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Concurrent and Short-term Prospective Relations among Neurocognitive Functioning, Coping, and Depressive Symptoms in Youth

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Abstract

Objective—The present short-term longitudinal study examined the concurrent and prospective relations among executive functioning (i.e., working memory and cognitive flexibility), coping (primary and secondary control coping), and depressive symptoms in children.

Method—Participants were 192 children between 9 and 15 years old (mean age = 12.36 years, $SD = 1.77$) recruited from the community. Youth were individually administered neuropsychological measures of executive functioning and intelligence, and completed self-report measures of executive dysfunction, coping, and depressive symptoms in small groups; the latter two measures were completed again four months later (Time 2). Linear regression analyses were used to examine direct associations among executive functions, coping, and depressive symptoms, and a bootstrapping procedure was used to test indirect effects of executive functioning on depressive symptoms through coping.

Results—Significant prospective relations were found between working memory measured at Time 1 (T1) and both primary and secondary control coping measured at Time 2 (T2), controlling for T1 coping. T1 cognitive flexibility significantly predicted T2 secondary control coping, controlling for T1 coping. Working memory deficits significantly predicted increases in depressive symptoms four months later, controlling for T1 depressive symptoms. Bootstrap analyses revealed that primary and secondary control coping each partially mediated the relation between working memory and depressive symptoms; secondary control coping partially mediated the relation between cognitive flexibility and depressive symptoms.

Conclusion—Coping may be one pathway through which deficits in executive functioning contribute to children's symptoms of depression.

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Keywords

Executive function; Coping; Depression; Children and Adolescents

Depression is a serious public health concern that can affect interpersonal relationships, academic and work performance, and physical health. Lifetime prevalence of major depressive disorder (MDD) in adolescents is about 15% (Kessler & Walters, 1998) and 2.5% in children (Costello, Foley & Angold, 2006). Identifying vulnerabilities that contribute to the onset, maintenance, and recurrence of depression is crucial for generating early interventions for its treatment and prevention. The present study focuses on two potentially important risk factors for depression -- executive functioning (EF) and coping.

A recent meta-analysis of studies of adults showed that depression is reliably associated with broad impairment in multiple neuropsychological measures of EF (Snyder, 2013). Snyder asserted that EF is “essential for successfully navigating nearly all of our daily activities,” (p. 81) such as responding flexibly to the environment, coping with novelty and adversity, and planning for the future. Failure to satisfactorily negotiate these tasks may increase exposure to stress and thereby heighten vulnerability to depression.

Executive Functioning

Executive functioning (EF) has been variously defined as a group of cortical functions that work to coordinate goal-oriented activity (Lezak, Howieson & Loring, 2004), and as a set of complex processes used to execute novel problem-solving tasks from inception to completion (Best, Miller, & Jones, 2009; Miyake, 2012). The executive functions of working memory and cognitive flexibility, in particular, have been hypothesized to underlie the ability to effectively select and utilize adaptive coping strategies in the presence of stress (e.g., Compas, 2006; Gotlib & Joorman, 2010), and these responses to stress then may either exacerbate or reduce risk of depression (Castaneda et al., 2008; Compas, 2006).

Working memory (WM) is a core cognitive process that involves the short-term storage of information while executing cognitive tasks that use this information. WM has been described as the brain's “scratch-pad,” and involves holding pieces of information “on line” until they can be dealt with or manipulated physically or mentally (Baddeley & Hitch, 1974) such as remembering a phone number while dialing it. *Cognitive flexibility* (CF) involves the ability to alter short- and long-term goals and strategies in response to changes in situations and contexts (Miyake et al., 2000). This ability to “shift” or “switch” between tasks involves top down, effortful control. CF is considered one of the most complex executive functions (Davidson, Amso, Anderson, & Diamond, 2006) because it requires not only holding information in mind about new rules (i.e., working memory), but also inhibiting previously learned knowledge to carry out a new rule. Both working memory and cognitive flexibility are central to learning and may provide the foundation for engaging in complex, coping behaviors in the presence of stress (Compas, 2006; Siegle & Hasselmo, 2002). Deficits in these particular executive functions have been hypothesized to affect the cognitive processing necessary for effective selection and utilization of adaptive strategies for responding to adversity (Campbell et al., 2009; Eisenberg et al., 1997).

Coping

Coping has been defined as “conscious volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment in response to stressful events or circumstances,” (Compas et al., 2001, p. 89). Voluntary coping responses can be further categorized as either engagement with or disengagement from a stressful event or one's emotional reaction to the event. Confirmatory factor analyses have revealed three voluntary coping factors (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). Primary control engagement coping involves attempts to directly change the situation or one's emotional reactions to it, and includes problem-solving, emotional expression, and emotion regulation. Secondary control engagement coping involves efforts to adapt to the situation by regulating attention and cognitions, such as acceptance, cognitive restructuring, positive thinking, or distraction. The third coping factor – disengagement coping – was not a focus of the present investigation.

Executive Functioning and Coping

The ability to hold different thoughts simultaneously in order to evaluate or modify them (i.e., working memory) underlies both primary and secondary control coping (Connor-Smith et al., 2000). For instance, problem solving to fix a stressor (i.e., primary control coping) requires considering multiple solutions while also evaluating various possible outcomes. Consistent with the notion that WM may be integral to engaging in effective coping, neuroimaging studies (e.g., Ochsner, Bunge, Gross, & Gabrieli, 2002) have revealed that the prefrontal regions of the brain associated with WM are activated during utilization of cognitive coping strategies such as reframing or reappraisal (i.e., secondary control coping).

Cognitive flexibility enables switching of focus or mental engagement in response to changing situational demands (Korkman et al., 2007). Successful navigation of stressful situations and engagement of coping skills may require the ability to flexibly adapt both cognitively and behaviorally to the changing demands of a situation (Compas, 2006). Thus, cognitive abilities such as WM and CF may provide a foundation for engaging in complex thinking and for effectively selecting and utilizing adaptive coping strategies (Compas, 2006). When these executive functions are delayed or aberrant, and when the development of coping skills is slow or fails to reach full capacity, a child may become locked into repetitive patterns of behavior or thinking, or be unable to engage in complex cognitive and regulatory processes.

