Published in final edited form as:

Int J Behav Dev. 2016 November ; 40(6): 544–554. doi:10.1177/0165025415597792.

Components of Effortful Control and Their Relations to Children's Shyness

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Abstract

Relations between children's ($N = 213$) mother-reported effortful control components (attention focusing, attention shifting, inhibitory control at 42 months; activational control at 72 months) and mother-reported shyness trajectories across 42, 54, 72, and 84 months of age were examined. In growth models, shyness decreased. Inhibitory control and attention shifting predicted higher levels and lower levels of shyness at 42 months (the intercept), respectively. Inhibitory control negatively, and attention shifting positively, predicted the shyness slope. Children with higher inhibitory control had relatively more rapid decreases in shyness. Children with higher attention shifting had relatively slower decreases in shyness. Activational control was negatively correlated with the shyness intercept. Effortful control components should be examined separately, rather than in combination, in relation to shyness in the future. If results are replicated, it may suggest that fostering attention shifting and activational control development may help prevent, or maintain low levels of, shyness during childhood.

Keywords

shyness; effortful control; regulation; trajectory

Children's shyness has been related to psychological, social, and school-related difficulties (e.g., Karevold, Coplan, Stoolmiller, & Mathiesen, 2011; Ladd, Kochenderfer-Ladd, Eggum, Kochel, & McConnell, 2011; Rudasill & Rimm-Kaufman, 2009). *Shyness* is the display of discomfort, anxiety, or inhibited approach (e.g., suppressed speech, keeping distance from others) in social situations (Rothbart, Ahadi, Hershey, & Fisher, 2001).

Individual differences in children's shyness are moderately to highly stable (e.g., Sanson, Pedlow, Cann, Prior, & Oberklaid, 1996), but that does not mean that shyness remains stable within individuals. Researchers have observed mean-level change in shyness across childhood, as well as individual differences in shyness *trajectories* – the level and change in shyness over time (e.g., Gazelle & Ladd, 2003).

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Portions of this study were completed as a part of doctoral dissertation requirements for Natalie D. Eggum-Wilkens.

It seems reasonable to believe that children with stably low or declining shyness would have fewer psychological, social, or academic difficulties than children with chronically high or increasing shyness. Studies in which outcomes of children's trajectories of shyness or social reticence have been examined support this idea. For instance, higher levels and more rapid increase of shyness from 1.5 to 12.5 years of age predicted higher anxiety, higher depression, and lower social skills at 12.5 years (Karevold, Ystrom, Coplan, Sanson, & Mathiesen, 2012). In addition, high-and-stable and low-but-increasing social reticence (onlooking and unoccupied behavior with unfamiliar peers) from 2 to 5 years of age predicted internalizing and externalizing problems, respectively, at age 5 (Degnan et al., 2014). Given these findings that suggest shyness trajectories are relevant to psychological and social adaptation, identifying predictors of shyness trajectories is important.

A potential predictor of children's shyness trajectories is their effortful control. *Effortful control* (EC) is "the efficiency of executive attention—including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors, ..." (Rothbart & Bates, 2006, p. 129). EC differs from reactive control, in that EC is willful and voluntary as opposed to automatic. EC can modulate individuals' reactive or dominant responses (Rothbart & Bates, 2006). EC is closely related to and supported by executive attention (see Posner & Rothbart, 2007). Researchers occasionally have examined relations between individual differences in EC and shyness. To our knowledge, researchers have not examined how different components of EC relate to shyness trajectories. As we discuss below, particular EC components may help children regulate negative arousal in social situations and suppress avoidance motivations and, thus, potentially decrease, or maintain low levels of, shyness over time. There are fewer reasons to expect other EC components to relate to children's shyness. Given the importance of understanding predictors of shyness trajectories, and the lack of research regarding the potential differential relations between EC aspects and shyness trajectories, the goal of this study was to examine EC components as predictors of shyness trajectories during early childhood (42 to 84 months).

Shyness Trajectories and Predictors of Shyness Trajectories

Asendorpf (1990) suggested that independent motivational systems—approach and avoidance—influence social tendencies. High approach and high avoidance motivations can be simultaneously experienced. This *approach-avoidance conflict*, in which many shy children seem trapped, elicits feelings of social anxiety and interest and results in ambivalent behavior if unresolved (Asendorpf, 1990). For instance, shy children may decide to withdraw and play alone (resolved conflict), or to ambivalently engage with others with limited speech, hover on the edge of social activity, or watch their peers socialize from a distance (unresolved).

