Preschool children’s development of emotional self-regulation strategies in a sample at-risk for behavior problems

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Abstract

Relatively little longitudinal research has been conducted on the development of children’s emotional self-regulation skills (SRS) use after infancy, particularly for children at high risk for problems in regulating emotions. The current study attempted to validate Kopp’s theory (1989) on the development of children’s regulation of negative emotions during the first few years of life. This study used a repeated observational assessment of a delay of gratification task at ages 2, 3, and 4 with both variable- and person-oriented analyses with a low-income sample of children initially selected on the basis of early problem behavior. Results were consistent with Kopp’s theory on the developmental progression of children’s emotional self-regulation strategies. Children initially used more other-oriented SRS (i.e. physical comfort seeking) and transitioned to greater use of independent SRS (i.e. information gathering) by age 4. Results are discussed as a platform for future research that might examine the development of SRS in toddlers and preschoolers.
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Emotional self-regulation strategies (SRS) encompass a variety of deliberate or automatic cognitive and physiological processes, including anticipating and dealing with existing or anticipated stressors by modulating behavior (Aspinwall & Taylor, 1997). Kopp’s (1989) model and related theoretical accounts (e.g., Blair, 2002; Calkins, 2004; Karoly, 1993) have suggested pathways for the development of emotional SRS; however, most of this research has relied on concurrent or cross-sectional data. A related body of literature suggests that less adaptive use of emotional SRS predicts increased risk for externalizing and internalizing problems (Buckner, Mezzacappa, & Beardslee, 2003; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Silk, Shaw, Forbes, Lane & Kovacs, 2006). Thus, there is a need for longitudinal research on normative changes in emotional SRS and individual differences in emotional SRS trajectories. To address this gap in the literature and inform future theoretical, empirical, and applied innovations, the present study examined the development of emotional SRS across the toddler and preschool periods using variable- and person-oriented approaches with a sample of boys at risk for the development of early-starting conduct problems.

Development of emotional self-regulation strategies in young children

It has been postulated that the achievement of emotional self-regulation begins very early in life (Kopp, 1989) and continues to develop throughout the early school years (Kochanska & Knaack, 2003; Posner & Rothbart, 2000), changing most rapidly during the toddler and preschool periods (Kochanska & Knaack, 2003; Vaughn, Kopp, & Krakow, 1984). Through the development of neurological skills (e.g., attention in infancy) and experiences interacting with caregivers (Blair, 2002; Calkins & Howse, 2004; Posner & Rothbart, 2000), the child’s brain gradually becomes better prepared to handle emotion-inducing situations (Posner & Rothbart, 2000). It is this process that is
hypothesized to contribute to individual differences in children’s ability to utilize different SRS effectively, leading to individual differences in behavioral control (Calkins & Howse, 2004).

Kopp’s (1989) theory suggests that in the first two months of infancy, children primarily use reflexive SRS (e.g., head turning) to alleviate distress. By about the third month, children move toward more voluntary forms of self-soothing and social communication (e.g., crying brings a caregiver to soothe the infant; Kopp, 1989). This notion has received empirical support, with most strategies after the initial months of infancy shown to involve social communication directed at caregivers (Grolnick, Bridges & Connell, 1996; Mangelsdorf, Shapiro, & Manzolf 1995; Rothbart, Ziaie, & O’Boyle, 1992). For example, Brungart-Reiker and Stifter’s (1996) longitudinal study of 5- and 10-month old infants indicated that older infants attempted to use communication with their caregiver more and avoidance of the stressful situation less than younger infants. Kopp also has postulated that after the first few months, infants decrease some of their dependence on the caregiver and begin to engage in basic forms of voluntary self-regulation when they encounter distressing situations. For example, Mangelsdorf and colleagues (1995) found young infants (6 months of age) used more reflexive strategies such as gaze aversion to avoid a negative stimulus, while older infants (12 and 18 months of age) used more self-soothing and self-distraction, a finding that has been replicated (Parritz, 1996).

As the child moves from late infancy to the toddler period, the model suggests that children become more purposeful and organized rather than reactive in their self-regulation and begin distracting themselves from the source of distress. Research on this issue also has received some empirical validation (Diener & Mangelsdorf, 1999; Grolnick, Bridges & Connell, 1996; Rothbart, Ziaie, & O’Boyle, 1992). For example, Grolnick and colleagues (1996) found that during a separation task, 2-year-olds’ use of
active distraction was related to lower negative emotions, whereas physical comfort seeking was not necessarily related to declines in negative emotions.

It is believed that from toddlerhood through the preschool years, children continue to develop more sophisticated regulation strategies in conjunction with their burgeoning advances in cognitive and language skills, abilities that increase their self-control (Calkins & Howse, 2004; Dodge, 1989; Kochanska, Murray & Coy, 1997; Kopp, 1989; Thompson, 1990). During the second and third years children are hypothesized to begin to understand how certain situations tend to arouse specific emotions and can therefore organize and monitor their behavior more effectively to obtain control over their behavior in these situations (Calkins, 2004; Calkins & Howse, 2004). Data generally support these suppositions. In one cross-sectional study of preschool children, age differences were found indicating that 3-year-old children used strategies that focused on the desired object more than 4-year-old children (Stansbury & Sigman, 2000). In Kochanska and colleagues’ (2001) longitudinal study of effortful control (EC) development, a concept similar to emotional self-regulation, moderate intra-individual stability was found in children’s performance on observational EC tasks from 2 to 5 years of age, with children demonstrating an increasing ability to delay gratification over time (Kochanska, Murray, & Harlan, 2000; Kochanska et al., 2001).

By the end of the preschool period, Kopp (1989) hypothesizes that children have developed new and increasingly complex ways of regulating their emotions, a supposition corroborated by concurrent data (Diener & Mangelsdorf, 1999; Mendez, Fantuzzo, & Cicchetti, 2002). For example, Silk and colleagues (2006) used a cross-sectional study of 4-, 5-, and 7-year old children in a delay of gratification task and found that older children used significantly more distraction and less focus on the delay object than younger children. Preschool children’s increasing proficiency with the use of SRS such as active distraction allows them to select behavioral means to improve a
It should be noted that in addition to developmental changes due in large part to biological maturation, parenting and other socialization factors most likely directly and indirectly influence children’s development of SRS (e.g., Calkins & Howse, 2004; Posner & Rothbart, 2000). However, the focus of the current paper is to describe the longitudinal change in low-income children’s SRS use rather than focus on specific moderating factors.