Although EF has been implicated in the successful engagement of coping skills, only limited empirical evidence exists of a direct relation between EF and coping. Both WM and CF have been linked to primary control coping strategies such as problem-solving and deductive reasoning (Fletcher, Marks, & Hine, 2011; Handley, Capon, Beveridge, Dennis, & Evans, 2004) and to secondary control coping strategies such as cognitive restructuring (Andreotti et al., 2011; Campbell et al., 2009). Greater cognitive flexibility also has been associated with the ability to understand alternate points of view (Hughes & Ensor, 2007), which may facilitate secondary control coping strategies such as acceptance and positive thinking. For example, a study of children receiving treatment for acute lymphocytic leukemia showed

that greater cognitive flexibility was linked with more frequent use of secondary control coping strategies such as acceptance and positive thinking (Campbell et al., 2009). A study of children with functional abdominal pain (FAP) found that attention regulation, which is related to cognitive flexibility, also predicted secondary control coping (Hocking et al., 2011). Thus, some evidence exists that working memory and cognitive flexibility are related to the ability to adaptively respond to stress, although these studies have been cross-sectional and only two involved children.

Executive Functioning and Depression

Deficits in working memory and cognitive flexibility have been observed in depressed adults (e.g. Butters et al., 2004; Harvey et al., 2004; Snyder, 2013) and children (e.g. Kyte, Goodyer, & Sahakian, 2005; Matthews, Coghill, & Rhodes, 2008; Micco et al., 2009). In normative samples of children, good EF has been found to be related to academic achievement (Blair & Razza, 2007), socioemotional adjustment (Rueda, Checa, & Rothbart, 2010), and adaptation in the face of stress (Obradovic, 2010), whereas deficits in EF have been associated with both internalizing and externalizing problems (e.g., Nigg, Hinshaw, Carte, & Treuting, 1998; Riggs, Blair, & Greenberg, 2003). In particular, working memory deficits have been found in depressed youth (Franklin et al., 2010; Matthews et al., 2008; Micco et al., 2009). Problems in WM have been linked to cognitive processes associated with depression such as intrusive thoughts (Joorman & Gotlib, 2008) and difficulty executing multi-step plans (Gathercole et al., 2008). Cognitive inflexibility has been associated with repetitive thoughts (e.g., rumination), impairments in problem-solving and in generating alternative views, and difficulty taking another's perspective (Davis & Nolen-Hoeksema, 2000, Hughes & Ensor, 2007). Thus, neurocognitive impairments have been related concurrently to internalizing symptoms in both normative and clinical samples (McClintock, Husain, Greer, & Cullum, 2010; Snyder, 2013).

Coping and Depression

Difficulties regulating emotions and coping with stressful events have been linked with various forms of psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Depression has been characterized by under-developed emotion regulation and by less adaptive forms of coping, which then contribute to the persistence and exacerbation of depressive symptoms (e.g., Forbes, Fox, Cohn, Galles, & Kovacs, 2006; Garber, Braafladt, & Weiss, 1995). Specifically, the inability to utilize adaptive coping strategies such as primary and secondary control coping has been proposed as a risk factor for internalizing problems (Compas et al., 2001). Cross-sectional studies of offspring of depressed parents have shown that greater use of secondary control coping was significantly associated with lower levels of depressive symptoms (e.g. Fear et al., 2009; Langrock, Compas, Keller, & Merchant, 2002), and primary control coping was associated with lower levels of symptoms in response to peer stress, whereas secondary control coping covaried with lower depressive symptom levels in the context of family stress (Jaser et al., 2007).

The few prospective studies of coping and depression in children also have found a significant relation. A five-month longitudinal study of children experiencing the stress of

parental divorce showed that active coping and distraction predicted lower internalizing symptoms (Sandler et al., 1994). Maladaptive coping (e.g., avoidance, withdrawal, venting of emotions) also has been prospectively linked to increased depression in normative samples (Sawyer, Pfeffer, & Spence, 2009) and in children exposed to marital conflict (Shelton & Harold, 2007).

Executive Functioning, Coping, and Depression

One possible mechanism through which executive function deficits may contribute to depression is by disrupting the cognitive processes needed for coping with stress. Some evidence exists that the relation between stress and depression is mediated by coping. For example, a cross-sectional study showed that secondary control coping mediated the relation between poverty-related stressors and depressive symptoms in children (Wadsworth, Raviv, Compas, & Connor-Smith, 2005). Similarly, in a sample of inner-city African American adolescents, Dempsey (2002) found that coping strategies such as avoidance and aggression prospectively mediated the relation between exposure to community violence and symptoms of depression. Finally, Compas and colleagues (2011) reported that changes in children's secondary control coping mediated the effects of a family group cognitive-behavioral intervention on children's depressive symptoms. Little is known, however, about the extent to which coping also mediates the relation between executive functioning and depressive symptoms in children. Executive processes are of particular interest because they are potentially modifiable (Diamond & Lee, 2011) and therefore could be targets of intervention.

The Present Study

The aims of this short-term longitudinal study were to examine the concurrent and prospective relations of the executive functions of working memory and cognitive flexibility with primary and secondary control coping and depressive symptoms in children. The following hypotheses were tested: (a) Better executive functioning (i.e., working memory; cognitive flexibility) would be significantly associated with greater use of primary control coping (e.g., problem-solving, emotional modulation) and secondary control coping (e.g., cognitive restructuring, acceptance) both concurrently (T1) and at the four-month follow-up (T2). (b) Deficits in EF abilities would be associated with higher levels of depressive symptoms concurrently (T1) and at T2. (c) T1 coping would be significantly associated with depressive symptoms concurrently and at T2. (d) T2 coping would mediate the hypothesized link between T1 EF and T2 depressive symptoms. (e) Finally, to address questions about the direction of the observed relations among executive functioning, coping, and depression, we tested an alternative mediation model in which the relation between executive functioning and coping was mediated by depressive symptoms.

Method

Participants

Participants were 192 children ages 9 to 15 (M age = 12.36 years, SD = 1.77). Letters and emails explaining the study and consents were sent to parents of children in grades 5 through

9 from local schools. Participants also were recruited through a university-based email, which provided information about the study and how to contact the researchers. The sample included 100 females (52.1%) and 92 males, and was 71.4% Caucasian, 18.2% African-American, 2.6% Asian-American, and 3.6% Hispanic, 4.2% self-reported mixed race/ethnicity. Children were excluded if their parents reported that they had a traumatic brain injury, neurological condition (e.g., seizures, stroke), developmental delay, or significant learning or reading problems that might prevent the child from understanding the assessment. One boy was excluded prior to study enrollment due to his having a serious learning disability.