Study results involving trajectories of childhood shyness or related constructs are not entirely consistent, perhaps owing to differences in measurement, ages of assessment, and/or analytic strategies. Several studies suggest a linear decline, or suggest an initial decline and then a leveling off or an increase in shyness. For instance, Grady, Karraker, and Metzger (2012) found an average decrease in mother-reported shyness from 24 months to first grade. Denissen, Asendorpf, and van Aken (2008) found that parent-reported shyness decreased on

average from 4 to 23 years. Shell, Gazelle, and Faldowski (2014) found declines in average peer-reported anxious solitude from third to sixth grade and low anxious-solitude levels from sixth to seventh grade. Using teachers' reports from kindergarten to fourth grade, Gazelle and Ladd (2003) observed an initial decline and subsequent increase in anxious-solitude. In another study, however, mother-reported shyness increased for boys and girls from 1.5 to 4 years, and increased to a lesser extent for girls (but not boys) from 4 to 12.5 years (Karevold et al., 2012). Degnan et al. (2014) examined latent classes of observed social reticence trajectories and found that high-and-stable, high-and-decreasing, and low-but-increasing trajectories (16%, 43%, and 41% of the sample, respectively) from 2 to 5 years of age. Thus, results are not consistent, but the majority of results suggest that shyness declines during early childhood on average. Results also supported variability among children in shyness trajectories (Gazelle & Ladd, 2003; Grady et al., 2012; Karevold et al., 2012; Shell et al., 2014).

The investigation of predictors of shyness *trajectories* rather than of shyness levels at one time point has many advantages (e.g., examination of actual intra-person change rather than using inter-person differences as a proxy for change, correction for measurement error in change), but this type of investigation is in its infancy. Initial studies suggest that early temperament is related to shyness trajectories. For example, elevated (albeit declining) shyness trajectories have been found for children with difficult temperaments (Grady et al., 2012). To our knowledge, prediction of shyness trajectories from EC has not yet been examined.

EC Composites and Shyness

Researchers often combine EC components. This decision often is appropriate and based on factor analyses (e.g., Rothbart et al., 2001). Yet shyness may differentially relate to various EC components (Eisenberg et al., 1998). If so, combining EC components masks the true nature of relations with shyness.

Individual differences in EC composites and in shyness have been inconsistently related. In childhood, negative relations have been found (e.g., Eisenberg, Liew, & Pidada, 2004; Eisenberg, Pidada, & Liew, 2001; Valiente, Lemery-Chalfant, & Swanson, 2010), and positive relations have been found (Kochanska & Knaack, 2003; Spinrad et al., 2004; Valiente et al., 2010). Within these studies, correlations generally were not consistently significant across all time points or all forms of measurement. Inconsistent findings may partly reflect differences in what each study captured with EC composites.

EC Components and Shyness

Rothbart and her colleagues' questionnaires are frequently utilized measures that assess several EC components (e.g., Rothbart, Ahadi, Hershey, & Fisher, 2001). *Attention shifting* is the ability to transfer attention from one stimulus to another (Derryberry & Rothbart, 1988)—for example, a boy who is playing but easily shifts his focus to the next activity when his teacher announces, "it's story time." *Attention focusing* is the ability to keep attention on a stimulus (Derryberry & Rothbart, 1988)—for instance, a child who is

concentrating while coloring. *Inhibitory control* is the ability to inhibit behavior when one is motivated to act or under instruction—for example, a running girl who can walk when her mother says, “slow down.” *Activational control* is the ability to initiate behavior when not motivated—for example, making oneself do boring homework.

Particular EC components (i.e., attention shifting, activational control) might help children suppress negative arousal or overcome avoidance motivations and be associated with lower shyness levels or with a reduction in shyness over time. Returning to Asendorpf’s (1990) approach-avoidance conflict, if a shy child is able to suppress or override his/her avoidance motivation, it should resolve the conflict and ease engagement in social interactions.

Attention shifting may be especially relevant to shyness trajectories. It might facilitate the regulation of negative arousal in social situations (Eisenberg et al., 1995). The rationale for such theorizing is consistent with that in the anxiety literature. Anxiety is more general than shyness and they are not the same, but they are related. Shyness reflects anxiety in social situations involving novelty or social evaluation (Coplan, Girardi, Findlay, & Frohlick, 2007). Anxious children and adults have been found to have attention biases in that they easily orient toward and/or have problems disengaging attention from threatening stimuli; in other words, their attention is involuntarily pulled toward and fixed on threatening stimuli (Derryberry & Reed, 1994; for a review, see Derryberry & Rothbart, 1997). Behaviorally inhibited children also have been found to show information processing biases toward threat and novelty (see Henderson, Pine, & Fox, 2015; behavioral inhibition is related to shyness but also includes reactions to novel objects and situations). Observations of shy children suggest that they may have similar attention biases. Shy children’s attention often is fixed on peers playing as they watch them from a distance (see Fox, Henderson, Marshall, Nichols, & Ghera, 2005). Derryberry and Reed (1994) suggested that problems disengaging from threatening stimuli may lead people to analyze a threat and potentially contribute to ruminative, worried thoughts. In addition, Derryberry and Rothbart (1997) believed attention biases shape anxious children’s mental representations of the world. Representations may begin to over-emphasize danger, leading them to be too cautious, or may begin to over-emphasize others’ evaluations of them, leading them to be self-conscious. Involuntary attention biases may partly underlie or maintain anxious and perhaps shy individuals’ negative arousal and distress, and thus their avoidance tendencies.