Variable-centered Approaches to Understand Developmental Change

As the preceding discussion demonstrates, there appears to be a high degree of consensus about the probable developmental pathway for children’s emotional SRS, based primarily on Kopp’s (1989) model and extant empirical support. However, with the exception of research on the stability of EC and developmental change in global measures of self-regulation (e.g., Berlin & Cassidy, 2003; Kochanska et al., 2000, 2003; Pauli-Pott, Mertesacker, & Beckmann, 2004; Raikes et al., 2007; Rothbart, Ziaie, & O’Boyle, 1992; Spinrad, Stifter, Donelan-McCall, & Turner, 2004), little longitudinal research has examined the development of emotional SRS in early childhood; therefore lacking data on the developmental progression of emotional SRS among the same individuals across time. When a longitudinal design has been used, typically there were few assessments (i.e., two) and/or a long interval between assessments (e.g., assessments at ages 3 and 6), making it difficult to draw conclusions about patterns and rate of change. The current study seeks to advance our understand of the development of children’s SRS in the toddler and preschool period by providing three waves of
longitudinal data on a cohort of boys utilizing the same observational coding system to examine the stability and development of SRS during early childhood.

In addition, few studies on the development of SRS have included low-income children or samples at heightened risk for emotional or behavioral problem even though it is especially important to examine emotional developmental issues within low-income, high-risk samples (Raver, 2004). Though some researchers have suggested that emotional SRS may not differ between low-income and middle-income samples (Garner & Spears, 2000), most researchers agree that the environmental stressors that children growing up in low-income homes experience leaves them at a greater risk for poor emotional and social outcomes (Evans, 2004; Raver, 2004; Thompson & Calkins, 1996). Examination of longitudinal change in low-income samples has the potential to advance our understanding of the developmental progression of emotional SRS for children at increased risk for later problem behavior. Thus, the first goal for the present study was to examine changes in emotional SRS strategy use over time using a variable-oriented approach in a high-risk sample of boys.

**Individual Differences in Emotional SRS and Outcomes**

In addition to cross-sectional and limited longitudinal reports on normative change in emotional SRS, the value of Kopp’s (1989) model and related theoretical perspectives are validated by research linking proficiency with emotional SRS during early childhood and important social and behavioral outcomes (e.g., Gilliom et al., 2002; Raver, Blackburn, Bancroft, & Torp, 1999; Silk et al., 2006). For example, preschool- and school-age children’s emotional SRS use has been related to concurrent internalizing and externalizing outcomes (Silk et al., 2006; Stansbury & Zimmerman, 1999). Similarly, parent and teacher ratings and observational measures of children’s use of specific emotional SRS (e.g., seeking comfort from a caregiver or actively distracting oneself in an emotion-invoking situation) have been associated with children’s
behavioral outcomes at school (Blair, Denham, Kochanoff, & Whipple, 2004; Eisenberg, Fabes, Nyman, Bernzweig, & Pinuelas, 1994; Gilliom et al., 2002) and at home (Feldman & Klein, 2003; Stansbury & Zimmerman, 1999). For example, children found to be adept at shifting their focus in an emotional situation were not only less likely to show increases in negative affect during the situation, but even years later were less likely to exhibit externalizing behavior and more likely to be cooperative in school (Eisenberg et al. 1996; Gilliom et al., 2002). In addition, the development and implementation of ineffective SRS appears to be related to variables associated with externalizing behavior such as negative emotionality and self-control (Gilliom et al., 2002).

The consistent associations demonstrated between early emotional SRS and social, behavioral, and cognitive outcomes suggests a need for research on individual differences in emotional SRS development across toddlerhood and the preschool period. Although examination of individual differences at a single time point informs the understanding of worthy SRS targets for intervention, examining individual differences in emotional SRS over time can help to uncover non-normative trajectories that may lead to later problems. For example, some children may begin to use planful SRS such as active distraction in early childhood, but their tendency to use these strategies may not increase as rapidly as the majority of their peers’ use of these strategies, leaving them at risk for increased behavior problems as the social and behavioral demands increase in the preschool environment. Person-centered approaches provide a valuable complement to variable-oriented approaches by examining trajectories of groups of children that use specific emotional SRS across the toddler and preschool periods (Nagin, 1999; Shaw, Gilliom, Ingoldsby, & Nagin, 2003).

Two important features of the present sample make the current analysis of emotional SRS development particularly noteworthy. First, members of the sample were selected based on their increased risk for conduct problems. As reviewed above, links
exist between externalizing problems at school entry and a tendency to less frequently use planful strategies more frequently focus on distressing events (Gilliom et al., 2002). Thus, young children who attain the ability to use more adaptive emotional SRS show more self-control and less conduct problems. It may be the specific strategies that children learn to use over time that promote self-control and decrease risk for conduct problems (Gilliom et al., 2002). Person-centered analysis of the at-risk sample in the current study can contribute to our understanding of longitudinal deviations from the normative development of strategy use.

Secondly, our sample consisted of boys. Although gender differences in emotional SRS in early childhood have received limited attention, it is reasonable to speculate that boys may show unique developmental trajectories of emotional SRS across the toddler and preschool periods. The majority of research supports a gender difference in rates of conduct problems with boys beginning to show higher rates than girls around beginning at age 4 (Keenan & Shaw, 1997). Given the importance of socialization for both the gender difference in conduct problems and for the development of emotional SRS usage (Keenan & Shaw, 1997; Kopp, 1989), it would be reasonable to expect a number of boys to show wide variability in trajectories of SRS from the toddler to preschool period.