Measures

Executive functioning—Commonly used working memory tasks are Digit Span Forward and Backward (e.g., Baddeley, 1992; Snyder, 2013), both of which presumably tap short-term auditory working memory, and the Backward Digit Span requires manipulation, or reordering, of mental information; some debate exists, however, about whether digit span tasks capture both the storage and processing components of WM (Baddeley, 2012). In a recent meta-analysis, Snyder (2013) reported that adults with MDD showed deficits on both forward and backward digit span, and he concluded that both were measures of WM.

In the current study, WM was assessed with the Forward and Backward Digit Span tasks of the Wechsler Intelligence Scale for Children - Fourth Edition (WISC-IV; Wechsler, 2003). The Digit Span subtest requires the child to repeat a series of digits presented orally (Digits Forward) and then to repeat a series of digits in reverse order (Digits Backward). Children's Digit Span Total scores (i.e., the sum of the Digit Span Forward and Digit Span Backward scores) were used as the behavioral index of working memory.

Cognitive flexibility was measured with a computerized version of the Wisconsin Card Sorting Test (WCST; Heaton et al., 1993), which assesses children's ability to flexibly adapt behavior in response to changing rules. Children were instructed to match a series of playing cards according to three categories (color, shape, number of objects) to four reference cards that remained constant, and were provided with feedback ("right" or "wrong") after each match, allowing them to learn the classification rule. The rule changes without notification, however, after a fixed number of correct matches, which then requires adjusting their sorting method. This procedure continues until the child has successfully completed six sorting categories, or until all 128 cards have been placed (Strauss, Sherman, & Spreen, 2006).

Children's CF was represented by total number of perseverative errors; higher values indicated less flexibility. Perseverative errors represent the inability to relinquish an old category for a new one or an inability to see a new possibility (Heaton et al., 1993) and are considered the best single metric of EF from the WCST (Rhodes, 2004). The generalizability coefficient, which is comparable to traditional reliability coefficients (Cronbach, Gleser, Nanda, & Rajaratnam, 1972), for Perseverative Errors was .52, indicating moderate reliability (Heaton, 1993).

The Behavior Rating Inventory of Executive Function - Self-Report (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000; Roth, Isquith, & Gioia, 2005) assesses impairment in executive

functioning in several domains. Children rated their behavior frequency using a three-point Likert scale (0 to 2) on 75 items covering nine non-overlapping scales, which comprise two broader indices of Behavioral Regulation (Inhibit, Shift, Emotional Control) and Metacognition (Initiate, Working Memory, Plan/Organize, Organization of Materials, Self-Monitor, Task Monitor). In the current sample, coefficient alpha for the BRIEF Working Memory Index was .83 and for the BRIEF Shift Index was .84.

We created separate composite indices for working memory and cognitive flexibility. In the present sample, correlations between the BRIEF Self-Report Indices and their corresponding behavioral tasks were low but statistically significant (see Table 1) and similar to those reported in other studies (e.g., Strauss et al., 2006). Given a lack of prior data regarding the relative predictive validity of self-report or behavioral measures and the lack of precision of commonly used EF measures (Strauss et al., 2006; Suchy, 2009), we used composite scores to capture unique aspects of EF assessed through each method. Composite scores were created by reverse scoring the WCST and BRIEF such that higher scores indicated better EF abilities on all measures, converting raw scores to standardized scores (*z*-scores) and combining the behavioral and self-report measures for each domain. The internal consistency for each composite was computed using the Cronbach's Alpha based on standardized items, which is recommended when combining items using different metrics (Falk & Savalei, 2011). The standardized alpha for the working memory composite was .82 and for the cognitive flexibility composite was .79.

Coping—The peer stress version of the Responses to Stress Questionnaire (RSQ; Connor-Smith et al., 2000) was used to assess children's reactions to 12 social stressors commonly experienced by children (e.g., fighting with other kids; not having as many friends as you want). The measure then includes 57 items describing ways in which a child might respond to stressful peer interactions. Children rate each item using a 4-point Likert scale (1=not at all; 2=a little; 3=some; 4=a lot) for how much they respond to peer stress in the manner described. The two subscales of the RSQ included in the present analyses were: primary control engagement coping (e.g., problem-solving, emotional expression, emotional modulation) and secondary control engagement coping (e.g., cognitive restructuring, acceptance, distraction, positive thinking). The RSQ uses proportional scoring, which takes into account the total number of items endorsed when reporting the scale statistics. Internal consistency reliabilities at both time points were .81 for primary control coping and .80 for secondary control coping.

Depressive symptoms—The Children's Depression Inventory (CDI; Kovacs, 1992) was used to measure children's report of 26 symptoms of depression (excluding the suicidal item). Children choose one of three statements that best describes them during the past two weeks. Internal consistency for the current sample was .86 at both time points.

Intelligence Quotient (IQ)—Given that executive functioning is associated with intelligence in children (Friedman et al., 2006), we obtained an estimated IQ score to use as a control variable. The Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) is an individually administered, brief intelligence test for children. The short form of the WASI contains one subtest from the Verbal Comprehension Index (Vocabulary subtest) and

one subtest from the Perceptual Reasoning Index (Matrix Reasoning subtest). These two subtests are combined to provide an estimate of children's overall IQ. WASI scores have been shown to correlate about .93 with the Full Scale IQ (Wechsler, 1999). In the present study, a minimum estimated Full Scale IQ (FSIQ) of 70 was required to ensure adequate comprehension of the questionnaires and behavioral tasks. Data from one enrolled participant were excluded from all analyses due to the girl having an estimated FSIQ score below 70.

Procedures

All study procedures were approved by the Institutional Review Board for the Protection of Human Subjects in Research. Parents signed consent forms and children signed assent forms before study procedures commenced. Children participated in two sessions approximately four months apart (Mean duration between T1 and T2 = 4.35 months; $SD = .69$). Time 1 (T1) was completed in-person and lasted 3 hours; the second session (T2) was 30 minutes and was conducted online or by telephone. At T1, the computerized and examiner-administered executive function tasks (WCST and Digit Span, respectively), the WASI, and the CDI, BRIEF, and RSQ were administered. The order of administration of the computerized tasks, questionnaires, and WASI was random across children. The WASI and computerized tasks were administered individually; questionnaires were completed independently in small groups of 1 to 5 participants ($M = 2.9$). A total of 66 testing sessions were conducted on campus or at a local school. At the T2 follow-up, children again completed the CDI and RSQ, which allowed us to examine the extent to which EF measured at T1 predicted changes in coping and depressive symptoms at T2, controlling for T1 coping and depression, respectively. All participants were compensated \$20 for the first session and \$10 for T2.

