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## **Pathways Thinking as a Mediator between Positive Emotions and General Life Satisfaction in Middle School Students**

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Pathways Thinking as a Mediator between Positive Emotions and General Life  
Satisfaction in Middle School Students

by

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## Abstract

Informed by the broaden-and-build theory of positive emotions, we tested a model of the origins of life satisfaction with a sample of 567 middle school students from the Southeastern United States. The pathways thinking domain of hope was proposed to mediate the relation between positive emotions and general life satisfaction at a single time point, as well as over one year. At Time 1, pathways thinking was a significant mediator of positive emotions and life satisfaction. In the longitudinal model, pathways thinking did not significantly mediate this relation between positive emotions and later life satisfaction. These findings have implications for understanding the role of positive emotions in early adolescents.

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## Chapter 1: Introduction

The purpose of the present study was to examine the relations among middle school students' positive emotions, pathways thinking, or the ability to generate a variety of ways to reach a goal, and general life satisfaction. Previous research with adults has demonstrated that ego resilience mediates the relation between positive emotions and life satisfaction, such that positive emotions build ego resilience, which leads to greater life satisfaction over time (Cohn, Fredrickson, Brown, Mikels, & Conway, 2009). Ego resilience is a higher order construct that includes an individuals' ability to flexibly adapt to change, challenges, and stress, as well as to solve problems (Funder & Block, 1989). Because ego resilience is a broad construct that is comprised of multiple subcomponents, it should be unpacked in order to identify those subcomponents that may be amenable to intervention with individuals, including children, who report low levels of life satisfaction. Because the ability to generate alternative pathways through which one can reach a goal is particularly functional when faced with challenges and stressors, pathways thinking may act as a subcomponent of ego resilience (Snyder, 1991).

### **The Broaden-and-Build Theory of Positive Emotion**

This study was informed by the broaden-and-build theory of positive emotion (Fredrickson, 2001). The theory hypothesizes that emotions are short-term physiological and cognitive experiences, and they motivate individuals to think in a particular manner and to perform related behaviors. These cognitive and behavioral patterns are called thought-action sequences (Fredrickson, 2001). According to broaden-and-build theory,

positive and negative emotions serve distinct purposes. For example, fear motivates people to either fight or flee a frightening situation, and disgust motivates an individual to either avoid or rid the body of a harmful substance (Fredrickson, 1998). While negative emotions promote these narrow thought-action sequences, positive emotions (e.g., joy, contentment, interest, and love) broaden individuals' thought-action sequences, thus increasing their cognitive and behavioral flexibility. According to Fredrickson (1998), the emotion joy motivates play behavior, which is typically broad and creative. In support of this hypothesis, Fredrickson and Branigan (2005) found that college students who watched a positive video clip demonstrated both a broader locus of visual attention during a visual processing task and more flexible word associations during a verbal task when compared to those who watched a neutral film. Similarly, in a meta-analysis of experiments assessing the causal relation between positive emotions and adaptive behavior in adults, Lyubormirsky, King, and Diener (2005) found that experimental induction of positive emotion led to increased creativity and flexible thinking, as compared to the induction of neutral or negative emotions.

The secondary component of broaden-and-build theory suggests that positive emotions lead to gains in personal resources over time. Broadened thought-action sequences may allow individuals to build lasting social and cognitive resources, such as social relations, beneficial coping strategies, or satisfaction with life (Fredrickson, 1998; Fredrickson, 2001). Sustained interest in a topic may lead to the development of new, beneficial skills; joy may develop positive interpersonal relationships and social support; contentment may motivate approach-based coping during stressful life events (Fredrickson, 1998; Fredrickson, 2001). After reviewing 293 cross-sectional, longitudinal,

and experimental analyses regarding the effects of positive emotions for adults, Lyubormirsky and colleagues (2005) concluded that positive emotions were associated with increased health, occupational, social, and personal resources. Finally, a bidirectional relation may exist between positive emotions and subsequent resources. Specifically, building beneficial resources may contribute to further experiences of positive emotions over time (Fredrickson, 1998; Fredrickson, 2001; Lyubormirsky et al., 2005).