Derryberry and Reed (2002) suggested that the voluntary ability to flexibly shift attention may help anxious people disengage their attention from threat and reduce anxious reactions. Similar ideas have been suggested with regard to shy individuals (Eisenberg et al., 1995). With regard to anxiety, anxious undergraduates were observed to have trouble disengaging from stimuli, but anxious undergraduates with high attention control were able to shift their attention from threat (Derryberry & Reed, 2002). In addition, behavioral inhibition at 24 months has predicted anxiety problems at 4 and 5 years for children with low, but not high, 48-month attention shifting (White, McDermott, Degnan, Henderson, & Fox, 2011). With regard to shyness, elementary school students’ teacher-reported shyness was negatively related to teacher-reported attention shifting in almost half of the potential correlations; in contrast, parent-rated shyness was positively related to teacher-reported attention shifting in 1 of 4 correlations, but not related to parent-reported attention shifting (Eisenberg, Shepard,

Fabes, Murphy, & Guthrie, 1998). Undergraduates' self-reported shyness and concurrent attention shifting have been negatively related (Eisenberg et al., 1995). Thus, correlations between attention shifting and shyness typically have not been significant, but significant correlations were mostly negative. Taken together, these studies may suggest that attention shifting helps anxious individuals overcome attention biases and cope with anxiety. Reduced anxiety should decrease avoidance motivations.

Activational control is another component of EC that may be associated with lower shyness levels or with a reduction in shyness over time. Activational control involves executing a behavior when one is motivated to avoid it (Derryberry & Rothbart, 1988). Shy individuals have trouble approaching others and initiating conversation due to their avoidance motivations. Even young children who are not considered shy often display ambivalence (suggesting at least some avoidance motivation) when confronted with unfamiliar people or when entering groups of unfamiliar or familiar peers (see Asendorpf, 1990). We have argued that activational control may help children to override avoidance motivations, resulting in less observable shyness and more social interaction (*blinded*). Activational control has been studied less often than other EC components, and rarely has been examined with respect to shyness. As an exception, Eisenberg et al. (1995) found that undergraduates' self-reported activational control and shyness were negatively related.

There are fewer or less compelling reasons to expect other EC components (i.e., attention focusing, inhibitory control) to relate to the development of children's shyness. We did not expect attention focusing to predict childhood shyness trajectories. A negative relation might be possible if the ability to willfully focus and sustain attention helps children regulate aversive arousal in social situations. For instance, toddlers' observed sustained attention has been positively and negatively related to concurrent use of some active and passive regulation strategies, respectively (Graziano, Calkins, & Keane, 2011). On the other hand, depending on the subject of the sustained attention (e.g., social aspects of the environment), it seems possible that focused attention could lead to increased distress.

Correlations between attention focusing (separated from attention shifting) and shyness typically have not been significant, and those that have been negative and positive. For example, self-reported attention focusing and shyness were concurrently negatively correlated for children (Simonds & Rothbart, 2004), whereas they were unrelated for undergraduates (Eisenberg, Fabes, & Murphy, 1995). In Eisenberg et al.'s (1998) study, parents' and teachers' reports of attention focusing and shyness were unrelated in most of the correlations examined, particularly when more time elapsed between measurements. Correlations that were significant were not all in the same direction.

Inhibitory control involves suppressing pleasurable impulses (e.g., Derryberry & Rothbart, 1988). This type of inhibition is willful and flexible. Whereas activational control is making yourself do something you do not want to do, inhibitory control is stopping yourself from doing something you want to do. In work on EC, inhibitory control is mostly assessed as inhibition of approach behavior. In our opinion, inhibitory control is theoretically unrelated to shyness, and not expected to help in suppressing anxiety or avoidance motivation.

Moreover, as we have argued (*blinded*), there may be reasons inhibitory control and shyness have been positively associated in some studies (e.g., Aksan & Kochanska, 2004) despite a lack of theoretical relation. First, shy children may *appear* to have good inhibitory control due to inhibited behavior. Shy individuals may demonstrate inhibition of approach behaviors, but the inhibition is reactive, involuntary, and based on fear or anxiety (Derryberry & Rothbart, 1997). Second, compliance with rules or adults' requests is emphasized in many inhibitory control laboratory tasks and questionnaire items. For instance, the majority of inhibitory control items on the Children's Behavior Questionnaire (CBQ; Rothbart et al., 2001) involve compliance with rules or exercising caution. Shy children have been rated by their teachers as cooperative and compliant with instructions and rules (e.g., Rudasill & Konold, 2008). Shy children's compliant nature may inflate their ratings of inhibitory control.

Alternatively, Aksan and Kochanska (2004) argued that reactive inhibition facilitates inhibitory control. Children with high inhibition to novelty have slow approach responses, which may assist children's development of inhibitory control. They argued that low approach speed could generalize from novel to non-novel situations.

Correlations between inhibitory control and shyness have been inconsistent in significance and direction. Positive relations have been found within and sometimes across time for children (Aksan & Kochanska, 2004; Gagne, Miller, & Goldsmith, 2013; Volbrecht & Goldsmith, 2010). Correlations between inhibitory control and shyness also have been found in the negative direction for children (Simonds & Rothbart, 2004) and undergraduates (Eisenberg et al., 1995). In studies using the NICHD Study of Early Child Care and Youth Development data, children's mother-reported inhibitory control and shyness were unrelated concurrently (e.g., Rudasill & Rimm-Kaufman, 2009).