Results

Descriptive and Preliminary Analyses

Table 1 presents descriptive statistics and correlations of all study measures. Mean scores on the EF tasks were within the average range and similar to those observed in normative samples (e.g., Kirkwood, Hargrave, & Kirk, 2011; Klimes-Dougan et al., 2006). The mean scores on the CDI were somewhat lower than those observed in normative samples of children ages 8–16 (Twenge & Nolen-Hoeksema, 2002). On the RSQ, the proportion of secondary control coping was significantly higher than primary control coping at T1, $t(189)=15.48, p<.001$, and T2, $t(167)=19.08, p<.001$. At T1, girls reported a significantly lower proportion of secondary control coping strategies ($M=.25, SD=.05$) than boys ($M=.27, SD=.05$), $t(188)=2.42, p<.05$. Inclusion of sex in the prospective analyses, however, did not alter the results, and therefore was not used as a covariate. Age was associated with estimated FSIQ and with primary control coping; therefore, age was included as a covariate in all analyses. To address the possibility that the results might have been driven by the older age group, we ran an exploratory multi-group model to compare the findings for younger (<12 ; $n=83$) versus older (≥ 12 ; $n=109$) participants. No significant age differences were found in any of the models in the paths between EF and T2 Depression, EF and T2 coping, or T2 coping and T2 Depression.

Sixteen children in the sample reported having a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD); 12 of these children currently were taking medication for ADHD. Children with ADHD obtained significantly lower working memory composite scores, $t(190) = 3.04, p < .05$. Results did not differ, however, when these 16 children were excluded from the regression analyses, and therefore they were retained in the final analytic sample.

Relations between Executive Functioning and Coping

As hypothesized, executive functioning correlated significantly and positively with coping at both T1 and T2 (see Table 1). Both the working memory and cognitive flexibility composites correlated significantly with primary and secondary control coping at T1 and T2. Separate multiple regression analyses were conducted with each executive functioning composite¹ as the independent variable and each coping subscale as the dependent variable, controlling for age and IQ. These regression models tested the relation of T1 executive function abilities to T2 coping, controlling for T1 coping, age, and estimated FSIQ.

Working memory—Table 2 presents the results of the multiple regression analyses of WM predicting coping at T2. The overall model indicated that WM accounted for a significant amount of the variance in the proportion of T2 primary control coping. The individual coefficients indicated that better WM significantly predicted increased use of primary control coping at T2. In the second model, WM also accounted for a significant proportion of variance in secondary control coping. Better WM uniquely predicted increased use of secondary control coping strategies at T2, controlling for T1 secondary coping, age, and estimated FSIQ.

Cognitive flexibility—Table 2 also shows the results of the multiple regression analyses of cognitive flexibility (CF) at T1 as a predictor of coping at T2, controlling for T1 coping, age, and estimated FSIQ. Overall, the first model accounted for a significant amount of variance in the proportion of primary control coping used at T2; T1 CF, however, did not significantly predict T2 primary control coping. In the second model, the relation between T1 CF and T2 secondary control coping also accounted for a significant proportion of the variance; better CF at T1 significantly predicted increased use of secondary control coping at T2.

Relation between Executive Function and Depressive Symptoms

Consistent with hypothesis 2, EFs were associated negatively with depressive symptoms at both T1 and T2 (see Table 1). Specifically, significant correlations were found between both working memory and cognitive flexibility composite scores and depressive symptoms at T1

¹We conducted posthoc regression analyses using self-report (BRIEF Working Memory Index and Shift Index) and behavioral tasks (WCST Perseverative Errors and WISC-IV Digit Span Total) measures separately, to examine the patterns of results for the different assessment methods. The regression models using self-report measures of executive functioning indicated that the results did not differ from those found using the composite measures of WM and CF. The overall regression models using the behavioral task measures remained significant and path coefficients for each behavioral task score were in the expected direction, but did not significantly predict coping or depressive symptoms at T2, with the exception of a nonsignificant trend for the WM measures (i.e., WISC-IV Digit Span tasks) to predict increased primary control coping at T2, $b = .005, SE = .003, p = .078$.

and T2. Thus, better executive functioning was linked with lower levels of depressive symptoms.

Next, we tested two separate regression models to determine whether each T1 executive function composite score predicted depressive symptoms at T2, controlling for depressive symptoms at T1, age, and estimated FSIQ. The overall model testing whether T1 WM predicted depressive symptoms at T2 was significant, (see Table 3); the individual coefficients indicated that higher levels of T1 WM significantly predicted lower levels of depressive symptoms at T2. The overall model testing T1 CF as a predictor of T2 depressive symptoms also was significant; cognitive flexibility did not uniquely predict T2 depressive symptoms, however, (see Table 3).

Relations between Coping and Depressive Symptoms

As predicted, both primary and secondary control coping correlated negatively with depressive symptoms (see Table 1). Significant concurrent correlations were found between primary and secondary control coping and depressive symptoms at T1 and T2. Thus, less use of primary or secondary control coping was associated with higher levels of depressive symptoms.

Indirect Effects among Executive Functions, Coping, and Depressive Symptoms

Path analysis using AMOS v. 21 was used to test the indirect effect of T1 executive functioning to T2 depressive symptoms through T2 coping. All models used observed scores and controlled for T1 depressive symptoms, T1 coping, age, and estimated FSIQ. Specifically, a bias-corrected bootstrap procedure was used to obtain a 95% confidence interval (CI) of the indirect effect. A bootstrap test is preferable to the traditional Sobel test for examining indirect effects, because the Sobel test assumes that the estimate of the indirect effect follows a normal distribution, which often is not the case, and it can lead to low power and high type I error rates (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). In contrast, bootstrap tests do not make distributional assumptions.

In the present analyses, each bootstrapping model used 5000 iterations to obtain the 95% CIs. Because bootstrap analyses do not allow for missing values within a data set, imputation for the bootstrap procedure was conducted using SPSS Multiple Imputation Procedures (SPSS, 2012). At T1, there was less than 1% missing data; at T2, there was 9.4% and 12.5% missing data for the CDI and RSQ, respectively. These procedures resulted in five multiply imputed data sets and bootstrap analyses were run on each. An overall confidence interval of the indirect effect was obtained by averaging the results across these bootstrap analyses for each imputed data set. A confidence interval that did not include zero indicated a significant indirect effect.