Despite a large body of research addressing the utility of the broaden-and-build theory with adults and college students (e.g., Cohn et al., 2009; Lyubormirsky et al., 2005), little research has examined whether broaden-and-build theory is an appropriate model to apply to youth. Preliminary research suggests that positive emotions may also broaden thought-action sequences and build personal resources in youth. Reschley and colleagues (2008) found that students' self-reported positive emotions at school were associated with broadened adaptive coping techniques and greater school engagement; these findings support the applicability of the broaden-and-build theory to adolescents in school settings. Nevertheless, this study was cross-sectional in nature, precluding inferences about causality related to the "build" aspect of the model. One purpose of the present study was to further investigate the applicability of the broaden-and-build theory with middle school students by assessing whether the findings are consistent with the broaden-and-build process in generalized settings, in addition to at school. Furthermore, because the broaden-and-build theory states that positive emotions engender personal resources over time (Fredrickson, 1998; Fredrickson, 2001), the theory should be tested longitudinally. For this reason, the present study measured life satisfaction one year after

participants' self-reported positive emotions. This longitudinal analysis specifically tested the hypothesis that positive emotions predict improvement in personal resources (i.e., life satisfaction) over time.

## **Hope**

In their meta-analysis of the correlates of positive emotion, Lyubormirsky and colleagues (2005) proposed that cognitive factors, such as hope, might mediate the relations between positive emotion and the associated positive outcomes. This hypothesis is consistent with broaden-and-build theory; positive emotions may broaden cognitive processes and lead to positive outcomes over time (Fredrickson, 2001).

### **Definition of Hope**

According to Snyder and colleagues (1991), hope is not an emotion. Instead, it is a cognitive construct that motivates individuals to establish and work toward personally relevant goals (Snyder et al., 1991). When validating the Adult Hope Scale, Snyder and colleagues (1991) found that hope consists of two distinct factors: agency and pathways thinking. Agency includes individuals' beliefs regarding their personal abilities to achieve goals, while pathways thinking includes cognitions regarding the number and variety of available pathways through which individuals may reach their goals.

### **Correlates of Hope**

When studied separately, positive emotion is positively related to both the agency and pathways thinking domains of hope (Ciarrochi, Heaven, & Davies, 2007). Because pathways thinking is a quantifiable construct that measures the number of routes through which individuals may achieve their personal goals, pathways thinking may be particularly sensitive to the broadening effects of positive emotion. Specifically, the

experience of positive emotion may increase the number of routes that individuals perceive are available to reach their goals. Perceiving multiple pathways may help individuals to persevere when they experience obstacles to their goals, as they are able to generate alternative routes through which they may achieve these goals (Snyder et al., 1991).

In addition to the relation between positive emotions and hope, a large body of literature supports the relation between hope and personal resources in youth. Students with high levels of self-reported hope also appear to derive a variety of academic benefits as compared to those with lower levels of hope. Onwuegbuzie and Snyder (2000) found that graduate students with high levels of hope employed more effective coping strategies when studying for a final exam, while those with low levels of hope employed less effective strategies. Another analysis of the relation between hope and academic performance demonstrated that hope was a significant predictor of college students' grade point average (GPA), even after accounting for their college-entry examination scores. Furthermore, students with higher hope were more likely to have graduated from college 6 years after initial assessment than were their peers with lower hope (Snyder et al., 2002). Hope has also been observed to predict GPAs for high school students, such that students who reported higher levels of hope had higher GPAs than their peers who reported lower levels of hope (Ciarrochi, Heaven, & Davies, 2007).