The Present Study

The relations between individual differences in attention shifting, attention focusing, or inhibitory control and shyness have been inconsistent in significance, direction, or both. We know nothing about the relation between children's activational control and shyness. In addition to the lack of consistency or absence of information in the literature, to our knowledge, relations between EC components and shyness trajectories (intercept and change over time) never have been examined. We expect that EC components will be differentially related to shyness and shyness trajectories.

Accordingly, the goal of this study was to examine the relations between children's EC components and shyness trajectories during early childhood (42 to 84 months of age). We examined attention focusing, attention shifting, and inhibitory control at 42 months. Activational control was not measured until 72 months. The age of activational control measurement was not ideal for testing our hypotheses, but we included the measure as a first step in addressing the literature's gap regarding children's activational control and shyness.

Based on the existing literature, we expected to observe an average decline in shyness, and individual differences in the initial level and rate of change of shyness. We hypothesized that

attention shifting and activational control would be related to lower shyness intercept and more negative slope of shyness. We expected that attention shifting would relate to lower and stable levels of shyness if attention shifting immediately reduces the child's avoidance motivation to the point that it does not exceed the approach motivation level. Attention shifting may relate to declining shyness over time for some children. For example, if a child experiences strong negative arousal and avoidance motivation, it may take "practice" (whether or not the child is cognizant of using this strategy) for attention shifting to sufficiently reduce the avoidance motivation, but it may gradually become less aversive for the child to approach and interact with peers or adults. We expected activational control to relate to low initial shyness if it helps children approach and interact with people even if it is uncomfortable, and relate to declining levels of shyness if, for instance, it allows children to interact with peers and adults some of the time despite discomfort and they begin to find interactions less aversive or even rewarding over time. We predicted that attention focusing and inhibitory control would be unrelated to intercept and rate of change in shyness. However, as already described, we acknowledged potential reasons for a positive or a negative relation between attention focusing and trajectories of shyness, and we thought inhibitory control might be positively related to the intercept of shyness.

Method

Participants and Procedures

Children and mothers in this study were participants in a longitudinal project (*blinded*). Three hospitals were selected for recruitment in an effort to obtain an economically and racially diverse sample. Shortly after giving birth to the child, mothers were provided information about the study. Mothers were telephoned a few weeks later. To be eligible for participation, these criteria must have been met: the baby was full term, the baby had no serious medical conditions, and parents were at least 18 years old.

When families were asked to participate in the first major assessment at 18 months, 256 agreed. Parents completed questionnaires every 6 to 18 months (depending on assessment) and families received payment. In the present study, data from the 42-, 54-, 72-, and 84-month assessments were analyzed because the shyness measure was changed starting at 42 months to maintain age-appropriateness.

In total, 213 children had data for at least one wave utilized in this study. Questionnaires were completed by mothers ($n = 205, 189, 162, \text{ and } 144$, respectively), and were returned when children were 41.43 ($SD = .66$), 54.00 ($SD = .79$), 73.00 ($SD = 1.58$), and 84.86 ($SD = 2.80$) months of age on average. The 42-, 54-, 72-, and 84-month samples included 92 girls and 113 boys, 83 girls and 106 boys, 72 girls and 90 boys, and 63 girls and 81 boys, respectively.

According to mothers' reports at 42 months, 22.4% of the children were Hispanic. Children were Caucasian (82.4%), African American (6.3%), Asian (2.4%), and Native American (5.9%). The remaining children were reported as biracial (two minority races; 1.5%), "unknown race" (.5%), or "other race" (1.0%). Mothers were married (79.5%), single but living with a partner (7.3%), single (4.4%), divorced (3.9%), or separated (4.4%; .5% of

mothers had missing data). Mothers' and fathers' education ranged from grade school completion to Ph.D., J.D., or M.D. (median and mode = some college or a 2-year college degree). Family income ranged from less than \$15,000 to over \$100,000 per year (median and mode = \$45,000 – \$60,000).

Attrition

The sample included 213 children (n s = 205, 189, 162, and 144 at 42-, 54-, 72-, and 84-months, respectively). Attrition analyses were used to investigate whether children with complete data (n = 133) differed from children with some missing data (n = 80) with regard to child's sex, child's race, child's ethnicity, mother's marital status, and maternal and paternal education (with Pearson chi-square analyses), as well as family income and 42-month study variables (with independent samples t -tests). Four demographic variables were recoded to prevent sparse data in chi-square analyses: race (Caucasian or Non-Caucasian), marital status (married or not married), and maternal and paternal education (high school graduate or less/some college or more). No significant differences between children with complete versus missing data were obtained.

