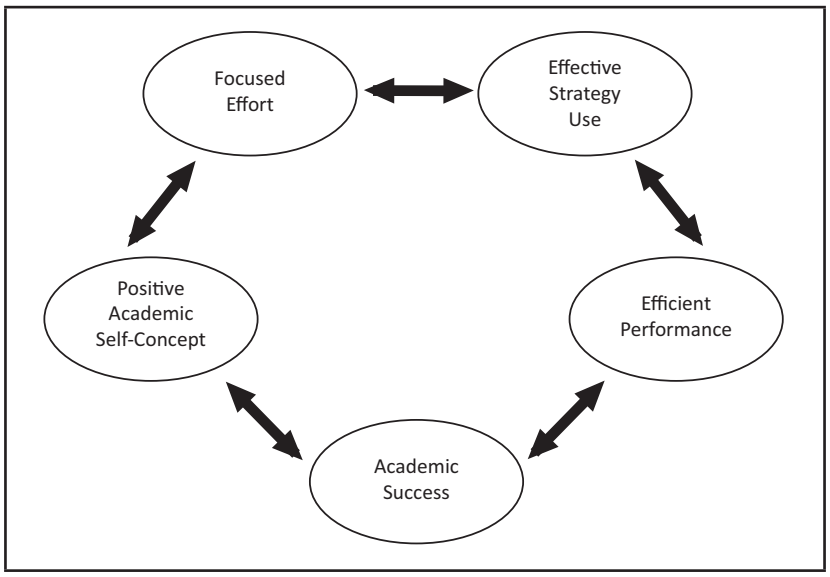

Figure 1. Academic success cycle.
From Meltzer, L. J., Reddy, R., Pollica, L., & Roditi, R. (2004c). Copyright 2004 by the International Academy for Research in Learning Disabilities. Reprinted by permission.

Struggling learners with positive academic self-concepts were more likely to work hard and to use learning strategies in their schoolwork than students who showed negative academic self-concepts (Meltzer et al., 2004a, 2004b, 2004c). These findings suggest that when students succeed academically as a result of their effort and strategy use, they begin to value these learning strategies and feel empowered to work harder, which, in turn, leads to positive academic self-concept, a willingness to persist, stronger academic performance, and resilient mindsets (see Figures 1 and 2).

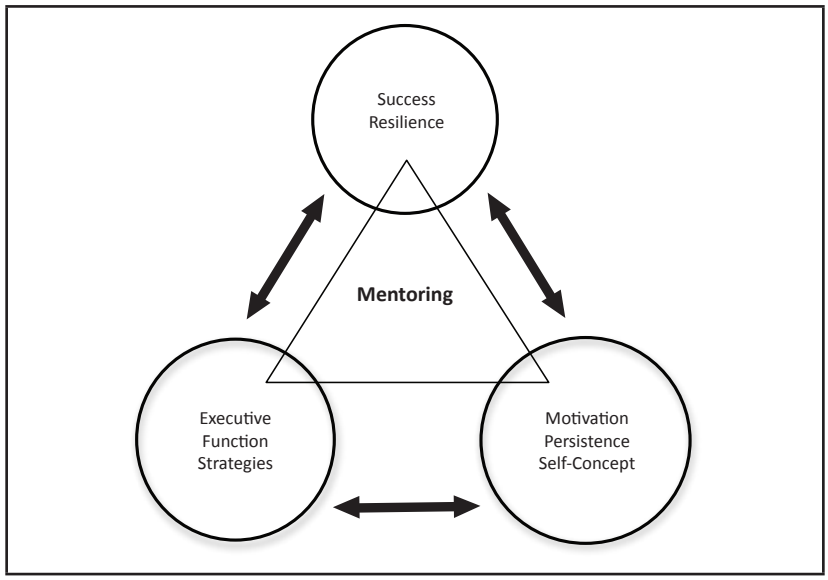

Figure 2. Theoretical paradigm for the SMARTS intervention.

The SMARTS Executive Function and Mentoring Intervention

The SMARTS intervention is anchored in a theoretical paradigm (see Figure 2) that blends the teaching of selected executive function strategies (i.e., organizing, prioritizing, shifting flexibly, memorizing, and self-monitoring) with peer mentoring. Such a blended executive function and mentoring program initiates a positive cycle in which students are more motivated to make the effort to use executive function strategies in their schoolwork. This, in turn, builds positive academic self-concept in students and a strategic approach to learning which results in more efficient performance and academic gains.

The current SMARTS intervention study consisted of two components. The first focused on the explicit teaching of executive function strategies that were linked with the curriculum content and that students could apply to their classwork, homework, and test-taking (Meltzer, 2007, 2010; Meltzer & Basho, 2010). The second component focused on the creation of a peer mentoring system to enhance students' learning and application of these executive function strategies. The major goals of the intervention were to improve students' academic self-concept, effort, strategy use, and resilience by building a supportive peer mentoring community in schools.

This exploratory study evaluated these interactions in highly engaged vs. less engaged mentor-mentee pairs. The following questions were investigated:

1. Do students in strongly engaged peer mentoring relationships use executive function strategies more frequently in their academic work than students in weak peer mentoring relationships?
2. Do students in strongly engaged peer mentoring relationships show higher levels of effort and willingness to work hard in school compared to students in weak peer mentoring relationships?
3. Do students in strongly engaged peer mentoring relationships show higher academic self-concept and resilience than students in weak peer mentoring relationships?

Method

Participants

The students in this study attended a small urban public high school in a Northeastern city in the United States. The school had a majority of African American (50.5%) and Hispanic (38.5%) students. Annual student dropout rates were 14%, and student mobility was 31.3%. According to the school's demographic data, 69% of the students were eligible for free or reduced-price lunch and 29% needed some form of special education. This school was selected for the current study because 30% of the school population comprised students with special

needs who were referred by the school district. All the procedures for subject selection and other aspects of the study were consistent with ResearchILD's IRB policies and were approved by an external IRB committee.

All 9th- and 10th-grade students who were available during the weekly 80-minute advisory/home room period in school took part in the study. The sample included all students with high-incidence disabilities (LD and attention deficit/hyperactivity disorder) as well as students who were struggling academically but had not been formally diagnosed as having learning disabilities. Students with more severe disabilities (autism spectrum disorders, developmental delays) were not included.

At the start of the study, 87 students were randomly assigned to either the SMARTS intervention or the control group. However, a number of challenging situations resulted in an unequal assignment of students to these groups by the end of the intervention. First, student absenteeism increased due to gang violence. In addition, budget cuts by the superintendent at the end of the first semester led to the decision that the school would be closed at the end of the year. As a result, a number of families decided to transfer their children to other schools in the spring. All these factors resulted in a high attrition rate and an uneven number of students in the intervention and control groups. Further, the resulting morale problems for teachers and students had a negative effect on compliance, particularly for the control group teachers whose students were not benefiting from the intervention. Specifically, these control group teachers were not invested in completing their own surveys or distributing surveys to their students. As a result, the control group had an attrition rate of 41% and 13% of the data were incomplete due to incomplete surveys. For the intervention group, there was a 19% attrition rate.