When both pathways thinking and agency are measured to create an index of hope, hope also appears to positively impact students' subjective well-being. Middle and high school students who reported higher levels of hope demonstrated fewer internalizing symptoms than their peers with lower levels of hope. Hope also appeared to buffer these

students from the deleterious effects of stress by allowing them to maintain high life satisfaction despite stressful life events (Valle, Huebner, & Suldo, 2006). In a sample of middle school students, higher levels of hope protected students from depression and decreased school satisfaction when they disliked their classroom climate and/or experienced competitiveness (Lagacé-Séguin & d'Entremont, 2010). Similarly, Hagen, Myers, and Mackintosh (2005) found that hope predicted adaptive behavior above and beyond social support and stressful life experiences in a sample of children with incarcerated mothers by facilitating positive coping techniques (Hagen, Myers, & Mackintosh, 2005). Hope also partially mediated the relation between parental attachment and life satisfaction in a sample of early adolescents (Jiang, Huebner, & Hills, 2013).

### **Unpacking Hope**

The constructs of agency and pathways thinking have rarely been measured separately (Tong, Fredrickson, Chang, & Lim, 2010). Tong and colleagues (2010) provided evidence indicating that agency and pathways thinking are distinct constructs in their study of both American and Singaporean students. Their results indicated that individuals in both cultures frequently reported possessing differing levels of agency and pathways thinking. For example, one might report simultaneously experiencing high agency and low pathways thinking, low agency and high pathways thinking, or commensurate levels of both agency and pathways thinking (Tong et al., 2010). Despite this finding, few studies have investigated how outcomes may vary for students with differing levels of pathways thinking and agency (e.g., a student with high agency and low pathways thinking and a student with low agency and high pathways thinking). Tong

and colleagues (2010) assert that researchers should unpack hope by examining these constructs separately, rather than combining agency and pathways thinking into the unitary construct of hope. The present study seeks to add to the literature by examining pathways thinking independently of agency.

## **General Life Satisfaction**

### **Definition of General Life Satisfaction**

General life satisfaction is measured by assessing an individual's cognitive appraisal of a variety of domains of his or her life. For school-aged children and adolescents, general life satisfaction refers to their aggregate level of satisfaction across various domains, including school, family, neighborhood, and friends (Gilligan & Huebner, 2007). Although positive emotions and general life satisfaction are related, Cohn and colleagues (2009) found that positive emotions and life satisfaction were distinct constructs. While positive emotions consisted of brief, specific emotional experiences, life satisfaction was more stable and more general (Cohn et al., 2009).

### **General Life Satisfaction as a Resource for Students**

Life satisfaction may be a particularly beneficial resource and protective factor for students during middle school. General life satisfaction is an indicator of a variety of positive outcomes in adolescents, and it may buffer students from deleterious effects of stressful life events (Suldo & Huebner, 2004). In a longitudinal analysis, Lyons and colleagues (2014) found that middle school students who reported higher life satisfaction engaged in fewer externalizing behaviors six months later than did students who reported lower life satisfaction. Similarly, Tolan and Larsen (2014) measured middle school students' life satisfaction longitudinally and compared students who maintained high life

satisfaction, increased life satisfaction, and decreased life satisfaction. Students who maintained high life satisfaction were rated by teachers as significantly higher on social skills and leadership, as well as lower in aggression in sixth grade. Studies have also demonstrated that lower levels of life satisfaction are antecedents of increased peer victimization, decreased school engagement, and declining parental support (see Huebner, Hills, Siddall, & Gilman, 2014, for a review).

### **Positive Emotions, Pathways Thinking, and General Life Satisfaction**

Consistent with the broaden-and-build theory, positive emotions appear to predict the positive outcome of life satisfaction. Schutte (2013) conducted a three-week intervention designed to increase positive emotions with adults, and participants experienced increased relationship and work satisfaction after the intervention. Additionally, Cohn and colleagues (2009) found that ego resilience mediated the relation between positive emotions and life satisfaction. However, ego resilience is a broad, higher order trait that included flexible problem-solving skills and adaptation to challenges (Cohn et al., 2009; Funder & Block, 1989). A subcomponent of ego resilience may be broad pathways thinking, in which individuals can generate multiple alternative pathways to achieve a goal when they encounter obstacles to that goal. Furthermore, compared to agency, pathways thinking seems to be more likely to be amenable to systematic intervention efforts, such as goal-directed thinking training (Feldman & Dreher, 2012). Feldman and Dreher (2012) found that college students' hope significantly increased after they underwent a 90-minute hope intervention, as compared to when they experienced relaxation training. Furthermore, the effect size for students' increase in pathways thinking was almost double the change in agency within the

intervention group (Feldman & Dreher, 2012). For these reasons, efforts to unpack the construct of resilience through the study of pathways thinking may be beneficial in clarifying more precise skills that may be amenable to understanding, intervention, and promoting linkages between positive emotions and life satisfaction in middle school students.