In sum, the broad goal of the current study was to examine the longitudinal development of boys’ emotional SRS using Kopp’s (1989) theory to guide hypotheses. First, using a variable-oriented approach, we expected the mean ratio of boys’ use of individual types of SRS to support Kopp’s model. Accordingly, we expected to see increased use of more sophisticated and planful strategies and the decrease of less sophisticated, more emotion-focused strategies, such as self-soothing, as a function of age. Second, it was anticipated that when children’s change in SRS over time was modeled using a person-oriented approach, the majority of children would follow a
pattern similar to Kopp’s model (i.e., use of more sophisticated strategies over time. However, due to the inclusion of boys screened on the basis of high risk for early-starting conduct problems, it was anticipated that a smaller group of boys would be identified that deviated from Kopp’s model, specifically continuing to use less sophisticated SRS through the preschool period (e.g., continued use of self-soothing and less use of active distraction).

Method

Participants

Participants included 120 mother-son dyads recruited from the Women, Infant and Children (WIC) Nutritional Supplement Program in the Pittsburgh, PA metropolitan area during the spring and summer of 2001 (for a more complete description of the sample, see Shaw, Dishion, Supplee, Gardner, & Arnds, 2006). Due to the study’s primary interest in examining the development of externalizing behavior and research suggesting that rates of externalizing behavior are higher in males, only families with male children were recruited. Families were approached at WIC sites and invited to participate if they had a son between 17 and 27 months old, following a screen to ensure that they met the study criteria by having socioeconomic, family, and/or child risk factors for future behavior problems. Two or more of the three risk factors were required for inclusion in the sample. Of 271 families who participated in the screening, 124 families met the eligibility requirements and 120 (97%) agreed to participate in the study. As shown in Table 2, the children in the sample had a mean age of 24.1 months (range 17.6 to 30.1 months). At the time of assessment, the mean age of mothers was 27.2 years (SD = 6.1), with a range between 18 and 45 years of age and the income in 2001 was $3,594 (range $480 to $13,000) per family member. The mean level of education attainment for mothers was 12.23 years (SD = 1.41).

Procedures
Mothers and sons completed a series of home-based assessments when children were approximately 2 years old. During the assessment, mothers completed questionnaires and mothers and sons completed a series of interaction tasks. All tasks were videotaped and coded at a later point in time. The visit began with a 15-minute free play that was followed by a five-minute clean up task. Next the child and mother completed a delay of gratification task (i.e. the No Toys task, 5 minutes, Smith & Pederson, 1988; see Appendix A for a more detailed description of the delay of gratification tasks at each assessment), followed by three cooperative tasks (3 minutes each), and two inhibition tasks in which the child was introduced to a loud robot (2 minutes) and a tunnel (2 minutes). Finally, mothers were filmed preparing a meal for the child (10 minutes) and eating the meal (10 minutes, Gardner, 2000). The assessments were approximately 2.5 hours in length and mothers were reimbursed for their participation.

Following the home visit, families randomly assigned to the intervention group were given the chance to meet with a parent consultant for two or more sessions. The two initial sessions included a get-to-know-you (GTKY) meeting (session one) and feedback on the child’s behavior and the family’s resources using motivational interviewing techniques (session two). Follow-up sessions addressed parenting and issues that compromised caregiving quality (e.g., parenting techniques, parental conflict, housing, and neighborhood resources; for additional details on the intervention, see Shaw et al., 2006). Although participation in the intervention was voluntary, 92% of the intervention group families participated in the GTKY and feedback sessions, and a smaller percentage (41%) engaged in one or more additional sessions with the parent consultant.

When the children were approximately 3 (112, 93% retention) and 4 years of age (109, 91% retention), families participated in follow-up home visits, similar in structure
and content used to the initial home visit, with a few alterations in the observation procedures to match the child’s developmental status (e.g. No Toys Task became the Cookie Waiting Task at age 3, Marvin, 1977, and Gift Waiting Task at age 4, Dryden, DeKlyen, & Speltz, 1993). Families were reimbursed for their time at each assessment. At age 4, there were no differences between the participants who remained in the study and those who did not participate in the age-4 assessment on income, $F(1, 118) = .01$, $ns$, or maternal education, $F(1, 118) =2.66$, $ns$. By the age-4 assessment, 55 control families and 54 treatment families remained.

**Measures**

*Children’s emotional self-regulation strategy use.* The study employed a coding system based on work by Grolnick and colleagues (1996) and adapted by Gilliom and colleagues (2002; see Appendix A for a more detailed description of the coding system). Four behaviors were coded for their presence or absence during each of the 10-second intervals during the delay of gratification tasks (5-minutes at age 2, 3-minutes at age 3, 4-minutes at age 4). For every interval, children were coded as having been engaged in at least one of the codes. The child could employ more than one strategy in an interval, and with the exception of the emotion-focus active codes, the child was only coded as engaged in one behavior at a time. For a code to be endorsed, the child had to use the strategy for at least four seconds during an interval. Codes included: 1) *emotion-focus active codes* which are those codes that indicated the child was focused on coping with their emotion actively but not attempting to change the delay situation. These behaviors included touching mother, reclining on mother’s lap, requesting to be held, sucking on a thumb, bottle or sippy cup, twirling hair, reaching for a comfort object such as a blanket; 2) *focus on delay object* included the child emotionally or behaviorally reacting to the situation but showing evidence he was upset about the delay situation. These behaviors included the child crying, tantruming, being noncompliant with his mother’s requests,
attempting to break into the forbidden box of toys, or speaking about ending the waiting period; 3) *emotion-focus passive codes* included coding whenever the child showed evidence of suppressing their emotional state and not attempting to change either their emotional state or the delay situation. This was coded whenever a child was engaged in non-goal oriented behavior such as sitting or standing without any active exploration or distraction for more than 5 consecutive seconds (e.g., the child appeared to almost “zone-out” or their eyes glazed over); 4) *planful strategies* included any time the child engaged in behaviors in which the focus of attention is not on the delay object or the task, including the child dancing around the room, singing, or engaging in imaginary play or when the child was attempting to learn more about the waiting situation by asking questions about the task (e.g., the child might ask about how many minutes the waiting time lasted, what they were allowed to do during this time); however, this was only coded once, if the child persisted in repeatedly asking about the delay object it was then coded as focus on delay object.