Because of the high rate of student attrition and teacher noncompliance, particularly in the control group, we decided to focus our analyses on pre-/post comparisons for the students who were initially assigned to the SMARTS intervention group and to omit the control group students. This resulted in a final analysis sample of 34 students (see Table 1).[1]

[1] The decision was made to remove the students with missing data rather than performing multiple imputations.

Table 1

Descriptive Statistics for the Sample

Demographics	SMARTS Program (*N* = 34)
Gender	
Female	7
Male	27
Grade	
9th	19
10th	15
Age	
Mean (SD)	14.85 (.82)
Unweighted GPA (10th Graders)	
Mean (SD)	2.39 (.95)
First Marking Period (9th Graders)	
Humanities	Mean D grade
Math	Mean C- grade
Special Education Status	14.7%

Note. Unweighted GPA scores were available for 14 tenth graders. First marking period grades were available for 18 of the ninth graders.

Because of the challenging situations that were outside our control, the final analysis sample included an uneven distribution of males and females and an uneven mentor-mentee ratio: 19 mentees (5 females and 14 males) and 15 mentors (2 females and 13 males).[2],[3] Grades from report cards during the first marking period as well as teacher reports indicated that a majority of the students in this study were "at-risk learners." In fact, 50% of the 9th graders and 31% of the 10th graders had failing grades in the sciences. Similarly, 31% of the 9th graders and 25% of the 10th graders were failing in their humanities courses. Nevertheless, most of these students did not have individualized education program plans (IEPs) (i.e., were not enrolled in special education) due to the school policy whereby students with mild to moderate learning disabilities were taken off their pre-existing IEPs when they entered this particular high school. Instead, the school continued to provide these students with accommodations in their general education classes as part of the regular school day. For all these reasons, we refer to the students in our sample as "at-risk learners" throughout this article.

[2] The attrition in the sample also resulted in the formation of two mentor-mentee triads. As the analysis was performed at the level of the student (and not mentor-mentee pair), these triads were included in the sample.

[3] Four mentoring pairs were female and 13 were male.

Procedure

The SMARTS intervention. The SMARTS intervention was designed to promote students' metacognitive awareness and use of executive function strategies. Instructional methodology and content were developed and incorporated into a six-month curriculum. The paradigm that guided the intervention emphasized the importance of metacognitive awareness as the foundation for teaching executive function strategies, which can be strengthened with peer mentoring (see Figure 3).

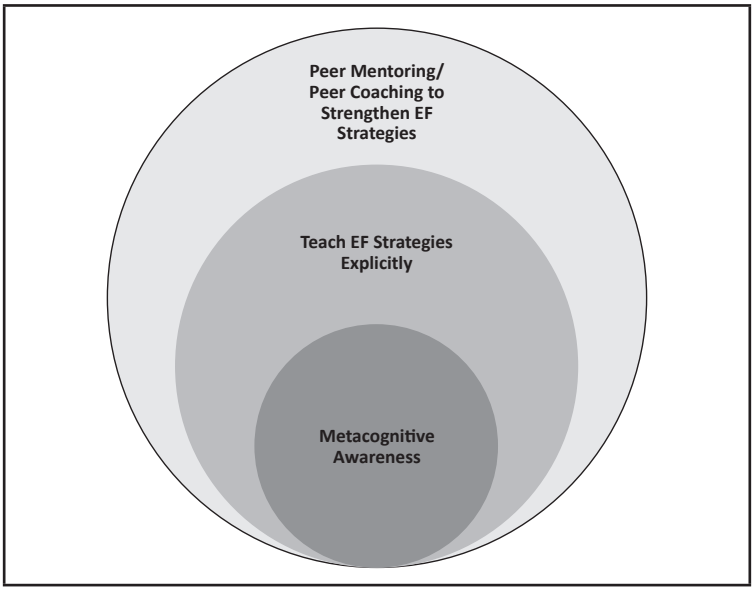

Figure 3. Blending metacognitive awareness and executive function processes with peer mentoring.

The SMARTS intervention comprised four components: (a) matching of mentor-mentee pairs, (b) mentor training, (c) executive function strategy instruction, and (d) application of executive function strategies to a school-based group project.

Matching of mentor-mentee pairs: Mentor-mentee matching was based on the criteria developed by Rhodes and Kupersmidt (2009) for establishing strong mentor-mentee relationships, with an emphasis on students' gender, interests, as well as their self-reported strengths and weaknesses. Before the intervention, 10th-grade students were required to complete a brief survey to assess their interest in becoming mentors. They were also familiarized with the expectations for their roles as mentors, including the importance of a one-year commitment to their mentoring relationships. A number of additional surveys assessed their skills, interests, and self-understanding of their academic strengths and weaknesses. Using all this information, peer mentoring dyads were assigned in ways that maximized students'

abilities to learn from each other. Students with similar profiles of strengths and weaknesses in strategy use and educational performance were matched so that mentors could provide support and modeling to help their mentees apply the executive function strategies they were learning to their weekly homework. To maximize the possibility that peer dyads would develop positive bonds, students were also matched on the basis of their shared interests (e.g., sports, music, video games), an element that has been shown to be critically important for matching mentors with mentees (Rhodes & Kupersmidt, 2009).

Two 10th-grade mentors were transferred to another school after the school closing was announced, with the result that we had to pair two 9th-grade mentees with a 10th-grade mentor who already had an assigned mentee. Even though this decision affected the design of the study, we needed to address the teacher requests that these mentees not be excluded from the intervention program.

Mentor training: The first four weeks of the intervention focused on providing systematic mentor training to the 10th-grade mentors while simultaneously building a sense of community for the 9th-grade mentees. Mentor training procedures were developed using the evidence-based guidelines developed by the National Mentoring Partnership (2005). Mentors were initially introduced to the elements of successful mentoring through role-playing; for example, commitment, supporting mentees, and mentor responsibilities. They were also involved in activities that helped promote students' understanding of their individual learning profiles and feeling of belonging in a community of learners. As a starting point, one of the lessons focused on the Know Yourself strategy sheets, which provided a structured system for encouraging students to think about their strengths and weaknesses and to create visual displays of their learning profiles (see Figure 4).