### **Research Questions**

The present study sought to assess the nature of the relations among positive emotions, pathways thinking, and general life satisfaction concurrently and over time in middle school students. Pathways thinking is proposed to be a mechanism through which positive emotions enable students to experience increased general life satisfaction. Informed by broaden-and-build theory, positive emotions should relate to higher cognitive flexibility, allowing students to perceive a greater number of pathways through which they can achieve their goals. In turn, broadened pathways thinking should relate to increased general life satisfaction. The cross-sectional model tested whether the relations between students' positive emotions, pathways thinking, and general life satisfaction at a single time point were consistent with the relations proposed by the broaden-and-build theory. The longitudinal model built upon this finding by determining whether the broaden-and-build theory was supported over one year in middle school students. Six primary research questions were proposed for the present study.

1. The first research question examined how students' positive emotions were related to life satisfaction at a single time point after controlling for demographic information.

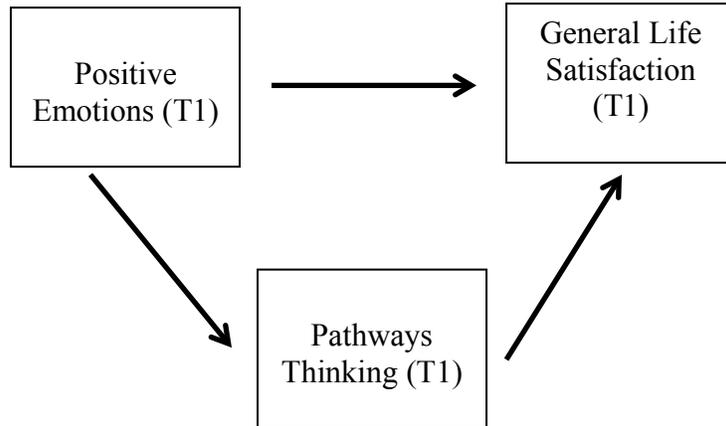
2. The second question examined how positive emotions were related to pathways thinking at a single time point after controlling for demographics.
3. The third question assessed whether pathways thinking mediated the relation between students' positive emotions and concurrent life satisfaction.
4. The fourth research question examined how positive emotions were related to students' life satisfaction over one year after controlling for demographics.
5. The fifth question assessed whether pathways thinking mediated the relation between students' positive emotions and later life satisfaction.
6. The final question examined how students' negative emotions were related to both life satisfaction and pathways thinking at a single time point.

Six hypotheses were proposed to answer these research questions. See Figures 1 and 2 for a conceptual model of the expected concurrent and longitudinal relations between positive emotions, pathways thinking, and general life satisfaction.

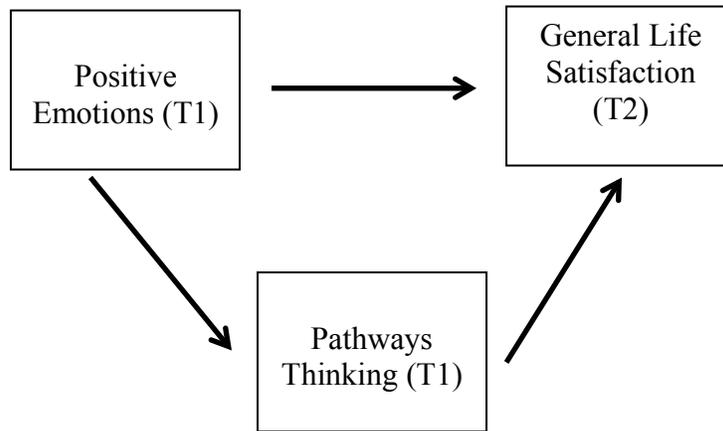
1. The first hypothesis was that positive emotions at Time 1 would predict general life satisfaction at Time 1, after controlling for demographics that are related to life satisfaction.
2. The second hypothesis was that positive emotions at Time 1 would predict pathways thinking at Time 1, after controlling for demographics related to life satisfaction.
3. The third hypothesis was that pathways thinking at Time 1 would mediate the relation between positive emotions and concurrent life satisfaction.