Due to the differing lengths of the task at different assessments, the ratio of the number of intervals the child employed a strategy to the total possible intervals was used as the final score for each strategy. Inter-rater reliability was calculated on 20% of the tapes and was found to be satisfactory (ICC = .76-.96). The coders were unaware of the study hypotheses and were blind to the treatment group status of families.

To ensure the task was adequately emotionally inducing for the children, the coders recorded the number of intervals in which the child showed some level of obvious negativity or distress (e.g., crying, whining, or fussing) or positivity (e.g., smiling, laughing). To code emotion as present, the child needed to show clear evidence of the emotion. Subtle indications of emotion such as a slight downturn of the mouth possibly indicating a frown were not included. The frequency of children who displayed at least two 10-second intervals of negativity or positivity for each age is in Table 1. The current
study found 46.5% of 2-year-olds and 34.2% of 3-year-olds in the current sample expressed negative emotion during at least two intervals. As a point of comparison, Gilliom et al.’s (2002) sample of three-year-olds using the cookie waiting task found approximately 30% of the time children showed negativity and Gronlick et al.’s (1996) paper found approximately 85% of the 2-year olds expressed at least some negative emotion during her parent-active waiting task. However, it should be noted that although both Gilliom et al.’s and Gronlick et al.’s waiting tasks were similar in the delay-of-gratification design, the tasks were administered in the lab versus the home and their coding systems examined more fine-grained emotional items than was coded in the current study, such as clenching of the jaw.

Results

Data analyses

To examine the patterns of change in the children’s SRS strategies at ages 2, 3 and 4, both variable- and person-oriented data analyses were conducted. To explore the first hypothesis in the study of whether children on average would move from less to more sophisticated strategies over time, a variable-centered, repeated-measures ANOVA was used to explore children’s ratio of use of each SRS over time. Second, a person-oriented, semi-parametric group-based method (Nagin, 1999) for modeling developmental trajectories was used to identify groups of children who displayed specific trajectories of SRS use over time.

As this is a longitudinal study utilizing observational data collection, missing data were present because of both subject attrition and problems encountered in coding (i.e., sound or video quality). In addition, different methods for handling missing data were used for each of the two analytic methods. For the repeated-measures ANOVA, the analyses were computed utilizing both expectation-maximization (EM) imputation methods and without imputed data. As the results did not differ when imputed data were included, the
authors decided to not utilize imputed data to provide a more conservative estimate of the results utilizing only those cases with all three data points present. Within the person-oriented analysis, the PROC TRAJ program assumes the data are missing at random and uses a general quasi-Newton procedure (Dennis, Gay, & Welsch, 1981; Dennis & Mei, 1979), allowing for analysis of the full sample (Jones, personal communication, August 19, 2007; Nagin, 1999). Further, the participants within this sample who participated at only one time point (n = 5) were selected to be dropped from the trajectory analyses, as the presence of only one time point does not yield information for an individual’s trajectory.

**Descriptive statistics**

To inform interpretation of the results, descriptive statistics are provided as a way to better understand the risk level of the sample. The sample was screened for both family risk factors, such as maternal depressive symptoms, and child behavior problems. As can be seen in Table 2, at the initial screening, on average the participating mothers reported moderate depressive symptoms for women between 18 and 64 years of age (Salokangas, Vaajtera, Pacriev, Sohlman & Lehtinen, 2002). Maternal reports of children’s behavior problems on both the Eyberg Intensity (M = 122.30; SD = 27.00) and Problem behavior (M = 12.25; SD = 6.25) scale also were well above normative means (Intensity = 98, Problem = 7).

Because the prevention program addressed behavioral issues of the children with the parents, differences between the children in the treatment and control group may be theorized to be present. Though the focus of the current study is descriptive and not to examine treatment effects, the data were first examined to see whether treatment group status was related to children’s emotional self-regulation strategy use. An ANOVA was conducted at each age for each of the four SRS strategies. At age 2 F (1, 112) = .24, ns, age 3 F (1, 109) = 1.17, ns, and age 4 F (1, 102) = 1.97, no significant
differences were found in the emotional self-regulation strategy use between children in the treatment and control conditions. Therefore, for the remaining analyses, the children were collapsed into one sample.

Variable-centered Approaches to Understand Developmental Change

The first goal was to examine the change in children’s mean ratio of use of specific SRS to total intervals in the task from age 2 to 4. Examination of the mean usage at each age (see Table 3) indicates that at all three time points, planful strategies were the most common strategy children employed. In addition, though infrequent, emotion-focus passive strategies were fairly stable over time, whereas focus on the delay object became less common over time.

Four repeated measures ANOVAs were used to examine the mean ratio change within each SRS over time (see Table 3 and Figure 1). In three of the four analyses, significant differences over time were found. For the child’s use of planful strategies $F(2, 92) = 6.49, p < .01, d = .12$, focus on delay object $F(2, 92) = 11.57, p < .001, d = .20$, and emotion-focus active strategies $F(2, 92) = 9.54, p < .000, d = .17$, the main effect for time was significant. In accord with Kopp’s model, for each SRS the mean change over time was in the expected direction. Specifically, higher levels of planful strategies and lower levels of focus on delay object and emotion control occurred at the older ages. For the child’s use of emotion-focus passive strategies, $F(2, 91) = 1.63, ns$, the main effect for time was nonsignificant.

Individual Differences in Emotional SRS

Although the use of whole sample means provides information about overall change over time, by relying completely on this method, individual differences in patterns of development may be lost (Siegler, 1987). To supplement these variable-oriented analyses, person-based trajectory modeling (Nagin, 2005) was applied to identify distinct trajectories of individual SRS from ages 2 to 4.
The group-based method uses a multinomial modeling strategy that can identify trajectories of individuals longitudinally using maximum likelihood parameters in a latent class model (Nagin, 1999). A censored normal model was used to account for the fact that the nature of the data (i.e., ratio) is artificially truncated at 0 and 1.