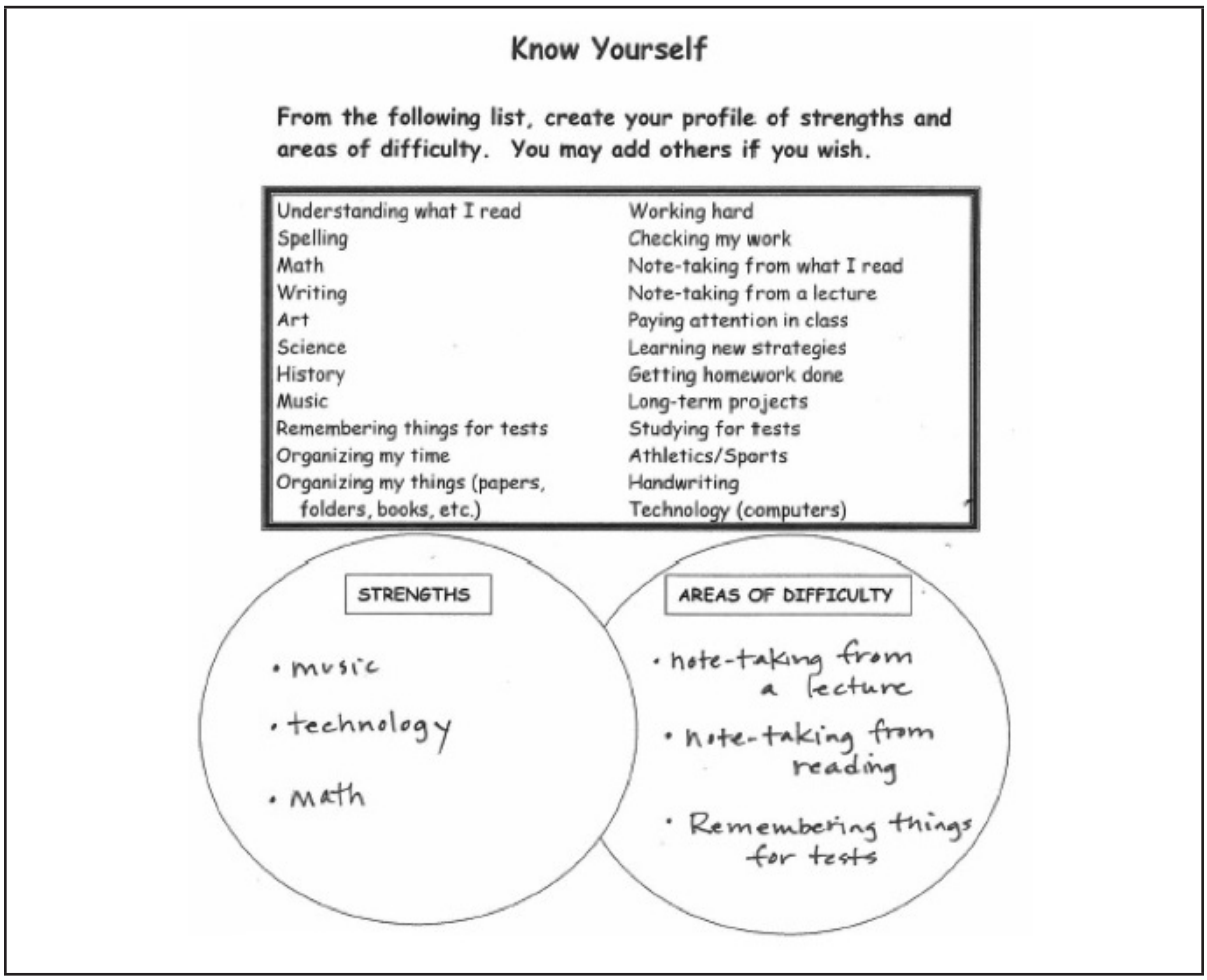

Figure 4. Know Yourself strategy sheet for promoting students' metacognitive awareness and understanding of their strengths and weaknesses.

Mentors were paired with one another during role-playing sessions so that they could help each other strengthen their self-understanding and metacognitive awareness. They discussed their learning profiles with one another and coached one another as they reflected on the specific strategies that had been helpful to them in different areas. Mentors then discussed ways in which they could use these same approaches and strategies when they were paired with their mentees.

Executive function strategy instruction: This component of the SMARTS intervention provided direct and explicit strategy instruction in key executive function processes: goal-setting, organizing, prioritizing, cognitive flexibility/shifting flexibly, accessing information in working memory, and self-monitoring/self-checking. Each strategy was taught directly and explicitly, after which student mentors and mentees worked together to apply the strategies to school tasks during interactive group activities. Mentors also coached their mentees during activities that were

designed to teach students to apply the specific executive function strategies to their classwork and homework. For example, during the lessons on cognitive flexibility, students were taught strategies for shifting flexibly in the context of reading, writing, and math tasks.

Students were taught the Triple Note Tote strategy (see Figure 5) to help them to organize, prioritize, and shift flexibly from the main ideas to the supporting details and back. They then applied the strategy to school tasks where they needed to extract information from textbooks, homework assignments, and class notes (Meltzer, Pollica, & Barzillai, 2007). After the mentors and mentees were taught the Triple Note Tote strategy in their separate groups, they worked in their peer mentoring pairs to apply the strategy to writing assignments that required summarizing, planning, and note-taking. When studying for history or science tests, mentors were also encouraged to work with their mentees to create study guides using the Triple Note Tote strategy to help them shift between the main ideas and details. Similarly, when completing math homework or studying for math tests, mentors coached their mentees to shift between the different steps for solving word problems.

Figure 5. The Triple Note Tote Strategy: A strategy for shifting flexibly between major concepts or main ideas and relevant details (Meltzer, Greschler, Kurkul, & Stacey, 2015).

Application of executive function strategies to a group project: In the last month of the SMARTS intervention, mentors worked with their mentees to apply these executive function strategies to a school-based group project. Throughout the project, which required students to take notes and to synthesize themes and details, there was an emphasis on collaborative learning and inquiry while applying executive function strategies (goal-setting, organizing and prioritizing, shifting flexibly, memorizing, checking) to the components of the project. Because of the morale problem created by the imminent school closing, the students and SMARTS staff decided that the final academic project would comprise multimedia presentations focused on the theme of giving students a voice in their school.

The SMARTS intervention was implemented once a week during the 80-minute home room period in school, beginning in the fall (October). Students met in two designated classrooms, each staffed by two SMARTS teachers and two assistant teachers. For the first month of the program, 9th and 10th graders were separated and remained in their grade-level groups. The first four sessions focused on mentor training for the mentors and community building for the mentees. For the remaining SMARTS sessions, 10th-grade mentors were paired with 9th-grade mentees for every session.

For the next seven months (23 sessions), weekly SMARTS sessions focused on teaching students selected executive function strategies. Thirteen strategies were taught in the five core executive function areas: goal-setting, organizing, prioritizing, accessing working memory, shifting flexibly, and self-monitoring. Students learned strategies that addressed the key processes relevant for reading comprehension, writing, math problem-solving, completing homework, studying, and taking tests.

For the first half of each SMARTS session (approximately 30 minutes), the SMARTS teacher taught the weekly executive function strategy in the context of academic tasks such as reading comprehension and math. The mentor-mentee pairs then worked together to apply these strategies to structured activities related to their academic work. For example, goal-setting strategies were modeled by mentors, who helped their mentees to identify the steps needed to achieve their goals. Mentoring pairs collaboratively estimated the amount of work involved in major school projects and open-ended homework assignments and selected specific strategies for breaking down tasks into manageable parts, especially when there were multiple deadlines for different assignments. The supportive nature of peer mentoring helped to make goal-setting strategies more meaningful for students. Mentors evaluated their mentees' goals in an accepting and nonjudgmental way, and offered advice about ways of coping with obstacles. For example, when using the CANDO goal-setting strategy (see Figure 6), students shared ideas about clear, manageable goals as they worked together to set their goals.