4. The fourth hypothesis was that positive emotions would predict general life satisfaction at Time 2, after controlling for demographic information and Time 1 life satisfaction.
5. The fifth hypothesis was that pathways thinking at Time 1 would mediate the relation between positive emotions and life satisfaction over time.
6. The final hypothesis was that there would be either no relation or a weak negative relation between negative emotions and pathways thinking at Time 1.

This study extends beyond previous research with youth by attempting to unpack the concept of resilience into subcomponents, such as pathways thinking, which are more amenable to focused interventions than the global construct of resilience. Furthermore, this study provides a rare examination of the relation between positive emotions and subsequent resources with youth using longitudinal methodology.



*Figure 1.1.* Conceptual model for the expected relations between positive emotions, pathways thinking, and general life satisfaction at Time 1.



*Figure 1.2.* Conceptual model for the expected relations between positive emotions, pathways thinking, and general life satisfaction over time.

## Chapter 2: Method

### **Participants**

The questionnaire and procedures employed in the present study received approval from the Institutional Review Board at the University of South Carolina. Two waves of data were collected at five public middle schools within two school districts in the Southeastern United States. The second wave of data was collected 12 months after the first wave. This dataset has been used in previous research (e.g., Elmore & Huebner, 2010), but these analyses are new. Before data were collected, the parents of all general education students ( $N = 1,201$ ) at the participating schools received letters that described the study, as well as parental consent forms. Of those students, 567 (340 female) students returned signed parental consent forms and participated in the study at Time 1. Four hundred twenty (74%) participants also completed the questionnaire at Time 2. After students returned signed parental consent forms, they completed an assent form. All students who returned consent forms assented to participate in the study. Trained research assistants administered the questionnaire to participants, who were seated in groups ranging from 20 to 75 students. The groups met in quiet locations, such as school libraries or cafeterias. Students completed the questionnaire individually, and surveys were coded with identification numbers in order to ensure confidentiality.

Two hundred two participants (35.63%) were in sixth grade, 180 participants (31.74%) were in seventh grade, and 185 participants (32.63%) were in eighth grade. Within the sample, 43.92% of participants were African-American, 43.92% were White,

2.47% were Asian, 2.12% were Native American, and 1.23% were Hispanic. The remaining 6.35% of students identified as another race or ethnicity. Additionally, 50.26% of participants reported receiving free or reduced lunch. Finally, 49.38% of participants reported living with both of their biological parents, 22.93% lived with only their biological mother, 1.94% lived with only their biological father, 16.05% lived with their biological mother and stepfather, 1.76% lived with their biological father and stepmother, and 7.94% reported other living arrangements.

### **Measures**

The present research questionnaire was primarily used for a larger study and contained multiple measures, including other measures that were not used in these analyses. The measures that directly related to the present study and its research questions are described.

**Positive and Negative Affect Scale for Children (PANAS-C).** The PANAS-C is a 27-item scale that measures positive and negative emotion in school-aged children and adolescents. Twelve items load onto the Positive Affect subscale, and 15 items load onto the Negative Affect subscale. Respondents rate how much they have experienced positive (e.g., “interested,” “cheerful”) and negative (e.g., “gloomy,” “jittery”) emotions during a specified duration of time (Laurent et al. 1999). In the present study, students were asked to rate to what extent they had experienced the emotions during the past two weeks. Response options range from 1 (“very slightly or not at all”) to 5 (“extremely”) (Laurent et al., 1999). When developing the measure, Laurent and colleagues (1999) found a correlation coefficient of  $-.20$  between the Positive and Negative Affect subscales. Additionally, they found Cronbach’s alpha values of  $.90$  for the Positive Affect subscale

and .94 for the Negative Affect subscale. Finally, the Positive Affect subscale was negatively correlated with measures of depression and anxiety, and there was a positive relation between the Negative Affect subscale and such measures (Laurent et al., 1999). The PANAS-C was administered at Time 1 of the present study, and Cronbach's alpha for the Positive Affect subscale was .90. Cronbach's alpha for the Negative Affect subscale was 0.89.