An important aspect to the trajectory modeling approach is the determination of the number of groups within the population that best fit the data. As recommended, the current study relied principally on the Bayesian Information Criteria (BIC; D'Unger, Land, McCall & Nagin, 1998; Kass & Raftery, 1995) to determine the most optimal model fit for the data. Using this procedure, individuals are assigned to trajectory groups based on their likelihood of showing similar patterns of development to other children in the sample over time, as evidenced by their posterior probability to be in one of the number of groups.

To identify the most optimal model of SRS, models were tested with two, three and four trajectory groups. Because the current sample included relatively few subjects (i.e., \( N \) varied from 103 to 120 at different time points) and the minimum number of data points for using semi-parametric modeling (i.e., at least three data points are required and a minimum sample size of at least 100 is recommended), models identification was limited to one to three groups. As a result, some caution is warranted in interpreting the findings from the current study, as findings with smaller samples should be seen as suggestive and preliminary (Loughran & Nagin, 2006). Individual groups were tested for the optimum fit, including intercept, linear, and quadratic trajectories for all groups. Trajectory groups are more stable when they have larger group memberships, and smaller sample size increases the likelihood that extremely small groups may emerge due to error (Nagin, personal communication, August 10, 2007).

Models were obtained for all strategies with the exception of emotion-focused passive strategies. Due to the small sample size and low base rate of this behavior, it
was not possible to obtain a stable model for this strategy. Thus, single group models were the best fitting, suggesting that for this strategy, group-based modeling was not appropriate. The trajectories of single groups are identical to the developmental paths presented in Figure 1.

The Baysian Information Criteria (BIC) for each of the modeled strategies is displayed in Table 4. The BIC is a log-likelihood statistic, provided as part of the PROC TRAJ output, which indicates the model that is most parsimonious for the data. PROC TRAJ utilizes significance testing to compare the BIC of the more complex model against the BIC simpler model. The final models selected as the best fit for each of the SRS strategy groups include models with the highest BIC values and significant parameters. Models with lower BIC values or parameters that failed to reach significance were rejected during model selection. According to Nagin (2005), it is left to the analyst to use a combination of professional judgment of the best fitting model given both theory and the BIC statistics and parameters. Using this criterion, the two group models were deemed to be the best fit for emotion-focused active strategies and focus on delay object. A three-group model appeared to be the best fit for planful strategies.

Next to each tested model for individual SRS in Table 4, a number representing the intercept (0), linear (1), or quadratic (2) trajectories in the final model is provided in parentheses (e.g., ‘2 1 1’ indicates one quadratic and two linear trajectories). The first row in the table presents the model chosen as the best fit in the current study. In addition to the BIC scores, the posterior probabilities, or the probability for membership into the trajectory group, for the each of models, can be used to judge model fit (see Table 5). The probabilities in the models judged to be the best fit for the current data indicate that all trajectory groups for the four models selected SRS were above the minimum level of 0.70 suggested by Nagin (Nagin, 2005). A more detailed discussion of the use of BIC
and posterior probabilities in model selection and the PROC TRAJ procedure can be found in Jones, Nagin, and Roeder (2001).

As can be seen in Figure 2, a two-group model was identified for emotion-focused active strategy use. Close to 75% of the sample (stable-low group) was included in a group that used emotion-focused active strategies infrequently at all three ages, less than one tenth of the time at each time point. For the remaining quarter of the children (decreasing-high group), emotion-focused active strategy use occurred more frequently at age 2, around half of the time, and then steeply declined between the ages of 2 and 3. By age 3, this group of children was using emotion-focused active strategies approximately 10% of the time.

As previously mentioned, planful strategy use was the most frequent type of strategy for the children in this sample. For most of the boys in the sample, the ratio of intervals in which they engaged in distraction increased as they grew older. Most children in this group were using distraction as a strategy close to 50% of the time (see Figure 3 and Table 5). However, the pattern of growth in planful strategy use in this sample was divided into three separate trajectory groups. The first smaller group of boys that showed growth in planful strategies over time (increasing-low group, \( n = 14 \)), displayed a steep level of growth from ages 2 to 4. At age 2, the children in this group engaged in planful strategy use infrequently (i.e. less than 10% of the time), but by age 4, they were using it approximately 50% of the time. The larger group (increasing-high group, \( n = 92 \)) engaged in planful strategies at age 2 approximately 35% of the time and by age 4 approximately 50% of the time. For a small minority of children (decreasing group, \( n = 14 \)), use of planful strategies decreased over time, starting around 35% of the time at age 2, and, by age 4, they were using this strategy less than 20% of the time.

Two groups emerged for the SRS, focus on the delay object. The largest (\( n = 111 \)) was a group of children who infrequently used focus on the delay object at all three
time points, although there was a gradual decrease in the frequency of use between ages 2 and 4 (see Figure 4). For a small group of children (n = 9), focus on the delay object was a frequently used strategy at each of the three time points, and there was no significant decrease over time.

Discussion

Kopp’s theory suggests the infant moves from other-comfort (i.e., a person or transitional object) to more independent strategies such as distraction during the toddler and preschool period (Diener & Mangelsdorf, 1999; Kopp, 1989; Grolnick et al., 1996). The current study appears to provide some support for this theory.

Decreases in emotion-focus active strategies were found over time for mean usage, supporting the notion that as boys mature, their emotional SRS change from using a transitional object such as a sippy cup or blanket to being able to engage in more independent and cognitively sophisticated strategies (Kopp, 1989). The trajectory analysis indicates that the majority of boys used fairly low levels of emotion-focus active strategies at age 2, and remained fairly stable over time. For around one-quarter of the boys, emotion-focused active strategies were used more frequently at age 2; however, just as for the stable-low trajectory group, these boys used emotion-focused active strategies less frequently as they matured, such that by age 4, this smaller group was similar to the frequency of use for the stable-low trajectory group. It may be that the 25% of boys using high rates of emotion-focused active strategies at age 2 were delayed in their progression away from these strategies. However, by age 4 most had caught up to the majority group. Additional research examining longer-term outcomes for both trajectory groups would be an important next step to know whether this delay in the lower rates of emotion-focused active strategy use in the stable-low group is related to outcomes such as externalizing behavior or whether the simple act of “catching up” was protective against negative outcomes for those boys.
The current data appear to support Kopp’s theorized increase in boys’ use of planful strategies over time, such as distraction, a strategy found in previous research to be related to effective emotion self-regulation (Gilliom et al., 2002; Silk et al., 2006). Both the mean ratio of planful strategies and the trajectory analysis indicate that the majority of children were already utilizing planful strategies even at age 2, and the majority of boys who were not using this strategy as frequently at age 2, had caught up with the rest of the sample by age four. However, as for small group of boys, the use of planful strategy use decreased over time, it would be interesting to replicate these findings in larger samples to determine the developmental characteristics of these children. Like the emotion active strategy trajectory groups, future research examining longer term outcomes for these children and the boys’ inclusion in one trajectory group over another would be invaluable to the field.