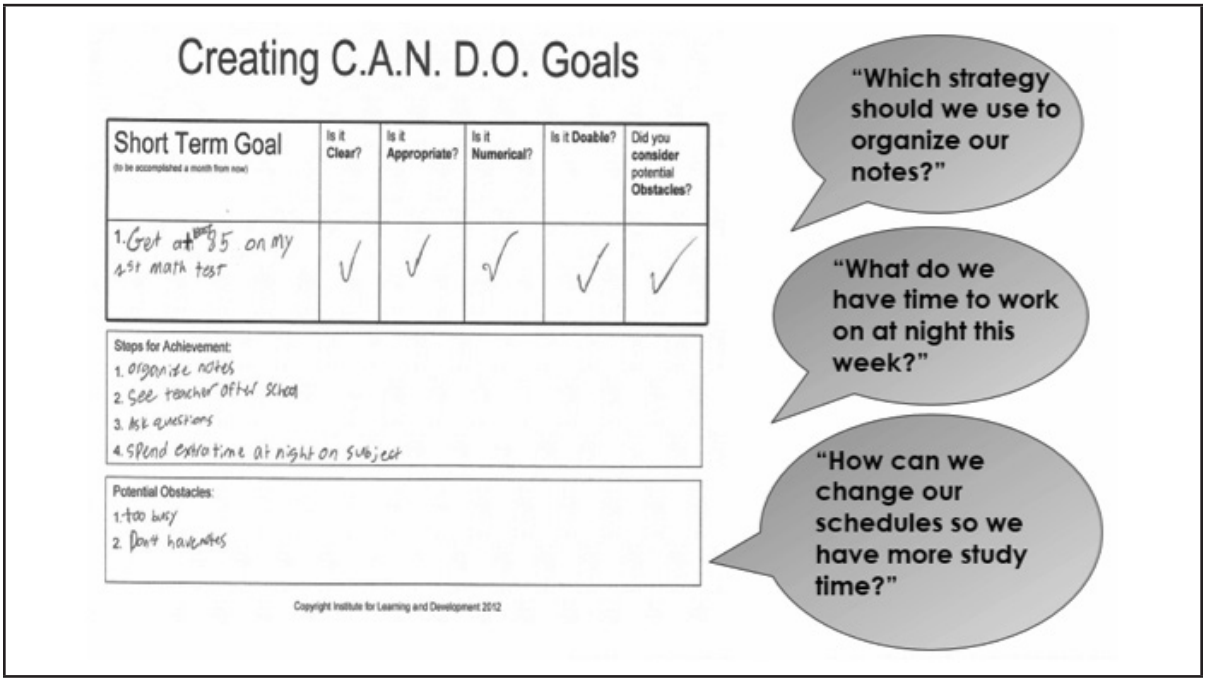

Figure 6. CANDO goal-setting worksheet for mentors and mentees to use together.

Measures

Student and teacher surveys were administered for pretesting before the intervention and for posttesting at the end of the school year. Semi-structured interviews were also conducted by SMARTS staff after the final surveys had been completed by students and their teachers.

Measures for Students and Teachers

Metacognitive Awareness System (MetaCOG). The Metacognitive Awareness System (MetaCOG), for use with 9- to 18-year-olds, is a criterion-referenced assessment system that compares students' and teachers' perceptions of students' metacognitive awareness, strategy use, and academic self-concept. Several studies have consistently shown high levels of reliability for the MetaCOG (Meltzer et al., 2004a, 2004b, 2004c; Meltzer & Krishnan, 2007; Miller, Meltzer, Katzir-Cohen, & Houser, 2001).

The MetaCOG comprises five rating scales that allow teachers to compare their own ratings and judgments of students' effort, strategy use, and academic performance with their students' self-ratings of the same processes. These strategy ratings focus on academic areas that depend on executive function processes and include written language, homework, studying, and taking tests (Meltzer, Katzir-Cohen, Miller, & Roditi, 2001; Miller et al., 2001). In this study, three of the five MetaCOG surveys were used (ME survey and PR survey for students, TPSE survey for teachers).

The MetaCOG surveys help teachers to understand their students' learning profiles and help students to develop an understanding of their strengths and weaknesses. Such self-awareness is the foundation for metacognitive awareness and use of executive function strategies.

Student Measures

Motivation and Effort Survey (ME). The Motivation and Effort Survey (ME), part of the MetaCOG, comprises three surveys that assess students' self-ratings of their motivation, effort, and strategy use in school. Part 1 consists of 19 items that assess selected components of students' academic goals, motivation, and effort. Students rate themselves on a 5-point scale (1 = never to 5 = always), with higher scores indicating higher levels of motivation and effort. Part 2 of the ME focuses on students' self-ratings of their executive function strategy use. Here students rate themselves along a 5-point scale (1 = poor to 5 = strong) on 14 items that sample key executive function strategies in relation to academic tasks (e.g., homework, tests, long-term projects, organization, checking, and making a plan before starting schoolwork). The final part of the ME assesses students' self-ratings of their academic competence with a single item, "I would rate myself as a … student" (ratings ranging from poor to strong). Higher scores on the ME indicate stronger motivation, effort, use of executive function strategies, and academic self-concept.

An overall level of effort was derived from 14 items on Part 1 of the ME (see also Meltzer et al., 2004a, 2004b, 2004c), which included items such as, *"In general, I am a hard worker," "I spend as much time as I need to get my work done,"* and *"I don't give up even when the work is difficult."* This variable was used to represent students' effort and persistence in their schoolwork. Reliabilities for this subscale were high at pre- and posttest (α = .89 at T1, α = .94 at T2). Single items from Part 2 of the ME were used to index how well the students thought they were using strategies in their schoolwork (i.e., overall executive function strategy use, organization, and checking). A final variable from Part 3 of the ME was used to assess students' academic self-concept (i.e., whether or not they thought they were good students). Higher values on these variables indicated more positive outcomes. Findings in this study again indicated high overall reliabilities for the ME (α = .94 at T1, α = .94 at T2), which were consistent with previous findings (Meltzer et al., 2001, 2004a, 2004b, 2004c).

Persistence and Resilience Survey (PR). For use in this exploratory school-based study, the Persistence and Resilience Survey (PR) was adapted from a longer survey. The PR survey included 11 items that assessed students' ratings of their persistence in relation to daily challenges in school. On a 5-point rating scale (1 = never and 5 = always), higher scores indicated higher levels of persistence and resilience. The last item was open-ended and required students to indicate what grade they hoped to earn at the end of the school year on selected subjects. Using factor analysis, a resilience index (labeled "resilience") was created based

on the following items, *"I do not let problems stop me from reaching my goals," "I'm good at bouncing back from a bad grade,"* and *"When I have a setback, I am optimistic that I can figure it out"* ($\alpha = .79$ at T1, $\alpha = .83$ at T2).

In addition to these two MetaCOG surveys, students completed strategy reflection sheets and participated in structured interviews.

Strategy reflection sheets. Students completed strategy reflection sheets on four occasions over the course of the SMARTS program. Strategy reflection sheets required students to reflect and describe the strategies they had used the previous week for their classwork, homework, or test preparation. These strategy reflection sheets incorporated a multiple-choice format, structured questions, and open-ended questions that required students to explain their strategy use (see Figure 7). By completing and sharing strategy reflection sheets, students began to understand which strategies worked well for them as well as why, where, when, and how to apply specific strategies.