Measures

Mother-reported data were collected for children's shyness at all four time points. Mother-reported data were collected for attention focusing, attention shifting, and inhibitory control at 42 months, and activational control at 72 months. All items were rated on a seven-point scale (1 = *never* to 7 = *always*). Scale scores were an average of the item scores. Scale scores were considered missing if < 75% of the items were completed.

Shyness—Shyness was assessed with the CBQ's 13-item shyness scale (Rothbart et al., 2001). Items assessed the comfort/discomfort displayed in social situations (e.g., *Sometimes prefers to watch rather than join other children playing*). Alphas were .94, .93, .93, and .94 at 42, 54, 72, and 84 months, respectively.

EC—Attention focusing, attention shifting, and inhibitory control were measured with CBQ scales (Putnam, Ellis, & Rothbart, 2001; Rothbart et al., 2001). Activational control was measured with a scale from the Temperament in Middle Childhood Questionnaire (TMCQ; Simonds & Rothbart, 2004).

The 14-item attention focusing scale assessed ability to maintain focus on a current task (e.g., *Will ignore others when playing with an interesting toy*). One item (*Has trouble concentrating when listening to a story*) was not included in the composite as it was accidentally omitted from the questionnaire. The scale score was computed using the average of 13 items (α = .75). The 12-item attention shifting scale assessed ability to shift attention from one task to another (e.g., *Can easily shift from one activity to another*; α = .67). The 13-item inhibitory control scale measured ability to suppress approach responses under instructions or when inappropriate (e.g., *Is able to resist laughing or smiling when it isn't appropriate*; α = .77). We also computed a general 42-month EC composite by averaging the subscale scores for attention focusing, attention shifting, and inhibitory control.

The activational control scale contained 15 items assessing ability to do actions he/she wanted to avoid (e.g., *Can make him/herself do homework, even when s/he wants to play*). This scale was designed for ages 7–10, but internal consistency was adequate in this sample with 6-year olds ($\alpha = .73$). One item (*Can say hello to a new child in class, even when feeling shy*) was deemed to be confounded with shyness and omitted from the composite.

Results

Descriptive Statistics

Descriptive statistics were computed in SPSS 22 (Table 1). Skew and kurtosis were acceptable. Mean differences in study variables by children's sex were examined with t -tests. One (of nine) tests was significant; 42-month attention focusing was higher for girls ($M = 4.64$, $SD = .65$) than boys ($M = 4.44$, $SD = .75$), $t(203) = 2.12$, $p = .04$, 95% CI [.01, .40].

Correlations were estimated in *Mplus* 7.11 (Muthén & Muthén, 1998–2012) using Full Information Maximum Likelihood (FIML; Table 2). EC components were positively correlated. Shyness was positively correlated across time. The EC composite and attention focusing at 42 months were not related with shyness at any time point. Attention shifting at 42 months was negatively related with 42- and 54-month shyness. Inhibitory control at 42 months was positively related with only 42-month shyness. Activational control at 72 months was negatively related to 54-, 72-, and 84-month shyness.

Latent Growth Models

Four latent growth models were estimated in *Mplus* version 7.11. Model 1 was to examine change in shyness across 42, 54, 72, and 84 months. Model 2 was to examine prediction of the shyness intercept and slope from the 42-month EC composite. Model 3 was to examine unique prediction of the shyness intercept and slope from 42-month EC components – attention focusing, attention shifting, and inhibitory control. Activational control was measured at 72 months; thus, it did not make sense to predict the intercept or slope from activational control because this would involve predicting backward in time. Therefore, the correlations of activational control and the shyness intercept and slope were examined in model 4.

FIML estimation was used for growth models; it handles missing data under the Missing at Random assumption. Participants with missing data on observed exogenous variables are omitted by default in *Mplus*.

Fit indices indicated that all models adequately reproduced the observed variance/covariance matrices and mean vectors. All chi-square tests of model fit were non-significant. See notes on the figures for the chi-square test, RMSEA, and SRMR for each model. CFI values were hand-calculated based on comparisons with intercept-only null models (with the appropriate EC variable[s] included in the model but uncorrelated with the intercept), which is more appropriate for growth models than the default null model (Widaman & Thompson, 2003).

All model parameter estimates of interest and significance levels are presented in the figures. Statistically significant estimates of interest also are discussed below.

See Figure 1 for the unconditional shyness growth model specification, fit statistics, and estimates. The intercept and slope means suggest that children's shyness tended to start at 3.518 at 42 months and significantly decreased .134 point per year. Model-implied means showed children's average shyness decreased from 3.518 at 42 months to 3.051 at 84 months (3 = *less than half the time* and 4 = *about half the time*). There was significant variability in the intercept and slope, indicating individual differences in the intercept of children's shyness trajectories and in their rates of change. The intercept was negatively correlated with the slope; thus, children who had higher initial shyness levels decreased faster over time than children who had lower initial shyness levels. R-square values (all > .72) indicated that the latent trajectory accounted for over 70% of the variability in shyness at each time point. The means residuals suggested that the linear trajectory closely reproduced the data.