Caution should be warranted, however, when interpreting these findings. The overall high mean rates of planful strategies may be the result of the definitional characteristics of this strategy in the coding system. Most behaviors that were not definable as one of the other SRS strategies and did not show clear, observable dysregulation on the child’s part were ultimately coded as planful strategies. It is possible that boys who use interpersonal distractions, such as engaging in conversations with their caregivers are different than boys who engage in solitary means of distraction, such as twirling around the room or dancing. A more nuanced definition of planful strategies separating self- versus dyadic-distraction may provide richer information on the developmental changes in use of this SRS over the first years of life.

In addition to changes in emotion self-regulation strategies, significant decreases in the boys’ focus on the delay object supports Kopp’s (1989) theory that increases in self-control abilities during this period of development may contribute to this change in strategy use (Kopp, 1989; Stansbury & Zimmerman, 1999). The results of the current
study suggest support for the supposition by Stansbury and Sigman (2000) and Mangelsdorf and colleagues (1995) that as toddlers increase their use of planful strategies, their use of focus on delay object decreases. This decrease in focus on delay object is important given previous research finding the use of this strategy to be related to increases in child negativity during a waiting task and later teacher-reported externalizing behavior at formal school entry (Gilliom et al., 2002).

One interesting finding is the stable quality of the boys’ use of emotion-focus passive strategies. Though few studies to date have specifically focused on boys’ development of emotion-focus passive strategies, previous research suggests that the use of these strategies may stem from the child’s observations of the parent’s own coping mechanisms, stemming from the parent either overtly or covertly modeling this strategy to the child (Silk et al., 2006). An alternative explanation is that passive coping to emotional situations is associated with individuals who are more socially inhibited (Asendorpf, 1991) and therefore may be a more stable, personality-driven regulation strategy. Research suggests that emotion-focus passive strategies may be related to children ruminating about their feelings of anger or sadness, are ineffective strategies for dealing with negative emotions, and place individuals at risk for psychopathology (Blair et al., 2004; Silk et al., 2003; 2006). The findings regarding emotion-focus passive strategies and child outcomes are mixed and may vary according to child gender, with girls who passively wait experiencing higher risk of internalizing and externalizing problems than boys who use the same strategy (Gilliom et al., 2002; Silk et al., 2006). Thus, in the present sample of boys, the use of emotion-focus passive strategies may pose relatively smaller risks for the development of behavior problems than in a sample of girls. It is therefore important that future research explores the origins and development of emotion-focus passive strategies further in samples that include males and females.
Limitations and Future Research

The current study has several limitations that should be acknowledged. First, a common problem when studying emotional self-regulation is the confound between the measurement of emotion and the use of regulation strategies. If the task does not elicit high levels of emotion, it may be due to either the children having more adept emotional self-regulation or the task being insufficiently stressful to elicit emotion. Similarly, ethical concerns arise in not wanting to raise negative emotions so high as to raise concerns about harming the children. Though the rates of negative emotion elicited in the current study were not exceptionally high, it is difficult to compare these rates to previous research, as different studies have utilizing more or less conservative definitions of negative emotions. In addition, the current study employed similar but slightly different tasks across a three-year period in part, to account for established increases in social maturity (e.g., decreases in tantruming between ages 2 to 4). Despite ‘raising the emotional stakes’ for older children (e.g., more valuable prize for older children), slight variability in the task demands may have affected our results, particularly given the development changes occurring in social maturity from ages 2 to 4. Even with differences in the task administration across ages, the data in the current study offer support to Kopp’s (1989) model that rates of negative emotion decline and rates of more planful SRS appear to remain relatively stable during this period. However, future research needs to more thoroughly investigate solutions to this regularly occurring challenge to the measurement of emotional SRS.

Second, the boys were observed during a delay of gratification task, and it is possible the task used to elicit boys’ use of emotional SRS may not have been ecologically valid compared to frustrating situations that occur in the child’s daily life. However, past research using similar laboratory-based tasks has shown associations with children’s emotion regulation skills and externalizing problem behaviors outside of
the laboratory context (e.g., Eisenberg et al., 1994; Gilliom et al., 2002). Future research should include multiple methods (e.g., observations, interviews vignettes across youth and parent informant when feasible), including assessment of child behavior outside of a laboratory to increase generalizability of findings.

Third, the sample includes primarily European- and African-American boys selected for their risk of developing behavior problems. The results of the current research therefore can only be generalized to a similar population. The exclusive focus on boys is particularly noteworthy given the unique self-regulatory styles that may emerge for males and females based on gender socialization, biology, or a combination. For example, previous research demonstrates that boys may use more venting and express more negative emotion during frustrating situations than girls (Cole, Zahn-Waxler, & Smith, 1994; Fabes & Eisenberg, 1992). Therefore, it is possible that girls’ SRS profiles may differ from the trajectories found in the present study of boys. Although the current study contributes to the literature by exploring the development of emotional self-control strategies longitudinally in a sample of boys at-risk for behavior problems, more longitudinal work with both normative samples and at-risk samples that include more diversity in socioeconomic status, ethnicity, culture and gender are needed.