**The Children's Hope Scale (CHS).** Pathways thinking was measured with three items from the CHS. The CHS is a six-item scale that assesses both the agency and pathways thinking dimensions of hope in children and adolescents between 8 and 16 years of age. Each subscale consists of three items. Factor analysis confirmed that the CHS subscales measure two distinct factors, with agency and pathways items loading onto separate factors (Snyder et al., 1991). An example of an item assessing pathways thinking is, "I can think of many ways to get the things in life that are most important to me" (Snyder et al., 1991). Response options range from 1 ("none of the time") to 6 ("all of the time"), with higher scores indicating greater levels of hope (Snyder et al., 1991). In a meta-analysis of research examining the reliability and validity of CHS, Snyder and colleagues (1991) found that Cronbach's alphas ranged from .63 to .80 for the Pathways Thinking subscale. Additionally, meta-analysis indicated that scores on the CHS were positively correlated with measures of both optimism and problem-solving skills (Snyder et al., 1991). The CHS was administered at Time 1 of the present study, and Cronbach's alpha was .62 for the Pathways Thinking subscale. Internal consistency for this subscale may be relatively low due to the inclusion of only three items, and it is consistent with the range reported by Snyder and colleagues (1991).

**The Multidimensional Student's Life Satisfaction Scale (MSLSS).** The MSLSS is a 40-item scale that assesses school-aged children and adolescents' life satisfaction in domains such as family, friends, living environment, school, and self. An example of an item in the family satisfaction subscale is "I enjoy being home with my family;" an item in the school satisfaction subscale is "I look forward to going to school." Response options range from 1 ("strongly disagree") to 6 ("strongly agree") (Huebner, Laughlin, Ash, & Gilman, 1998). When developing the MSLSS, Huebner and colleagues (1998) found a Cronbach's alpha of .93 for the entire scale. Furthermore, factor analyses indicated that the subscales loaded onto distinct factors as well as a higher-order factor, which indicates that the total score functions as a measure of general life satisfaction (Huebner et al., 1998). The MSLSS total score has been shown to correlate with parental estimates of students' life satisfaction for typically developing high school students (Huebner, Brantley, Nagle, & Valois, 2002). The MSLSS was administered at both Times 1 and 2 of the present study. Cronbach's alpha was .80 at Time 1 and .93 at Time 2, and the test-retest reliability for Times 1 and 2 was .57.

### **Data Analysis**

Scores for the PANAS-C (Positive Affect subscale), the CHS (Pathways Thinking subscale), and the MSLSS were calculated by standardizing each item within the scales, summing the standardized scores, and standardizing the sums. After scaled scores were created, the data were examined for outliers. DFFIT values were calculated for all data points. A DFFIT cutoff value of 0.08 was established, as suggested by Cohen, Cohen, West, and Aiken (2003) for a data set with a sample size of 567 and three predictors. The

maximum observed DFFIT value was 0.07, and thus no outliers were excluded from analyses.

The data were then examined for clustering within schools. The intraclass correlation (ICC) for life satisfaction at Time 1 was  $8.12 \times 10^{-3}$ , and the ICC for life satisfaction at Time 2 was  $1.05 \times 10^{-9}$ . Additionally, the ICC for positive emotion was  $4.82 \times 10^{-3}$ , and the ICC for pathways thinking was  $1.55 \times 10^{-9}$ . The design effect for the relation between positive emotion and life satisfaction at Time 2 was 1.00. The design effect for the relation between positive emotions and pathways thinking was 1.00. Finally, the design effect for the relation between pathways thinking and life satisfaction at Time 2 was 1.00. These findings indicated that clustering within schools would not downwardly bias the standard errors in the present study, and therefore a multi-level model was not employed in further analyses.