Working memory, coping, and depressive symptoms—A significant indirect effect was found between T1 working memory and T2 depressive symptoms through T2 primary control coping (95% CI for indirect effect: $-.417, -.054$). Specifically, better WM predicted increased use of primary control coping strategies, which was related to lower concurrent depressive symptoms, (see Table 4 and Figure 1). In the model testing the indirect effect

between T1 WM and T2 depressive symptoms through T2 secondary control coping (Table 4), the relation between WM and increased use of secondary control coping at T2 was not significant, but T1 WM was significantly related to T2 depressive symptoms. The 95% bootstrapped CI for the indirect effect did not include zero ($-.319, -.005$), indicating that secondary control coping partially mediated the link between WM and depressive symptoms. Although the path from WM to secondary control coping was not significant, Hayes (2009) noted that an indirect effect may be detectably different from zero, even if one of its constituent paths is not (i.e., a or b path in a mediation model).

Cognitive flexibility, coping, and depressive symptoms—Because a significant direct effect is not necessary in longitudinal designs in order to test for mediation (McCartney, Bub, & Burchinal, 2006), we conducted a mediation analysis even though T1 cognitive flexibility did not significantly predict T2 depressive symptoms. A significant indirect effect was found for T1 cognitive flexibility, T2 secondary control coping, and T2 depressive symptoms (95 % CI for indirect effect: $-.409, -.042$) (see Table 5). Specifically, better CF predicted increased use of T2 secondary control coping, which was related to lower T2 depressive symptoms (see Table 5). The bootstrapped CI testing the indirect effect of CF on T2 depressive symptoms through T2 primary control coping included zero and thus, was not significant (95% CI for indirect effect: $-.238, .132$).

Alternative Model: Indirect Effect of EF on Coping through Depressive Symptoms

Because coping and depressive symptoms were assessed concurrently, we tested an alternative mediation model in which the direction of the relation between coping and depression was reversed. That is, did T2 depressive symptoms mediate the relation between T1 EF and T2 coping. Separate mediation analyses were conducted for the two EF components and the two coping factors. The CIs for the indirect effect included zero in all models (see Table 6). Thus, no evidence emerged of an indirect effect of EF on T2 coping through T2 depressive symptoms.

Discussion

The present study investigated the concurrent and short-term prospective relations among executive functioning (i.e., working memory and cognitive flexibility), coping (primary and secondary control coping), and depressive symptoms in children. Consistent with hypotheses: (a) better EF was associated with greater use of primary and secondary coping strategies; (b) deficits in WM predicted higher levels of depressive symptoms; and (c) greater use of primary and secondary control coping were associated with lower levels of depressive symptoms. All analyses predicting T2 coping or T2 depressive symptoms controlled for the T1 level of the respective variable. (d) Mediation analyses revealed significant indirect effects indicating that coping partially accounted for the relations between EF and depressive symptoms. Finally, the alternative mediation model revealed no significant indirect effects of executive functioning on coping through depressive symptoms.

Relation of Executive Functioning to Coping

Consistent with hypothesis 1, better WM and CF were significantly associated with greater use of primary control coping (i.e., problem-solving, emotional modulation) and secondary control coping (i.e., cognitive restructuring, distraction, acceptance). The cross-sectional associations observed here parallel findings of a previous study of EF and coping in youth with cancer (Campbell et al., 2009). Results differed, however, from a study of children with functional abdominal pain (FAP; Hocking et al., 2011), which had a smaller sample. It is possible that EF abilities are less central to coping with the chronic health condition of FAP.

Significant prospective relations also were found between EF and coping. Controlling for coping assessed at T1, age, and estimated FSIQ, better WM significantly predicted both primary and secondary control coping four months later (T2), and greater cognitive flexibility significantly predicted T2 secondary control coping. The higher order executive skills that characterize WM (e.g., planning, implementing multi-step solutions, holding several perspectives while simultaneously evaluating their accuracy) were related to primary control coping strategies, which involve actively modifying events or one's reactions to them (i.e., problem-solving; emotion modulation). WM abilities also likely facilitate secondary control coping strategies that involve perspective-taking and re-evaluating current conditions (i.e., cognitive restructuring, acceptance) (Rudolph, Dennig, & Weisz, 1995).

The direct effect of cognitive flexibility on secondary control coping, controlling for T1 coping, age, and estimated FSIQ, also was significant; that is, better CF significantly predicted greater use of secondary control coping four months later. This result is consistent with Compas' (2006) suggestion that CF facilitates the use of secondary control coping strategies that involve shifting thoughts and behaviors (i.e., cognitive restructuring, distraction, acceptance) and adapting to stressful events. Children who lack such flexibility may become trapped in repetitive cycles of behavior (i.e., perseveration) and be less able to recruit new strategies for coping effectively with novel situations.

Thus, the present short-term longitudinal study revealed several important concurrent and prospective links between EF and coping. These results expand upon previous evidence that EF is associated with the skills that characterize primary control coping such as problem-solving and deductive reasoning (Fletcher, Marks, & Hine, 2011; Kail, 2007) as well as secondary control coping such as cognitive restructuring (Andreotti et al., 2011). An important question for future research is whether improving children's EF skills increases the likelihood of their engaging in more adaptive strategies for coping with stress.

Relation between Executive Functioning and Depressive Symptoms

Consistent with hypothesis 2, we found that deficits in EF were associated with higher levels of depressive symptoms both concurrently and prospectively. In particular, controlling for T1 depressive symptoms, age, and estimated FSIQ, difficulties in working memory significantly predicted increases in depressive symptoms four months later. Significant concurrent and prospective bivariate associations also were found between cognitive flexibility and depressive symptoms, although not when T1 depressive symptoms, age, and estimated FSIQ were controlled. These findings are similar to other studies that have shown

that depressed youth have deficits in working memory, but intact cognitive flexibility (Brooks, Iverson, Sherman, & Roberge, 2010; Matthews et al., 2008; Micco et al., 2009). Interventions aimed at improving working memory, in particular, may be especially beneficial for youth with depression.

Does Coping Mediate the Relation of Executive Functioning to Depressive Symptoms?