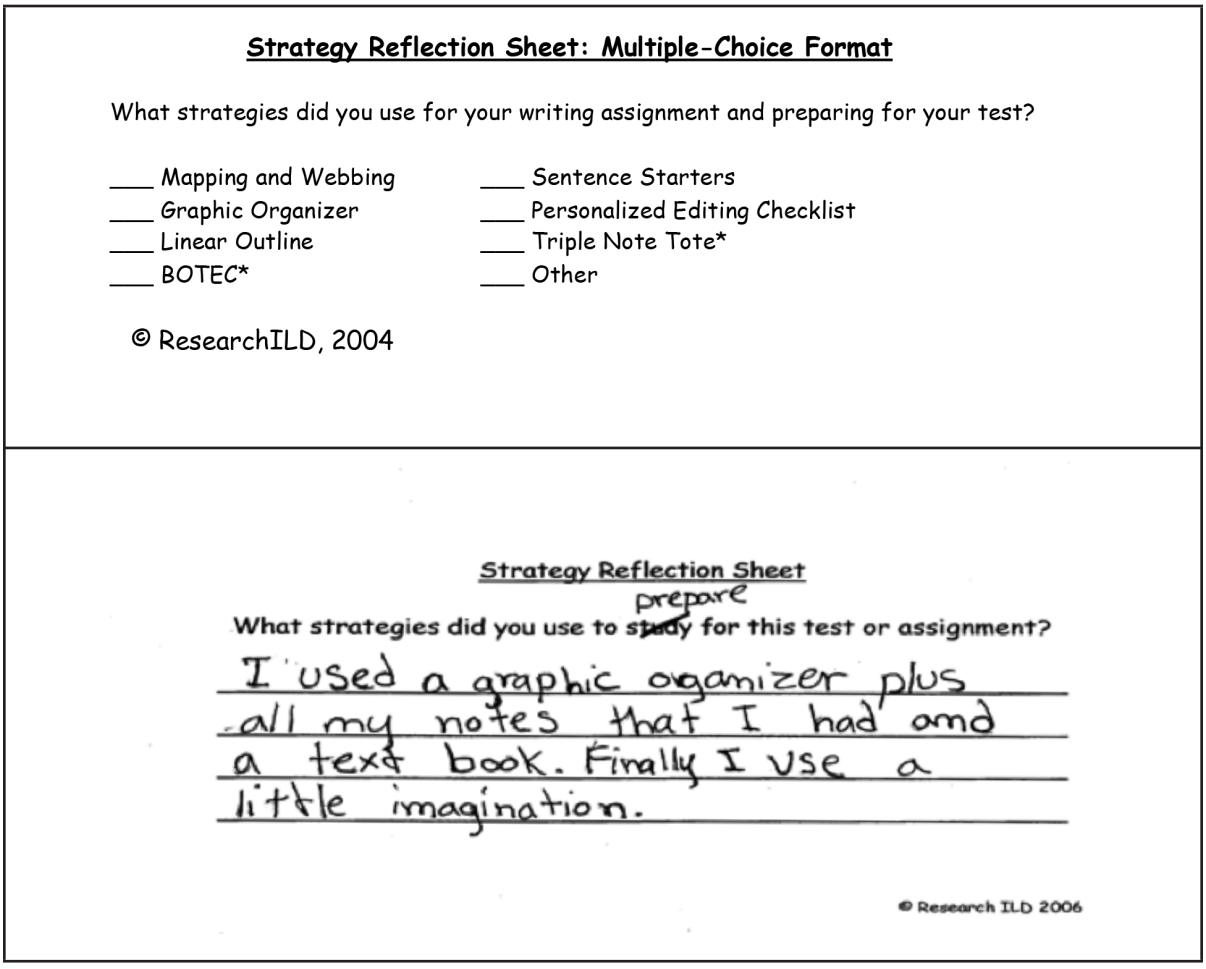

Figure 7. Strategy reflection sheets for writing and test preparation: Multiple-choice and open-ended question formats.

Qualitative responses on the strategy reflection sheets were coded by two raters using a 0-1 rating scale (1 if identified or applied strategy correctly; 0 if not). Inter-rater reliability was high (K = 85% for application and K = 85% for identification). Scores for strategy identification, application, and overall strategy use were each summed across the four different time points, resulting in three outcome variables.

Student Interviews

Students' perceptions of their mentoring relationships were examined using one-to-one semi-structured interviews with 20 students who were randomly selected at the end of the intervention. Of these students, three were not included in the analysis as they did not complete surveys at follow-up, leaving a final sample of 17 students. The semi-structured interviews were coded by two members of the SMARTS research team for indices of students' reports about the quality of their mentor-mentee relationships. These interviews were also coded for indices of students' effort, persistence, executive function strategy use, and metacognitive awareness. Inter-rater reliability was established at 88%.

Teacher Measures

Teacher Perceptions of Students' Effort Survey (TPSE). Teachers completed the MetaCOG Teacher Perceptions of Students' Effort Survey (TPSE) for students in the intervention study. The TPSE items were identical to the ME items for students and followed a similar format. Part 1 required teachers to rate students' effort in the various academic domains on a 5-point Likert scale (1 = never to 5 = always). In Part 2, teachers rated how well the students used executive function strategies and how they performed in reading, writing, math, homework, tests, and long-term projects, all academic tasks that rely on executive function processes (e.g., *"He spends as much time as needed to get his work done;" "She does not give up even when the work is difficult"*). Teachers also rated students' overall academic performance in response to the question: *"If you had to assign a grade for this student's overall academic performance, what would this be?"* (1 = poor; 5 = strong). Finally, teachers responded to open-ended questions regarding each student's motivation, effort and academic performance.

An overall index of students' effort was derived from 14 TPSE items using the same approach as that used for the ME (α = .99 at T1, α = .99 at T2). Thus, teacher-rated outcomes included an overall index of students' effort, academic self-concept, and strategy use in their schoolwork. Overall reliabilities for the TPSE for the current study were high (α = .98 at T1, α = .99 at T2).

Teacher ratings of quality of mentor-mentee relationships and level of engagement. SMARTS teachers completed a weekly staff session reflection survey in which they rated the engagement of all the mentor-mentee pairs. Each mentor-mentee pair was rated by multiple

raters based on their interactions and their engagement with each other. Interrater reliability was 89%. A score of 1 was given to pairs who worked well together. These student pairs shared more interests, had more frequent positive verbal exchanges, and stayed on task for over 90% of the time. A score of 0 was given to pairs whose interactions were not positive and showed markedly less engagement. These students sat together but did not interact with one another and needed frequent teacher prompting to complete the tasks. Three ratings were obtained for each mentor-mentee pair, and a mean score was obtained for each rating.[4] Ratings were used to categorize mentor-mentee pairs into two groups: those who showed positive relationships with strong engagement and those who did not.

Data Analysis

To study the effects of the quality of mentor-mentee relationships on strategy use, effort, academic self-concept, and resilience, students were classified as being in strongly engaged vs. weakly engaged mentor-mentee relationships. Teacher ratings of mentor-mentee engagement were analyzed separately from students' self-ratings of their engagement in their mentor-mentee pairs. When teacher ratings were used, the sample comprised all 34 students. When student ratings were used, the sample comprised 17 students who were randomly selected for the semi-structured interviews. More specifically, teachers' vs. students' ratings of mentor-mentee engagement were calibrated as follows.