Less than 1.00% of data was missing on the PANAS-C and the CHS at Time 1, 9.33% of data was missing on the MSLSS at Time 1, and 34.15% of data was missing on the MSLSS at Time 2. In order to determine whether missing data were related to other variables within the data set, each item was regressed on all other items using logistic regressions. No item's missingness was significantly predicted by any other item within the data set; nor was missingness jointly predicted by all other items. Multiple imputation was used to impute missing data. Due to high multicollinearity between items, the Amelia package for R could not reach normal EM convergence for 40 iterations when imputing individual missing item scores (Honaker, King, & Blackwell, 2011). For this reason, missing scaled scores, rather than missing item scores, were imputed using 40

iterations of multiple imputation in the Amelia package (Honaker et al., 2011). Normal EM convergence was reached.

In order to answer the research questions, mediation analyses were conducted using six regression models. Three models investigated the cross-sectional relations between positive emotions, pathways thinking, and general life satisfaction, and three models assessed the longitudinal relations between these variables. In the cross-sectional models, demographic covariates were entered as a set in the first step of a hierarchical multiple regression, and the research variable(s) for the model were added in the second step. The first research question was answered by Model 1, which assessed the  $c$  pathway, or the relationship between positive emotions and concurrent life satisfaction after controlling for demographics. The second research question was answered by Model 2, which assessed the  $\alpha$  pathway, or the relationship between positive emotions and concurrent life satisfaction after controlling for demographics. Model 3 assessed the  $\beta$  pathway of the cross-sectional mediation model, and the third research question was answered with the mediation term for the relationship between concurrent positive emotions, pathways thinking, and life satisfaction. The mediation term was calculated by multiplying the parameter estimates for the  $\alpha$  pathway in Model 2 and the  $\beta$  pathway in Model 3 (MacKinnon, 2008). The Sobel test was employed in order to determine the 95% confidence interval for the mediation term.

In each hierarchical multiple regression equation for the longitudinal mediation model, demographic covariates and life satisfaction at Time 1 were entered as a set in the first step, and the research variable(s) was added in the second step. Model 4 answered the fourth research question, and it examined the relation between positive emotions at

Time 1 and life satisfaction at Time 2, after controlling for demographics and Time 1 life satisfaction. Model 5 measured the relation between positive emotions and pathways thinking at Time 1, after controlling for demographics and Time 1 life satisfaction. Finally, Model 6 examined the relation between pathways thinking at Time 1 and life satisfaction at Time 2, after controlling for demographics and Time 1 life satisfaction. The mediation term for the longitudinal relation between positive emotions, pathways thinking, and general life satisfaction answered the fifth research question. Like in the cross-sectional model, the parameter estimates for the longitudinal  $\alpha$  and  $\beta$  pathways were multiplied to calculate the mediation term, and the Sobel test yielded the 95% confidence interval. The final research question was answered by examining the simple, zero-order correlations between negative emotions and life satisfaction, as well as between negative emotions and pathways thinking.

The regression assumptions of linearity, homoscedasticity, and normality of residuals were examined graphically for each model with one randomly selected imputed data set. For Model 2, none of the regression assumptions appeared to be violated. For Models 1 and 3, the assumptions of linearity and homoscedasticity of errors did not appear to be violated. The residuals were negatively skewed in both models (Model 1 skew = -1.29, Model 3 skew = -1.29). In order to preserve the interpretability of the results, the data were not transformed to normalize the residuals. Because of the violations of the assumption of normality of residuals, the standard errors in the present study may be biased upward, which would provide a more conservative test of significance. However, regression weights are unaffected by this assumption violation (Cohen et al., 2003).

The Zelig package in R was used for all regression models in order to account for variance between and within imputed data sets (Imai, King, & Lau, 2008). In all results, degrees of freedom were estimated, the  $F$  statistic may be biased upward, and the  $p$  statistic may be biased downward due to multiple imputation.