Sex differences in the shyness trajectory were not hypothesized, but were examined. Two multiple-group latent growth models were estimated. In the first model, the intercept mean, slope mean, intercept variance, slope variance, and intercept/slope covariance were estimated for boys and girls. In the second model, these estimates were constrained equal for boys and girls. Difference testing, $\chi^2(5) = 9.57, p = .09$, indicated invariance of the estimates. The average trajectory and the size of individual differences in the shyness trajectory did not differ by sex.

A model was estimated in which the shyness intercept and slope were regressed on the mean-centered 42-month EC composite. See Figure 2 for model specification, fit statistics, and estimates. EC did not significantly predict the shyness intercept or slope. EC accounted for a very small amount of variability in the shyness intercept (.7%) and slope (1.9%).

Then a model was estimated in which the shyness intercept and slope were regressed on mean-centered 42-month attention focusing, attention shifting, and inhibitory control. See Figure 3 for model specification, fit statistics, and estimates. Attention focusing did not significantly predict the shyness intercept or slope. Attention shifting significantly predicted the shyness intercept and slope. Controlling for attention focusing and inhibitory control, a 1-unit increase in 42-month attention shifting was associated with a .661-unit decrease in 42-month model-predicted shyness, but was associated with a .116-unit increase (indicating slower decline/more stability) in change in shyness per year (Figure 4). Thus, children with high attention shifting had lower shyness than children with low attention shifting and, probably because they were so low, their decline in shyness was less marked. Inhibitory control significantly predicted the shyness intercept and slope. Controlling for attention focusing and attention shifting, a 1-unit increase in 42-month inhibitory control was associated with a .595-unit increase in 42-month model-predicted shyness, but was associated with a .113-unit decrease in change in shyness per year (see Figure 5). Thus, children with high inhibitory control had higher initial, but more rapidly declining, shyness than children with low inhibitory control (note, however, that their level of shyness remained

higher than that of low inhibitory control children). The 42-month EC components accounted for a modest percentage of variability in the intercept (13.1%) and slope (12.5%).

A model was estimated in which the shyness intercept and slope were allowed to covary with 72-month activational control (Figure 6). Activational control at 72 months was significantly negatively correlated with 42-month model-predicted shyness ($r = -.185$), but was not significantly correlated with model-predicted change in shyness per year.

Discussion

To our knowledge, this was the first study in which components of children's EC were examined in relation to shyness trajectories. Furthermore, results provided some of the first information regarding children's activational control and shyness.

Consistent with hypotheses and most shyness trajectory studies, we observed a significant decrease in shyness from 42- and 84-months of age, as well as considerable individual differences in the intercept of and rate of change in the shyness trajectory (e.g., Denissen et al., 2008; Gazelle & Ladd, 2003; Grady et al., 2012; but see Karevold et al., 2012). On average, children were moderately shy (i.e., rated as exhibiting shyness between less than half and half the time) at 3½ years of age and became less shy as they entered early elementary school ages. Individuals' trajectories and descriptive statistics of the intercept and slope (available from the first author) illustrated a wide range of initial shyness (i.e., rated as never/very rarely to almost always/always exhibiting shyness). The negative correlation between the intercept and slope indicated that children who started the highest tended to have the fastest declines in shyness over time.

There was significant average intraindividual (within-person) change in shyness. However, zero-order correlations supported high interindividual stability in shyness, consistent with previous studies of parent-reported shyness (e.g., Eisenberg et al., 1998).

The 42-month EC composite did not significantly predict the intercept or the slope of shyness. When unique prediction of the shyness trajectory from 42-month EC components was examined, attention shifting and inhibitory control predicted the intercept and slope, but in opposite directions. The results suggested that high attention shifting is related to less problematic (lower over time), whereas high inhibitory control is related to more problematic (higher over time), trajectories of shyness. These findings are reminiscent of findings in which behaviorally inhibited children with low attention shifting or high inhibitory control are at risk for problems, such as anxiety or social anxiety (see Henderson et al., 2015). Attention focusing at 42-months did not significantly predict the shyness intercept or slope. This underscores the importance of examining EC components separately, even though EC components are interrelated, when examining EC's relation to shyness.

As hypothesized, 42-month attention shifting negatively predicted the shyness intercept. In contrast to the hypothesis, it positively predicted the shyness slope. Children with better ability to volitionally shift their attention from one activity to another when necessary tended to have lower shyness at 42-months. Although their shyness decreased more slowly/was more stable, it was still lower than the shyness of children with low attention shifting across

the early school years. In addition, 42-month attention shifting was negatively correlated with 42- and 54- (but not 72- and 84-) month shyness. The correlations are consistent with a study in which correlations between children's attention shifting and shyness were not always significant, but most that were significant were negative (Eisenberg et al., 1998).

Although speculative, it is possible that children who were relatively more skilled at attention shifting were better able to disengage attention from potentially distressing aspects of social situations and refocus attention on neutral or positive aspects of social situations. Attention shifting skills may help keep distress and avoidance motivation low.

Alternatively, it is possible that children with skilled attention shifting are attractive playmates. For instance, relative to a child who is more rigid, peers might prefer to play with a child who is able to freely transition from one activity to another as the focus of the dyad's/group's play moves. Frequent interactions with others may foster the development of social skills and shyness might be unlikely.