Teacher ratings of mentor-mentee engagement. SMARTS teachers' observations and ratings of mentor-mentee interactions and engagement were used to categorize students into strongly engaged vs. poorly engaged mentoring relationships. Strong levels of mentor-mentee engagement were defined in terms of the extent to which mentors and mentees bonded, showed interest in each other, and displayed enthusiasm when they worked together to apply executive function strategies to academic tasks. Nineteen students were classified as belonging to "strong" and "engaged" peer mentoring relationships and 15 students were in "weak" or "poorly engaged" relationships, where mentors and mentees did not engage readily with each other. Initial analyses of these subgroups showed no gender or grade-level differences between the groups.

Students' ratings of their engagement in their mentor-mentee pairs. To assess students' perspectives about their engagement in their mentor-mentee pairs, analyses focused on the one-on-one semi-structured interviews with the mentors and mentees. The moderating effects of the quality of mentor-mentee relationships on students' use of executive function strategies in their schoolwork were also analyzed. As mentioned, a subset of 17 students from the 34 students in the SMARTS intervention group were randomly selected to participate in

[4] Initial exploration of the data showed that staff ratings changed relatively little over time. The decision was, therefore, made to average the data over time. Observations of mentor-mentee pairs started once the dyads were formed and started working on curriculum-based projects.

these student interviews. Twelve of these students were from dyads that showed high levels of engagement and worked well together (five mentees and seven mentors). Five of the students were from mentor-mentee pairs that showed limited levels of engagement (four mentees and one mentor).[5]

Analyses used either parametric or nonparametric methods, depending on the sample sizes. As a first step, we analyzed pre- vs. post-intervention differences across the key variables for the overall intervention sample, using repeated-measures analysis of variance. Analysis of covariance (ANCOVA) was used to compare students in strongly engaged vs. weak peer mentoring relationships, given the pre- vs. post-intervention nature of the outcome variables. The pre-intervention score was entered as a covariate to increase precision of estimates and to control for possible differences at baseline. To examine differences between these student groups for dependent variables derived from the strategy reflection sheets, analysis of variance (ANOVA) was used. Nonparametric analysis, specifically the Mann-Whitney U (MWU) test, was used to test all group differences for teacher-reported and student interview data given the small sample size ($n = 17$). Outcome variables were converted into gain scores (posttest-pretest) and used as dependent variables in these analyses. In addition, effect sizes (Hedge's g) were computed using parameters from the raw data (i.e., means, standard deviations) (DeFife, 2009). In accordance with the approach recommended by the What Works Clearinghouse (2008), effect sizes greater than .25 were interpreted as "substantively important."

Results

Question 1: Do students in strongly engaged peer mentoring relationships use executive function (EF) strategies more frequently in their academic work than students in weak peer mentoring relationships?

Prior to examining differences between students in strong vs. weak peer mentoring relationships, pre-intervention versus post-intervention changes were analyzed for all students in the intervention sample ($N = 34$). For the combined groups, findings showed a decrease in self-reported EF strategy use at the end of the program year, $F(1, 33) = 12.58$, $p<.01$. There were no significant changes in students' use of organizing strategies, $F(1, 33) = .03$, $p>.05$, and checking strategies, $F(1, 33) = 2.16$, $p>.05$. Students in strongly engaged peer mentoring relationships were then compared with students in weak peer mentoring relationships.

Teacher ratings. When teacher ratings of student engagement were used, findings showed no statistically significant differences in students' overall use of EF strategies, $F(1, 31) = .98$, $p>.05$; Hedge's $g = .27$, checking strategies, $F(1, 31) = .69$, $p>.05$; Hedge's $g = .25$,

[5] Thus, students who were interviewed came from strongly engaged or poorly engaged mentor-mentee pairs.

or organizing strategies, $F(1, 31) = .31$, $p>.05$; Hedge's $g = .15$, between students in strongly engaged vs. weakly engaged peer mentoring relationships. However, the effect sizes were moderate for overall use of EF strategies (Hedge's $g = .27$) and for checking strategies (Hedge's $g = .25$). These effect sizes were large enough to be considered substantively important even though they were not significant (What Works Clearinghouse, 2008), indicating that students in the strongly engaged peer mentoring relationships used EF strategies more frequently than students who were not engaged.

Analyses also focused on students' use of strategies in their strategy reflection sheets based on three parameters: (a) the extent to which students could identify and name the strategy they were using, (b) how and when they could use the strategy, and (c) how successfully they had applied the strategy to their classwork or homework. Findings indicated that students in the engaged peer mentoring group were significantly more likely to name the EF strategies correctly, $F(1, 32) = 6.93$, $p = .01$; Hedge's $g = .89$, to apply these strategies correctly, $F(1, 32) = 8.34$, $p < .01$; Hedge's $g = .97$, and to use general EF strategies more often, $F(1, 32) = 4.57$, $p < .05$; Hedge's $g = .72$, in their classwork, homework, projects, studying, and tests.[6]

Student ratings. When students' self-ratings of their levels of engagement in their mentor-mentee relationships were used, findings indicated that students in strong mentor-mentee relationships used overall EF strategies significantly more frequently (MWU = 15, $z = -2.02$, $p<.05$). These students also used checking strategies more often; this difference was not statistically significant (MWU = 18, $z = -1.77$, $p>.05$) but was large enough to be considered substantively important (Hedge's g = 1.31). Their use of organizing strategies did not change significantly during the intervention (MWU = 31.50, $z = -.37$, $p>.05$). However, the change was large enough to be considered substantively important (Hedge's $g = .08$). Analyses of these students' strategy reflection sheets were consistent with the ME findings. Students in strongly engaged mentor-mentee pairs correctly applied strategies significantly more often (MWU = 15.5, $z = -2.03$, $p<.05$) and reported using these strategies significantly more frequently in their classwork, homework, projects, studying, and test-taking (MWU = 15, $z = -1.98$, $p<.05$) (see Table 2). Similarly, for the strategy use variable derived from the interview data, students who reportedly had more positive mentor-mentee relationships also used EF strategies significantly more often (MWU = 14.5, $z = -2.05$, $p<.05$).

[6] The homogeneity of variance assumption did not hold for the overall EF strategy use variable. The analysis was re-run using a corrected model. The results remained the same.

Table 2

Students' Use of EF strategies: Comparison of Students in Strong vs. Weak Peer Mentoring Relationships[1]

	Strong Peer Mentoring Relationship (n = 10)	Weak Peer Mentoring Relationship (n = 7)	Mann-Whitney U	z	p
Strategy Reflection Sheets[2]					
Identified EF strategy correctly	10.70	6.57	18.00	-1.71	0.09
Applied EF strategy correctly	10.95	6.21	15.50	-2.03	0.04
Total reported EF strategy use	11.00	6.14	15.00	-1.98	0.05
Interview Composites[3]					
Use of EF strategies	11.05	6.07	14.50	-2.05	0.04
Hard work/effort	10.25	7.21	22.50	-1.25	0.23
Persistence	10.20	7.29	23.00	-1.19	0.23
Evidence of metacognitive awareness	9.85	7.79	26.50	-.90	0.37

Note.

[1]Results are shown only for the students who were interviewed (n = 17). All results are based on analyses using the Mann-Whitney U-test statistic. Mean ranks are displayed.

[2]For the strategy reflection sheets, results are based on students' use of EF strategies summed over four time points during the school year.