We tested mediation models of whether EF was *indirectly* related to subsequent depressive symptoms through coping. As predicted, analyses of the indirect effects revealed that both primary control coping and secondary control coping strategies mediated the relation between working memory and depressive symptoms. Better WM ability predicted engaging in increased levels of primary control coping strategies that changed the stressor or the individual's emotional reactions to it, and secondary control coping strategies that regulated attention and cognitions about the stressor. Greater use of each of these coping approaches then predicted lower levels of depressive symptoms.

Secondary control coping also mediated the relation between CF and depressive symptoms. That is, the ability to think flexibly and shift cognitive set predicted children's use of secondary coping strategies such as cognitive restructuring and acceptance, which then were related to children's level of depressive symptoms. These results are similar to the cross-sectional findings of Campbell and colleagues (2009) who showed that secondary control coping mediated the relation between CF abilities and behavior problems in children. Thus, coping appears to be tied to these higher order executive functions and may be one salient pathway through which EF deficits contribute to children's symptoms of depression (Compas, 2006).

Direction of the Relations among Executive Function, Coping, and Depressive Symptoms

To examine the direction of the observed relations, we tested an alternative model in which depressive symptoms were the potential mediator of the relation between executive functions and coping. A previous longitudinal study found that coping significantly predicted an increase in symptoms over time, but the reverse relation from symptoms to coping was not significant (Wadsworth & Berger, 2006). The present study similarly found that none of tests of the indirect effect of either type of EF on T2 coping through T2 depressive symptoms was significant. Of course these null results cannot completely rule out the possibility that depressive symptoms might mediate the prospective path from EF to coping. Future studies that include three or more time points are needed to allow for direct examination of longitudinal mediation effects (Cole & Maxwell, 2003). Other data analytic methods such as dynamic latent change score (LCS) modeling across multiple time points also could be used to evaluate possible bidirectional relations among these variables over time (McArdle & Hamagami, 2001).

Study Strengths and Limitations

The current investigation addressed several methodological problems of previous studies by using a short-term longitudinal design, a moderate size sample, well-validated measures of executive functioning and coping, and controlling for estimated IQ, demographic variables, and prior levels of the dependent variables. Because intellectual abilities are related,

although not identical, to executive functions (Friedman et al., 2006), we controlled for WISC-IV FSIQ in all analyses. In contrast to prior studies that did not control for IQ (Campbell et al., 2009; Hocking et al., 2011), the current study examined the unique contribution of EF, over and above IQ, to coping and depressive symptoms. Finally, the present longitudinal investigation was an advance over previous cross-sectional studies as we controlled for T1 levels of coping and depressive symptoms, and included concurrent correlations among variables in the mediation models. These more stringent tests of the longitudinal direct and indirect effects among executive functioning, coping, and depression allowed us to minimize potential bias in the observed relations.

Limitations of this study highlight directions for future research. First, we used composite measures of executive functioning comprised of the behavioral tasks and self-report measures, in part because many of the commonly used measures of EF are imprecise indices of specific executive skills and often tap into several different components of EF (Strauss, Sherman, & Spreen, 2006; Suchy, 2009). The self-rating scales of the BRIEF are considered complementary to, rather than redundant with, the behavioral tasks (Gioia & Isquith, 2004). Correlations between the self-report measures and behavioral tasks used here were small, but significant. It is possible that the observed relations between EF and coping and depression were being “carried” more by one of these measures. Therefore, we conducted posthoc analyses that revealed that the self-report measures significantly predicted coping and depressive symptoms at follow-up; the relation of the behavioral tasks to these constructs was in the expected direction, but not significant. Thus, it is possible that the observed relations among EF, coping, and depression were partially due to shared method.

Second, the executive function composite scores were comprised of both experimenter administered cognitive tasks and child-report. Although combining different methods likely is better than using only one measure, including additional behavioral indices might allow for even more precise identification of EF (Chase-Carmichael, Ris, Weber, & Schefft, 1999). Thus, using multiple informants about children's EF and psychopathology likely would reduce the possibly inflated correlations that may occur when only a single informant is used.

Another limitation was the relatively short duration between the two assessments. The four-month follow-up period may not have been long enough for significant changes in coping or depressive symptoms to occur. Future studies should include more than two waves of data collection over a longer time period to increase the chances of observing change in the variables of interest, and to allow for the use of multi-wave tests of mediation (Cole & Maxwell, 2003).

Fourth, the current sample consisted of children recruited from the community. Children reported somewhat lower depressive symptoms than same-aged normative samples (Kovacs, 1992). The extent to which the observed relations among EF, coping, and depressive symptoms would be similar in children with depressive diagnoses needs to be explored. Future studies also should include a larger and more diverse sample of children in order to conduct a more extensive examination of possible age differences in the relations among the variables studied here.

Finally, the current study examined associations among two domains of executive functioning – working memory and cognitive flexibility – and coping and depression. These two cognitive abilities provide a foundation for utilizing effective coping strategies. Other executive functions (e.g., inhibition, and attention) and cognitive abilities (e.g., scientific reasoning, meta-cognition, and processing speed), as well as social and emotional skills (e.g., emotion understanding and expression) also may be related to coping and should be the focus of future investigations.

Clinical Implications

In the present study, WM deficits predicted subsequent symptoms of depression through both primary and secondary control coping, and CF predicted depressive symptoms through secondary control coping, over and above prior symptom levels. Thus, WM and CF may be promising targets for interventions aimed at improving children's ability to utilize regulatory strategies that predict greater well-being in the context of social stress. Such interventions may especially benefit children who exhibit EF deficits and have difficulty learning and utilizing new coping strategies. Indeed, recent evidence indicates that executive functions are malleable and can be modified through intervention (Diamond & Lee, 2011; Zelazo & Carlson, 2012). The extent to which enhancing EF abilities increases children's use of adaptive coping skills and reduces their depression needs further study (e.g. Riggs, Greenberg, Kusche, & Pentz, 2006).

On the other hand, interventions that directly target coping may be more efficient and effective than those that first aim to strengthen executive functioning. EF deficits, however, may limit children's ability to comprehend and utilize interventions that teach coping strategies and CBT techniques. Several types of executive processes and cognitive skills are required for successful engagement in CBT, such as meta-cognition, flexible thinking, problem-solving, perspective-taking, and cognitive restructuring (Frankel, Gallerani, & Garber, 2011). Adjunctive interventions that enhance children's executive functions might improve their ability to learn and benefit from therapy, particularly among children with EF deficits.