In contrast to attention shifting, 42-month attention focusing did not uniquely predict the shyness intercept or rate of change. In addition, 42-month attention focusing was not significantly correlated with shyness at any time point. The lack of correlations in the present study is consistent with the previous research in which most correlations were not significant (Eisenberg et al., 1995, 1998), although some positive and some negative correlations have been found (Eisenberg et al., 1998). Our results indicate that young children's ability to willfully concentrate their attention on a task is unrelated to intraindividual change, or individual differences, in mother-reported shyness during the early school years.

We hypothesized that inhibitory control would be unrelated to the shyness trajectory intercept and rate of change, but acknowledged that it might be positively related to the shyness intercept. We found that 42-month inhibitory control positively predicted initial shyness. In contrast to the hypothesis, inhibitory control negatively predicted the shyness slope. Children with higher compared to lower inhibitory control had higher 42-month shyness. Although their shyness declined faster it remained higher than for children with lower inhibitory control across early childhood. One interpretation of these results is that inhibitory control was associated with higher shyness during early childhood; however, inhibitory control helped children decrease their shyness over time. Inhibitory control may facilitate high-quality interactions with other people. For instance, children with good inhibitory control are skilled at following game rules and waiting their turn. This could foster shy children's peer acceptance and shyness may decrease over time.

An alternative interpretation is that overlap between inhibitory control and compliance in the inhibitory control measure inflated the correlation between inhibitory control and shyness, and the inflation was most pronounced within time (42 months). It may be of interest to explore whether reported inhibitory control can be assessed more independently of compliance, or if we should rely on other forms of measurement for inhibitory control when assessing its relation with shyness (e.g., Stroop or Flanker tasks).¹

A major contribution of this study was examination of children's activational control in relation to shyness because little is known about children's activational control and its relations to social behavior. Consistent with hypothesis, 72-month activational control was negatively related to shyness intercept but, contrary to hypothesis, was unrelated to the shyness slope. In addition, activational control at 72-months was negatively correlated with 54-, 72-, and 84- (but not 42-) month shyness. Thus, the relation of activational control to low shyness seems to be fairly consistent across time.

Activational control reflects the ability to make yourself do something you do not want to do. It seems logical that children with high activational control could force themselves to approach and engage with peers or adults, even if it was difficult or uncomfortable, and exhibit lower shyness levels. The relations between activational control and shyness are particularly noteworthy given our efforts to omit conceptual overlap from the activational control and shyness measures. Activational control has been the least-studied EC component, perhaps because the subscale was recently added to the TMCQ, but our results suggest it is relevant to the study of shyness and should be the subject of additional investigations.

Limitations

Despite its merits, the present study is not without limitations. One limitation was sole reliance on mothers' reports. Strengths of mothers' reports have been noted in the temperament literature; for instance, mothers observe children's behavior in a variety of contexts, including situations that are difficult to simulate in the laboratory (Putnam, Ellis, & Rothbart, 2001; Rothbart & Bates, 2006). Despite the advantages of mothers' reports, our results may be subject to common-method bias which can inflate correlations. The use of parents' reports in conjunction with observed measures in future studies would help omit common-method bias. One challenge will be to identify observed measures suitable for young children that can parse the components of EC (e.g., assess attention shifting, but not attention focusing or inhibitory control).

Future Directions

Our results highlight the need to differentiate among EC components in future shyness research. A next step for this line of research is inclusion of assessments of children's approach and avoidance motivations. Including approach and avoidance motivations as mediators between EC components and shyness will allow a more complete test of our theoretical arguments.

Furthermore, several of our hypotheses regarding prediction of the shyness trajectory from EC components were at least partially supported, but the intercept and slope R-squared values were not large. This is not surprising given previous studies have suggested that factors such as genetics, parenting, and peer treatment help account for individual

¹We attempted to examine the relation between inhibitory control and shyness when compliance-related items were removed from inhibitory control. We removed 7 items that included wording such as "when asked" or "when told," or referred to "following instructions." The resulting alphas were low (.52, .59, .45, and .58 at 42, 54, 72, and 84 months, respectively). We did not use these variables in analyses.

differences in shyness (e.g., Goldsmith, Lemery, Buss, & Campos, 1999; see Rubin & Coplan, 2004). Future studies of shyness trajectories that include a wider variety of predictors will provide a more comprehensive understanding of how genetics, child-centered variables, and the multiple environments in which children exist (e.g., home, school) contribute to the development of shyness.

In addition, examination of prediction of shyness trajectories from EC components should be extended to later ages. The factors underlying shyness may diversify with age (e.g., peer rejection, self-consciousness), but certain EC components may continue to predict shyness trajectories. For instance, attention shifting may allow shy children to disengage self-directed attention or ruminative cognitions and shift their attention to less aversive stimuli and thoughts.

Finally, EC continues to develop across childhood and beyond (see Eisenberg, Spinrad, & Eggum, 2010). It is possible that shyness contributes to EC's development. Examination of parallel process growth models or panel models involving shyness and EC will help investigate processes of bidirectional relations.