[3]For the interview composites, results are based on students' reports of their EF strategy use, metacognitive awareness, and effort at the end of the school year.

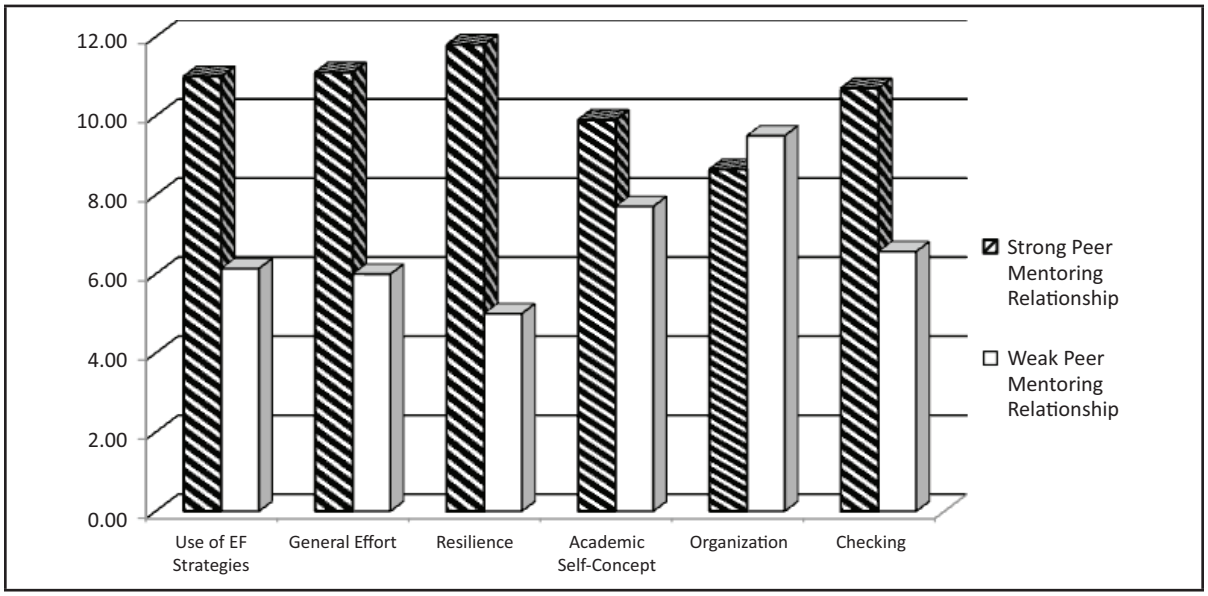

Figure 8. Executive function strategy use, effort, and resilience for students in strong vs. weak peer mentoring relationships.
Note. Results are based on the interview sample (n = 17).
*p<.05. **p<.01.

Question 2. Do students in strongly engaged peer mentoring relationships show higher levels of effort and willingness to work hard in school than students in weak peer mentoring relationships?

Prior to examining differences for students in strong vs. weak peer mentoring relationships, pre-intervention vs. post-intervention changes were analyzed for all students in the intervention sample. Students in the combined group showed less effort at the end of the year, $F(1, 33) = 7.67$, $p<.05$; Hedge's $g = .94$. Students in strongly engaged peer mentoring relationships were then compared with students in weak peer mentoring relationships.

Teacher ratings. Overall findings indicated a significant between-group difference in students' effort and willingness to work hard in school. More specifically, students in engaged mentor-mentee relationships reported significantly higher effort, $F(1, 31) = 6.70$, $p<.05$; Hedge's $g = .58$, at the end of the intervention program (Mean = 3.61; $SD = .67$) than those in less engaged peer mentoring relationships (Mean = 3.28; $SD = .86$).

Student ratings. When students' ratings of engagement were considered, the same results were evident. Students who reported having more positive experiences with their mentors also reported significantly higher levels of effort (MWU = 14, $z = -2.05$, $p<.05$) (see Figure 8).

Question 3. Do students in strongly engaged peer mentoring relationships show higher academic self-concept and resilience than students in weak peer mentoring relationships?

When the combined intervention sample was considered, students showed similar levels of academic self-concept over the year, $F(1, 33) = 3.17$, $p>.05$; Hedge's $g = .60$. However, they showed lower levels of resilience at the end of the year, $F(1, 33) = 8.61$, $p<.05$; Hedge's $g = .99$. Findings were then analyzed separately for students in strongly engaged peer mentoring relationships versus students in weak peer mentoring relationships.

Teacher ratings. Findings showed that students in more engaged mentor-mentee dyads demonstrated higher academic self-concept than students in weak mentor-mentee relationships (Hedge's $g = .27$). This effect size exceeded the .25 effect size benchmark (What Works Clearinghouse, 2008) even though it was not statistically significant, $F(1, 31) = 0.94$, $p>.05$. When teacher ratings of students' resilience were used, the group differences were not significant, $F(1, 31) = 0.03$, $p>.05$; Hedge's $g = .05$).

Student ratings. Students who reported strong engagement in their mentor-mentee relationships did not report significantly higher academic self-concept (MWU = 26, $z = -0.94$, $p>.01$). However, the Hedge's g value, calculated using the raw data, was larger than the .25 benchmark (Hedge's $g = .41$). With respect to resilience, students who reported strong engagement in their mentor-mentee relationships during the interviews also reported

significantly higher levels of resilience (MWU = 7, z = -2.76, p<.01) than those who did not (see Figure 8).

Post-Hoc Analyses

Correlational analysis was performed for all students in the program (strong peer mentor-mentee engagement group, n = 19; weak mentor-mentee engagement group, n = 15). We examined the pattern of associations among the variables from the student surveys that directly mapped onto their use of executive function strategies as well as their effort, resilience, and academic self-concept (see Figure 1). All correlations were calculated using spearman rho (see Table 3).

Table 3

Correlations Among EF Strategy Use, Effort, Resilience, and Academic Self-Concept for Students in Strong and Weak Peer Mentoring Relationships

	1	2	3	4
1. Use of EF Strategies		0.30	0.54*	0.16
2. Effort	0.25		0.54*	0.47*
3. Resilience	0.08	0.16		0.60**
4. Academic Self-Concept	-0.36	0.68**	-0.07	

Note. Spearman-Rho correlations above the diagonal represent students in strong peer mentoring relationships (n = 19; groups defined by SMARTS staff). Correlations below the diagonal represent students in weak peer mentoring relationships (n = 15).
*p<.05. **p = .01.

As is evident from Table 3, there were moderately strong correlations among the four outcome variables in the success paradigm for students in engaged mentor-mentee pairs. On the other hand, for students who were not engaged in their mentor-mentee pairs, only students' general effort and academic self-concept were significantly correlated (r = .68, p = .01).

Teacher ratings of students' strategy use were available for a subset of the students (n = 17 in the strongly engaged peer mentoring group; n = 11 in the weak mentor-mentee engagement group). Teachers' ratings of students' strategy use on the TPSE were also analyzed using gain scores (T2-T1) and the Mann-Whitney U test. Findings indicated a "substantively important" effect size when the raw data were analyzed (What Works Clearinghouse, 2008) for students' use of organizational strategies (Hedge's g = .46) and overall use of EF strategies (Hedge's g = .36). However, these differences did not meet the criteria for significance (MWU = 71.5, z = -1.10, p>.05 for organizational strategies and MWU = 77.50, z = -.85, p>.05 for overall use of EF strategies).