The current study sets the stage for exploration of links between the developmental trajectories of executive functions and coping, particularly in the context of different types of stressors. The developing brain undergoes periods of great plasticity, which increases both vulnerability to the effects of stress (Andersen & Teicher, 2008; Davidson, Jackson, & Kalin, 2000) and potential response to intervention. Children with delayed or aberrant EF may have coping skills that fail to reach full capacity. Identifying when developmental shifts in coping occur and how they differ for children with and without EF deficits could help researchers and clinicians target youth who are at greatest risk for negative outcomes.

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Figure 1.

Path analysis testing indirect effect of working memory on Time 2 (T2) depressive symptoms through T2 primary control coping. Age and estimated FSIQ were included in the model as predictors of T2 Coping and T2 Depressive Symptoms, and were allowed to correlate with all T1 variables. Standardized parameter estimates are presented. [†] $p < .10$, * $p < .05$, ** $p < .01$

Table 1

Means, Standard Deviations, and Correlations among Study Variables

	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Age	12.36	1.77	--													
2. Full Scale IQ	111	13.41	-.36**	--												
3. T1 Working Memory Composite ^a	.001	1.52	.18*	.29**	--											
4. T1 BRIEF WM Index	19.01	4.47	.02	.15*	.76**	--										
5. T1 WISC-IV Digit Span Total	16.90	3.80	.25**	.29**	.76**	.16*	--									
6. T1 Cognitive Flexibility Composite ^a	.07	1.36	.10	.25**	.46**	.56**	.14	--								
7. T1 WCST Perseverative Errors	13.77	10.59	-.16*	-.21**	-.16*	-.10	-.15*	-.76**	--							
8. T1 BRIEF Total Shift Index	15.54	3.81	-.02	.16*	.53**	.74**	.07	.76**	-.15*	--						
9. T1 Children's Depression Inventory	6.61	5.73	.11	-.30**	-.42**	-.49**	-.15*	-.40**	.12	-.49**	--					
10. T1 Primary Control Coping	.19	.04	.14*	.19*	.25**	.25**	.13	.16*	-.06	.18*	-.22**	--				
11. T1 Secondary Control Coping	.26	.05	.00	.11	.23**	.23**	.12	.21**	-.04	.28**	-.47**	-.02	--			
12. T2 Children's Depression Inventory	6.70	6.61	.09	-.20**	-.37**	-.43**	-.13	-.33**	.14	-.39**	.69**	-.12	-.35**	--		
13. T2 Primary Control Coping	.19	.04	.10	.24**	.38**	.33**	.25**	.24**	-.11	.28**	-.42**	.42**	.25**	-.47**	--	
14. T2 Secondary Control Coping	.27	.05	.09	.07	.26**	.32**	.09	.30**	-.13	.34**	-.36**	.20*	.53**	-.44**	.28**	--

Note. T1 = Time 1; T2 = Time 2; SD = Standard Deviation; CF = Cognitive Flexibility; WM = Working Memory; WCST = Wisconsin Card Sorting Test. BRIEF = Behavior Rating Inventory of Executive Function; mean proportion scores and SD are reported for the Responses to Stress Questionnaire; raw scores are reported for the BRIEF and WISC-IV Digit Span. Higher scores on the BRIEF indicate poorer performance.

*
p < .05;

**
p < .01

Table 2
Multiple Regression Analyses of Executive Functioning Predicting Coping at 4-Month Follow-Up

Working Memory										
Model 1: T2 Primary Control Coping					Model 2: T2 Secondary Control Coping					
Variable	<i>b</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>	<i>b</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
Age	.001	.002	.06	.77	.441	.002	.002	.07	.90	.368
Full Scale IQ	.001	.00	.12	1.45	.149	<.001	.00	-.001	-.01	.990
T1 Coping	.34	.08	.32	4.43	<.001	.51	.07	.50	7.51	<.001
WM Composite	.007	.002	.25	3.27	.001	.005	.002	.15	2.08	.039
<i>R</i> ²				.26				.31		
<i>F</i>				14.24**				18.22**		
Cohen's <i>f</i> ²				.35				.45		
Cognitive Flexibility										
Model 1: T2 Primary Control Coping					Model 2: T2 Secondary Control Coping					
Variable	<i>b</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>	<i>b</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
Age	.003	.002	.11	1.42	.16	.002	.002	.07	.98	.33
Estimated FS/Q	<.001	.00	.16	1.94	.054	<.001	.00	-.01	-.17	.863
T1 Coping	.37	.08	.35	4.71	<.001	.50	.07	.50	7.46	<.001
CF Composite	.003	.002	.12	1.67	.097	.007	.002	.20	2.81	.006
<i>R</i> ²				.23				.33		
<i>F</i>				11.66**				19.48**		
Cohen's <i>f</i> ²				.30				.49		

Note. WM = Working Memory; CF = Cognitive Flexibility; FSQ = Estimated Full Scale Intelligence Quotient; T1 = Time 1; T2 = Time 2.

**
p < .01

Table 3
Multiple Regression Analysis for Executive Functioning Predicting Depressive Symptoms at Four-month Follow-Up

	Model 1: Working Memory → T2 Depressive Symptoms					Model 2: Cognitive Flexibility → T2 Depressive Symptoms				
Variable	<i>b</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>	<i>b</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
Age	.29	.23	.08	1.28	.203	.20	.22	.05	.89	.38
Estimated FSIQ	.03	.03	.06	.96	.341	.02	.03	.04	.61	.54
T1 Depressive Symptoms (CDI)	.76	.07	.64	10.51	<.001	.78	.07	.66	10.63	<.001
WM or CF Composite	-.63	.28	-.15	-2.27	.025	-.40	.27	-.09	-1.48	.14
R^2	.49					.48				
<i>F</i>	40.92**					38.97**				
Cohen's f^2	.97					.92				

Note. FSIQ = Estimated Full Scale Intelligence Quotient; T1 = Time 1; T2 = Time 2; CDI = Children's Depression Inventory; WM = Working Memory; CF = Cognitive Flexibility

**
 $p < .01$

Table 4
Results from Path Analysis Testing Indirect Effect of Working Memory on Depressive Symptoms through Coping