Finally, research exploring emotional SRS needs to continue to explore developmental data in multiple ways including both group mean differences and individual change over time using both variable- and person-centered approaches. For example, insecure attachment or parenting that is characterized as harsh or rejecting may impede the development of adaptive SRS (e.g., planful strategies) and reinforce relatively maladaptive strategies (e.g., focus on the delay object). Previous research provides some support for these predictions when SRS were measured at a single time point (e.g., Gilliom et al., 2002), but future research should examine individual or relationship factors as predictors of unique trajectories of SRS from toddlerhood through
the preschool period. Also, trajectories of decreased emotion active strategies and focus on the delay object may enhance school readiness by promoting the coordination of cognition and emotion (Blair, 2002). The present study combined with these suggestions for future research can enhance early prevention and intervention efforts so that all children, particularly boys at-risk for behavior problems due to poverty and related socioeconomic factors (e.g., neighborhood dangerousness, exposure to deviant peers), can have the opportunity to develop adaptive emotional self-regulatory skills.

References


Appendix A: Delay of Gratification Tasks and Coding System

Given the emphasis on the waiting tasks for the data in the current study, a fuller description of the No Toys, Cooking Waiting Task and Gift Waiting Tasks is provided in this appendix. In addition, this appendix includes a theoretical discussion of the coding system.

Delay of gratification tasks

All three delay of gratification tasks were chosen for their similar foundation of the child waiting for an assumed desired object that the child was instructed by the caregiver that they needed to wait for a brief period of time. In addition for all three tasks, the child had access to their caregiver in the room to utilize as a potential resource in their self-regulation. The No Toys task occurred after the children had been playing with new free play toys that had been introduced to the home removed and placed into an opaque Tupperware bin with locking lids following a clean up task. The two-year-olds were then made to wait for five minutes without those toys while their caregiver completed questionnaires. During each of the waiting tasks the caregivers were instructed to react however is most comfortable for them during this time but they needed to ensure the child does not regain access to the toys that were placed in the bin. During the Cookie Waiting Task, the free play toys were removed and stored in a similar fashion and the caregivers were given a clear ziplock baggie with a cookie inside to hold for three minutes while they completed questionnaires. Again, they were told to react to the child however they were most comfortable but to not allow the child access to the toys or access to the cookie until the time was up. Finally, the Gift Waiting Task was similar to the Cookie Waiting Task except that the child had to wait for a wrapped gift for four minutes with the same instructions to the caregiver.

Emotional SRS codes.
The current study adapted a coding system initially utilized by Grolnick and colleagues (1996). For the purposes of the current study, the original codes were mapped on to Kopp’s (1989) theoretical model to create four separate emotional SRS codes. The rationale behind each code will be discussed in turn below.

Emotion-focus active strategies included behaviors that indicated the child was actively attempting to engage in goal-oriented behaviors that react to their emotional state and potentially alter their emotional state. However, these children did not appear to be actively attempting to deal with the problem to change any aspect of the situation other than their own emotional state. The emotion-focus active strategies included seeking comfort from a caregiver, accepting comfort from the caregiver, or choosing to manage their own emotions through self-soothing behaviors. Kopp (1989) discusses how these are early, more immature behaviors the child develops to cope with the situation.

Emotion-focus passive strategies are similar to emotion-focus active strategies in that they are reacting to the emotional situation in a way that merely responds to the emotion. However, in emotion-focus passive strategies the child is not overtly attempting to change their emotional state but instead is engaging in non-active, non-goal oriented behavior. The children who engage in this behavior appear to remove themselves mentally from the situation. Though Kopp does not directly speak about these behaviors in her model, they are theoretically distinct from both the emotion-focus active strategies discussed above and the planful strategies and were therefore kept separate.

Planful strategies incorporated two codes from Grolnick’s original system, active distraction and information gathering. Kopp (1989) discusses how as a child matures, they become more planful and organized over their strategies rather than simply being emotionally reactive. In the current paper, both active distraction, or the child engaging in a goal-oriented behavior with the aim of occupying their own attention, and information
gathering, or the child engaging in questions aimed at learning about the waiting situation appear to fall under planful, organized or monitoring strategies. Engaging in active distraction requires the child to develop an alternative activity during the waiting task. Theoretically, gathering information about the wait task allows the child to monitor the activity (i.e. if the task will continue another 2 minutes the child may decide to engage in one behavior over another for that time period).

Finally, the code focus on delay object shows a lack of the child either dealing with their emotions or actively attempting planful, organized behavior. The code captures distress that is related to the task at hand, separating out simple negativity from negativity due to the waiting task. It included situations such as if the caregiver tells the child to remain in the room during the course of the delay of gratification task and the child attempts to leave the room, the child was coded as focus. In this situation, the caregiver placed an additional restriction to the task and the child was seen as not self-regulating to keep from both attempting to get at the toys and/or remaining in the room. Though Kopp (1989) does not directly discuss the lack of emotional SRS, it is inferred that children who are not engaging in the behaviors she discusses, would be potentially classified as struggling to emotionally self-regulate and therefore focusing on the delay object.
Table 1

Number of children who showed at least two intervals of observed negative or positive child emotion

<table>
<thead>
<tr>
<th>Age</th>
<th>Negative Emotion</th>
<th>Positive Emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 2 (N = 114)</td>
<td>53 (46.5%)</td>
<td>36 (31.6%)</td>
</tr>
<tr>
<td>Age 3 (N = 111)</td>
<td>38 (34.2%)</td>
<td>29 (26.1%)</td>
</tr>
<tr>
<td>Age 4 (N = 103)</td>
<td>16 (15.5%)</td>
<td>32 (30.7%)</td>
</tr>
</tbody>
</table>
Table 2
Socio-demographic Description and Screening Criteria of Sample at the Age 2 Home Visit (N=120)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s Age (Months)</td>
<td>24.10</td>
<td>2.80</td>
</tr>
<tr>
<td>Maternal Age (Years)</td>
<td>27.20</td>
<td>6.10</td>
</tr>
<tr>
<td>Number of People in Home</td>
<td>4.49</td>
<td>1.53</td>
</tr>
<tr>
<td>Annual Income</td>
<td>$15,504.92</td>
<td>8,754.25</td>
</tr>
<tr>
<td>Annual Per Capita Income</td>
<td>$3,624.14</td>
<td>2,058.24</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African-American</td>
<td>58</td>
<td>48.30</td>
</tr>
<tr>
<td>Caucasian</td>
<td>48</td>
<td>40.00</td>
</tr>
<tr>
<td>Biracial</td>
<td>14</td>
<td>11.70</td>
</tr>
<tr>
<td>Maternal Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than High School</td>
<td>22</td>
<td>18.30</td>
</tr>
<tr>
<td>High School/GED</td>
<td>58</td>
<td>48.30</td>
</tr>
<tr>
<td>Greater than High School</td>
<td>40</td>
<td>33.30</td>
</tr>
<tr>
<td>Maternal Marital Status</td>
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<td></td>
</tr>
<tr>
<td>Married/Living with Partner</td>
<td>54</td>
<td>45.00</td>
</tr>
<tr>
<td>Single and Never Married</td>
<td>60</td>
<td>50.00</td>
</tr>
<tr>
<td>Divorced/Separated/Widowed</td>
<td>6</td>
<td>5.00</td>
</tr>
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</table>
### Screening Criteria