Discussion

Findings from this exploratory study provide preliminary support for an intervention approach that blends peer mentoring in schools with explicit instruction in executive function strategies. When subgroups of students in engaged mentor-mentee pairs were compared with mentor-mentee pairs who were not engaged with one another, significant group differences emerged. More specifically, with the exception of teacher-rated use of EF strategies, students in strong peer mentoring relationships used executive function strategies more often and displayed significantly higher levels of effort than students in weak peer mentoring pairs. On a number of additional qualitative measures (e.g., their completion of strategy reflection sheets), students in stronger peer mentoring relationships were also significantly more likely to identify and correctly use executive function strategies in their classwork, homework, projects, studying, and tests.

These findings suggest that students who connect well with their peer mentors feel more confident academically, are more willing to work hard in school, and are more open to learning executive function strategies as well as using these strategies for homework and tests. This generalizability of strategy use is extremely important given that many students use strategies in the classroom when their teachers explicitly direct them to do so but often do not generalize these strategies to their homework and studying. Furthermore, these results begin to address Karcher's (2005) recommendation in his review of cross-age peer mentoring research that it is imperative to evaluate the effects of mentoring programs when mentors use structured activities with their mentees. In the current study, the combination of a structured executive function curriculum with a strong mentoring program met Karcher's guidelines and had a positive effect on academic outcomes.

Another important finding was that, based on student ratings, students in strong peer mentoring relationships showed significantly higher levels of resilience in comparison with students in weak peer mentoring relationships (e.g., *"I do not let problems stop me from reaching my goals"*). This suggests that the social support offered by mentors who could connect with their mentees' social and emotional needs helped mentees to feel more confident and better equipped to deal with the many academic and other challenges in school. These results are consistent with the findings of Karcher (2005) and Parra, DuBois, Neville, and Pugh-Lilly (2002) that mentors' and mentees' self-esteem and perceived self-efficacy are central mediators of the impact of mentoring.

The findings of the current study provide additional support for our theoretical paradigm and for the strong interactions among academic self-concept, effort, executive function strategies, resilience, and academic success (review Figures 1 and 2). Students in more engaged mentor-mentee pairs (compared to the weak peer mentoring pairs) reported

significantly higher levels of effort and executive function strategy use in their schoolwork as well as higher levels of resilience, a finding that is consistent with our Academic Success Cycle (review Figure 1). These results suggest that strong peer mentoring relationships may be an "extrinsic factor" (within the resiliency framework) that can help motivate students to work hard and to commit to using executive function strategies, which initiates a positive learning cycle. This support for our theoretical model aligns with the recommendations of DuBois, Portillo, Rhodes, Silverthorn, and Valentine (2011), who emphasized the need for mentoring studies that are grounded in a theoretical framework that explicitly links the processes occurring at the level of the mentoring program with the processes occurring at the level of the mentor-mentee relationships.

Overall, this exploratory study represents an important first step towards establishing and evaluating the efficacy of school-based programs that address the cognitive (i.e., executive function strategies) and socio-emotional (i.e., peer mentoring) needs of at-risk learners. More specifically, our findings suggest that students' performance can be strengthened when they are explicitly taught executive function strategies that are linked with the academic curriculum so that they can apply these strategies to their classwork, homework, and tests. Further, when a supportive peer mentoring community is created in schools, engaged mentoring relationships can strengthen students' motivation to work hard and to use these executive function strategies in their classwork and homework. Lastly, a blended executive function and mentoring program can build students' academic self-concept and foster resilience, processes that are critically important for academic and life success (Margalit, 2003, 2004; Raskind et al., 1999).

Limitations

A number of the factors that affect our findings have been frequently documented in a wide range of youth mentoring programs (DuBois et al., 2011). First, school-based programs are extremely difficult to implement reliably because the practical realities of school schedules and curricula often interfere with tightly designed intervention programs. As a result, year-long intervention programs such as SMARTS are often reduced to only 3-6 months due to last-minute cancellations of sessions by school staff for field trips, special events, state standardized tests, snow storms, holidays and school vacations. These challenges often affect the quality of mentor-mentee relationships, which need to extend beyond a one-year relationship in order to ensure a strong impact (Rhodes, 2008). In this study, the fact that significant, albeit small, differences were identified when the scheduled mentoring events were reduced to 6 months' duration, suggests strongly that the SMARTS intervention should be extended and its impact evaluated in greater detail.

Other factors outside the control of SMARTS staff often affected program implementation as well as student engagement. First, student absenteeism was increased by gang membership. Second, a high attrition rate and an uneven number of students in the intervention vs. control groups resulted from the announcement that the school would be closed at the end of the year. Third, our data collection efforts at the beginning and end of the SMARTS intervention program were challenging because students often did not complete all sections of the surveys, resulting in large amounts of missing data. Further, many of the mentees in the program seemed to have such severe writing deficits that they were unable to complete some of the measures. As a result, we refined our data collection efforts to gather more qualitative data (e.g., interviews, qualitative ratings of students' performance). Therefore, our statistical analyses were restricted by the inconsistent sample size and missing data. The small subgroup sample sizes of the current study also raise the possibility of both Type I and Type II errors. The limited statistical power may have affected the findings so that existing group differences may not have been detected. Furthermore, school administrators had promised us access to students' standardized test scores and final grades, but they did not comply despite our many attempts to obtain these data. As a result, we had to refine our data collection efforts on an ongoing basis so that we could use a multi-pronged approach to collecting qualitative and quantitative data.

Recommendations for Future Research

There is a major need for more research on the impact of peer mentoring in schools, as emphasized in previous reviews of cross-age peer mentoring studies (Chan et al., 2012; Karcher, 2005). Future studies should ideally involve school administrators and teachers who are trained to implement a blended executive function and mentoring program systematically. This would ensure that executive function strategies are taught systematically and embedded into the day-to-day curriculum as well as homework and tests. In addition, outcome measures in school-based peer mentoring programs should include semi-structured interviews, portfolio analyses, video ratings, and qualitative data analyses so that the impact of school-based peer mentoring can be effectively assessed. Therefore, school-based peer mentoring programs need to incorporate practical, easy-to-use pre- and post-measures, which are less time consuming or detailed than the measures we used in the current study. Finally, an interesting trend in our study was that the benefits of mentoring relationships appeared to be as strong or stronger for mentors than mentees. Future research is needed to evaluate the transformative effects of mentoring relationships on older students who begin to take on more responsibility.

Conclusions

The fast pace in our 21st-century classrooms and the expanding influence of technology on classroom instruction have placed increasing pressure on students to use executive function strategies in order to set goals, organize, prioritize, think flexibly, and self-monitor. As a result, teachers are beginning to recognize the benefits of promoting metacognitive awareness and teaching executive function strategies to all students, regardless of whether or not they exhibit any learning challenges. Peer mentoring is a powerful technique that teachers can use to extend and deepen the effects of teaching these executive function strategies. When executive function strategy instruction is combined with peer mentoring, teachers provide students with a strong foundation for building self-concept, persistence, and resilience, the gateways to academic and life success.

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