Parameter Estimates for Paths	Model 1: Primary Control Coping			Model 2: Secondary Control Coping		
	Unstandardized (SE)	Standardized	p	Unstandardized (SE)	Standardized	p
Working Memory Composite → T2 Depressive Symptoms	-.46 (.27)	-.11	.09	-.49 (.27)	-.11	.07
Working Memory Composite → T2 Coping	.004 (.002)	.16	.04	.004 (.003)	.13	.10
T2 Coping → T2 Depressive Symptoms	-.43.43 (10.25)	-.26	<.001	-.31.99 (8.04)	-.25	<.001
T1 Coping → T2 Coping	.30 (.07)	.28	<.001	.48 (.08)	.46	<.001
T1 Depressive Symptoms → T2 Depressive Symptoms	.69 (.07)	.59	<.001	.70 (.08)	.60	<.001
T1 Depressive Symptoms → T2 Coping	-.002 (.001)	-.26	<.001	-.001 (.001)	-.10	.23
T1 Coping → T2 Depressive Symptoms	20.30 (10.17)	.11	.05	7.75 (8.60)	.06	.67
FSIQ → T2 Coping	<.001 (.00)	.10	.20	.00 (.00)	-.002	.97
Age → T2 Coping	.002 (.002)	.08	.26	.002 (.002)	.07	.36
FSIQ → T2 Depressive Symptoms	.04 (.03)	.08	.21	.03 (.03)	.06	.33
Age → T2 Depressive Symptoms	.34 (.22)	.09	.13	.36 (.22)	.09	.11
Covariances						
Working Memory Composite ↔ T1 Depressive Symptoms	-.3.65 (.68)	-.42	<.001	-.3.65 (.68)	-.42	<.001
T1 Coping ↔ T1 Depressive Symptoms	-.05 (.02)	-.22	.003	-.14 (.02)	-.48	<.001
Working Memory Composite ↔ T1 Coping	.01 (.004)	.25	<.001	.02 (.01)	.23	.002
T1 Depressive Symptoms ↔ FSIQ	-.22.82 (5.77)	-.30	<.001	-.22.82 (5.77)	-.30	<.001
T1 Coping ↔ FSIQ	.09 (.04)	.19	.01	.08 (.05)	.12	.10
Working Memory Composite ↔ FSIQ	5.81 (1.53)	.29	<.001	5.81 (1.53)	.29	<.001
FSIQ ↔ Age	-.8.38 (1.81)	-.36	<.001	-.8.38 (1.81)	-.36	<.001
T1 Depressive Symptoms ↔ Age	1.10 (.73)	.11	.13	1.10 (.73)	.11	.13
T1 Coping ↔ Age	.01 (.01)	.14	.06	-.001 (.01)	-.01	.89
Working Memory Composite ↔ Age	.48 (.20)	.18	.02	.48 (.20)	.18	.02

Note. FSIQ = estimated Full Scale Intelligence Quotient; SE = Standard error. Traditional model-fit statistics are not presented because model is just-identified.

Table 5
Results from Path Analysis Testing Indirect Effect of Cognitive Flexibility on Depressive Symptoms through Coping

Parameter Estimates for Paths	Model 1: Primary Control Coping			Model 2: Secondary Control Coping		
	Unstandardized (SE)	Standardized	p	Unstandardized (SE)	Standardized	p
Cognitive Flexibility Composite → T2 Depressive Symptoms	-.36 (.26)	-.08	.16	-.21 (.26)	-.05	.43
Cognitive Flexibility Composite → T2 Coping	.001 (.002)	.03	.72	.01 (.002)	.16	.02
T2 Coping → T2 Depressive Symptoms	-45.71 (10.15)	-.28	<.001	-32.31 (8.19)	-.25	<.001
T1 Coping → T2 Coping	.31 (.08)	.29	<.001	.47 (.07)	.46	<.001
T1 Depressive Symptoms → T2 Depressive Symptoms	.69 (.07)	.59	<.001	.72 (.08)	.62	<.001
T1 Depressive Symptoms → T2 Coping	-.002 (.001)	-.30	<.001	-.001 (.001)	-.09	.27
T1 Coping → T2 Depressive Symptoms	19.61 (10.20)	.11	.06	7.65 (8.68)	.06	.38
FSIQ → T2 Coping	.00 (.00)	.14	.07	.00 (.00)	-.01	.90
Age → T2 Coping	.003 (.002)	.13	.09	.002 (.002)	.07	.31
FSIQ → T2 Depressive Symptoms	.03 (.03)	.07	.26	.02 (.03)	.03	.57
Age → T2 Depressive Symptoms	.29 (.22)	.08	.18	.27 (.22)	.07	.22
Covariances						
Cognitive Flexibility Composite ↔ T1 Depressive Symptoms	-3.46 (.67)	-.40	<.001	-3.45 (.67)	-.40	<.001
T1 Coping ↔ T1 Depressive Symptoms	-.05 (.02)	-.22	.003	-.14 (.02)	-.48	<.001
Cognitive Flexibility Composite ↔ T1 Coping	.01 (.004)	.16	.03	.02 (.01)	.22	.004
T1 Depressive Symptoms ↔ FSIQ	-22.82 (5.77)	-.30	<.001	-22.82 (5.77)	-.30	<.001
T1 Coping ↔ FSIQ	.09 (.04)	.19	.01	.08 (.05)	.12	.10
Cognitive Flexibility Composite ↔ FSIQ	4.97 (1.51)	.25	<.001	4.97 (1.51)	.25	<.001
FSIQ ↔ Age	-8.38 (1.81)	-.36	<.001	-8.38 (1.81)	-.36	<.001
T1 Depressive Symptoms ↔ Age	1.10 (.73)	.11	.13	1.10 (.73)	.11	.13
T1 Coping ↔ Age	.01 (.01)	.14	.06	-.001 (.01)	-.01	.89
Cognitive Flexibility Composite ↔ Age	.26 (.19)	.10	.18	.26 (.19)	.10	.18

Note. FSIQ = estimated Full Scale Intelligence Quotient; SE = Standard error. T1 = Time 1; traditional model-fit statistics are not presented because model is just-identified.

Table 6

Results from Alternative Models: Bootstrapped 95% CI of Indirect Effect of Executive Functioning on Coping through Depressive Symptoms

	Lower Bound	Upper Bound
WM → T2 Depressive Symptoms → T2 Primary Control Coping	.000	.003
WM → T2 Depressive Symptoms → T2 Secondary Control Coping	.000	.004
CF → T2 Depressive Symptoms → T2 Primary Control Coping	.000	.002
CF → T2 Depressive Symptoms → T2 Secondary Control Coping	.000	.003

Note. WM = Working Memory, CF = Cognitive Flexibility