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beck Depression Inventory</td>
<td>11.97</td>
<td>9.31</td>
</tr>
<tr>
<td>Eyberg Intensity Score</td>
<td>122.30</td>
<td>27.00</td>
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<tr>
<td>Eyberg Problem Score</td>
<td>12.25</td>
<td>6.25</td>
</tr>
<tr>
<td>CBCL 2/3 Internalizing Factor (T-scores)</td>
<td>57.87</td>
<td>8.41</td>
</tr>
<tr>
<td>CBCL 2/3 Externalizing Factor (T-scores)</td>
<td>59.95</td>
<td>7.58</td>
</tr>
</tbody>
</table>
Table 3

*Mean SRS change over time (N = 94)*

<table>
<thead>
<tr>
<th></th>
<th>Age 2</th>
<th>Age 3</th>
<th>Age 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Planful Strategies</td>
<td>.69</td>
<td>.27</td>
<td>.73</td>
</tr>
<tr>
<td>Emotion Active Strategies</td>
<td>.35</td>
<td>.43</td>
<td>.16</td>
</tr>
<tr>
<td>Emotion-focus passive strategies</td>
<td>.09</td>
<td>.18</td>
<td>.08</td>
</tr>
<tr>
<td>Focus on Delay Object</td>
<td>.25</td>
<td>.28</td>
<td>.27</td>
</tr>
</tbody>
</table>
Table 4

Model fit statistics for the trajectory analysis for each SRS

<table>
<thead>
<tr>
<th>MODEL</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotion Active 2-Group:</td>
<td></td>
</tr>
<tr>
<td>Linear, Quadratic Model(1 2)</td>
<td>-132.61*</td>
</tr>
<tr>
<td>Quadratic, Quadratic Model (2 2)</td>
<td>-135.28</td>
</tr>
<tr>
<td>Quadratic, Quadratic, Quadratic (2 2 2)</td>
<td>-139.11</td>
</tr>
<tr>
<td>Planful Strategies 3-Group:</td>
<td></td>
</tr>
<tr>
<td>Quadratic, Linear, Linear Model(2 1 1)</td>
<td>158.35*</td>
</tr>
<tr>
<td>Quadratic, Quadratic (2 2)</td>
<td>158.58</td>
</tr>
<tr>
<td>Quadratic, Quadratic, Quadratic (2 2 2)</td>
<td>153.41</td>
</tr>
<tr>
<td>Focus on Delay 2-Group:</td>
<td></td>
</tr>
<tr>
<td>Linear, Intercept Model(1 0)</td>
<td>-187.48*</td>
</tr>
<tr>
<td>Quadratic, Quadratic (2 2)</td>
<td>-194.24</td>
</tr>
<tr>
<td>Quadratic, Quadratic, Quadratic (2 2 2)</td>
<td>-102.02</td>
</tr>
</tbody>
</table>

*Parameters were significant for this model.
Table 5

Probabilities of group membership by SRS for trajectory analysis

<table>
<thead>
<tr>
<th>SRS</th>
<th>Group</th>
<th>N</th>
<th>Observed</th>
<th>Predicted</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Emotion-Focused</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Linear Trajectory)</td>
<td>90</td>
<td>75</td>
<td>75.0</td>
<td>73.3</td>
<td>0.96</td>
</tr>
<tr>
<td>2 (Quadratic Trajectory)</td>
<td>30</td>
<td>25</td>
<td>25.0</td>
<td>26.7</td>
<td>0.94</td>
</tr>
<tr>
<td>Planful Strategies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Quadratic Trajectory)</td>
<td>14</td>
<td>11.6</td>
<td>11.6</td>
<td>13.1</td>
<td>0.95</td>
</tr>
<tr>
<td>2 (Linear Trajectory)</td>
<td>14</td>
<td>11.6</td>
<td>11.6</td>
<td>12.6</td>
<td>0.81</td>
</tr>
<tr>
<td>3 (Linear Trajectory)</td>
<td>92</td>
<td>76.7</td>
<td>76.7</td>
<td>74.3</td>
<td>0.94</td>
</tr>
<tr>
<td>Focus On Delay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Linear Trajectory)</td>
<td>111</td>
<td>92.50</td>
<td>92.50</td>
<td>91.16</td>
<td>0.98</td>
</tr>
<tr>
<td>2 (Intercept Trajectory)</td>
<td>9</td>
<td>7.50</td>
<td>7.50</td>
<td>8.84</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Figure 1

*Developmental change of SRS over time*
Planful Strategies**
Emotion Active**
Emotion Passive
Focus on Object**
Figure 2

2 Group Trajectory Model of Emotion Active Strategies
Ratio of Emotion-Focused Active Strategy Use

- Decreasing High (27%)
- Stable Low (73%)
Figure 3

3 Group trajectory model of Planful Strategies
The graph shows the ratio of planful strategy use across different age groups:

- **Decreasing (13%)**
- **Increasing Low (13%)**
- **Increasing High (74%)**

The x-axis represents age groups: Age 2, Age 3, and Age 4. The y-axis represents the ratio of planful strategy use, ranging from 0 to 0.5.
Figure 4

2 Group trajectory model of SRS focus on delay
Stable High (9%)  Low Decreasing (91%)