Our results suggest inhibitory control was related to high initial and faster declining shyness, whereas attention shifting was related to low initial and slower declining/more stable shyness. Activational control was negatively correlated with the intercept of the shyness trajectory. Given attention shifting and activational control were associated with lower levels of shyness across childhood, these EC components are potential candidates for inclusion in interventions aimed at preventing the development of shyness. Attempts to improve attention shifting and activational control early in childhood may help depress children's levels of shyness.

Acknowledgments

This research was supported, in part, by a grant from the National Institute of Mental Health (2 R01 MH060838) awarded to Drs. Nancy Eisenberg and Tracy L. Spinrad.

The authors thank the undergraduate and graduate students who contributed to this project, as well as the children and their parents for their participation.

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Figure 1.

Unconditional growth model of shyness. Residual variances of shyness were not constrained equal and were specified as being uncorrelated. Unstandardized estimates and 95% confidence intervals are presented. Completely standardized estimates are in parentheses.

$\chi^2(N = 213; df = 5) = 9.63, p = .09$, RMSEA = .07, adjusted CFI = .92, and SRMR = .04. * p .05. ** p .01. *** p .001.

Figure 2.

Shyness growth models predicted from 42-month effortful control composite. Loadings for intercept were all set at 1.0. Loadings for linear slope were set at 0.0, 1.0, 2.5, and 3.5 for 42-, 54-, 72-, and 84-month indicators, respectively. Unstandardized estimates and 95% confidence intervals are presented. Completely standardized estimates are in parentheses. $\chi^2(N=205; df=7) = 9.65, p = .21$, RMSEA = .04, adjusted CFI = .95, and SRMR = .04. * p .05. ** p .01. *** p .001.

Figure 3.

Shyness growth models predicted from 42-month attention focusing, attention shifting, and inhibitory control. Loadings for intercept were all set at 1.0. Loadings for linear slope were set at 0.0, 1.0, 2.5, and 3.5 for 42-, 54-, 72-, and 84-month indicators, respectively. Unstandardized estimates and 95% confidence intervals are presented. Completely standardized estimates are in parentheses. $\chi^2(N = 205; df = 11) = 15.026, p = .18$, RMSEA = .04, adjusted CFI = .95, and SRMR = .03. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 4. Shyness trajectories at three levels of attention shifting ($N = 205$).

Figure 5. Shyness trajectories at three levels of inhibitory control ($N = 205$).

Figure 6.

Shyness growth model and activational control. Loadings for intercept were all set at 1.0. Loadings for linear slope were set at 0.0, 1.0, 2.5, and 3.5 for 42-, 54-, 72-, and 84-month indicators, respectively. Unstandardized estimates and 95% confidence intervals are presented. Completely standardized estimates are in parentheses. $\chi^2(N = 213; df = 7) = 11.33, p = .13$, RMSEA = .05, adjusted CFI = .93, and SRMR = .04.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 1

Descriptive Statistics

Variable	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	Observed Minimum	Observed Maximum
Effortful control 42 months	4.32	.53	-.10	-.26	2.84	5.64
Attention focusing 42 months	4.50	0.71	-0.53	0.68	1.77	6.00
Attention shifting 42 months	4.06	0.61	0.07	-0.05	2.25	5.67
Inhibitory control 42 months	4.37	0.73	-0.23	0.49	1.38	6.00
Activational control 72 months	4.47	0.69	-0.24	0.33	2.50	6.14
Shyness 42 months	3.58	1.24	0.05	-0.42	1.00	6.69
Shyness 54 months	3.29	1.19	0.14	-0.32	1.00	6.69
Shyness 72 months	3.17	1.15	0.26	-0.56	1.00	6.00
Shyness 84 months	3.10	1.18	0.44	-0.57	1.00	6.15

Note. *M*s and *SD*s were estimated using FIML in *Mplus* v7.11 ($N = 213$). Skewness, kurtosis, observed minimum, and observed maximum were computed in SPSS v22 (Range of $N = 144-205$). Potential minimum = 1 (*never*). Potential maximum = 7 (*always*).

Table 2

Zero-order Correlations

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Effortful control 42 months	-								
2. Attention focusing 42 months	-	-							
3. Attention shifting 42 months	-	.20**	-						
4. Inhibitory control 42 months	-	.47***	.51***	-					
5. Activational control 72 months	.48***	.36***	.34***	.36***	-				
6. Shyness 42 months	.14	.08	-.14*	.19**	-.13	-			
7. Shyness 54 months	-.03	.06	-.14*	.11	-.18*	.77***	-		
8. Shyness 72 months	.09	.00	-.04	.08	-.22**	.64***	.71***	-	
9. Shyness 84 months	-.11	.01	-.11	.06	-.16*	.58***	.69***	.72***	-

Note. Correlations were estimated using FIML in Mplus v7.11 ($N = 213$). Effortful control is a composite of attention focusing, attention shifting, and inhibitory control.

*
p

.05.

**
p

.01.

p

.001.