### Chapter 3: Results

In order to determine which demographic variables should be controlled for in all mediation models, pathways thinking and life satisfaction at Time 2 were regressed on participant sex, race, socioeconomic status (SES) (i.e., whether the participant received free or reduced lunch), parental marriage status (e.g., divorced, widowed), custody (e.g., living with biological parents, living with father only), and grade. None of these demographic variables were significant predictors of pathways thinking. Life satisfaction at Time 2 was not predicted by custody, parental marriage status, or SES. Life satisfaction differed by sex, with females showing greater life satisfaction at Time 2 than the grand mean of life satisfaction for both sexes [ $B = 0.15$ ,  $SE = 0.05$ ,  $t(566) = 3.07$ ,  $p < .05$ ]. Life satisfaction also differed between grades, such that seventh grade students' life satisfaction at Time 2 was lower than the grand mean of life satisfaction for all grades [ $B = -0.13$ ,  $SE = 0.06$ ,  $t(565) = -2.15$ ,  $p < .05$ ], and eighth grade students' life satisfaction at Time 2 was also lower than the grand mean [ $B = -0.19$ ,  $SE = 0.06$ ,  $t(565) = -3.19$ ,  $p < .05$ ]. Race also emerged as a significant predictor of Time 2 life satisfaction, with African-American students reporting higher levels of life satisfaction than the grand mean of life satisfaction for all groups [ $B = 0.12$ ,  $SE = 0.05$ ,  $t(562) = 2.33$ ,  $p < .05$ ], and Asian students reporting lower levels of life satisfaction than the grand mean [ $B = -0.36$ ,  $SE = 0.15$ ,  $t(562) = -2.35$ ,  $p < .05$ ]. Because such differences emerged, sex, race, and grade were included as covariates in all mediation analyses, and in addition to Time 1 life satisfaction for all longitudinal mediation analyses.

### **Research Question One**

Model 1 examined the  $c$  pathway between positive emotion at Time 1 and concurrent life satisfaction. Covariates were entered in Step 1 of a hierarchical multiple regression predicting life satisfaction at Time 1, and together they accounted for 7.74% of the variance in Time 1 life satisfaction [ $F(5, 562) = 9.36, p < .05$ ]. Positive emotion was added in Step 2 of the hierarchical multiple regression and accounted for an additional 32.00% of the variance in Time 1 life satisfaction over and above the covariates [ $F(7, 553) = 42.13, p < .05$ ]. Parameter estimates for Model 1 are presented in Table 1.

### **Research Question Two**

To test the  $\alpha$  pathway for the Time 1 mediation model, the covariates were entered in the first step of a hierarchical multiple regression predicting pathways thinking, and they jointly accounted for 1.10% of the variance in pathways thinking at Time 1 [ $F(5, 562) = 1.12, p > .05$ ]. In Step 2 of the model, positive emotion at Time 1 was added as a predictor of pathways thinking, and there was a small effect of positive emotion on pathways thinking. Specifically, positive emotion accounted for an additional 13.26% of the variance in pathways thinking [ $F(7, 553) = 11.94, p < .05$ ]. Parameter estimates for Model 2 are presented in Table 2.

### **Research Question Three**

The  $\beta$  and  $c'$  pathways for the Time 1 mediation model were tested in Model 3. The covariates were entered in Step 1 of a hierarchical multiple regression predicting life satisfaction at Time 1, and they jointly accounted for 7.74% of the variance in Time 1 life satisfaction [ $F(5, 562) = 9.36, p < .05$ ]. Positive emotion and pathways thinking were added in Step 2 and together accounted for an additional 35.00% of the variance in Time

1 life satisfaction [ $F(8, 552) = 42.37, p < .05$ ]. Parameter estimates for Model 3 are displayed in Table 3.

In order to determine whether pathways thinking mediated the relation between positive emotions and concurrent life satisfaction, the parameter estimates for the  $\alpha$  and  $\beta$  pathways were multiplied. A small mediation effect of 0.09 emerged ( $SE = 0.02, 95\% CI = 0.06, 0.13$ ). This indicates that a standard deviation change in positive emotions was associated with a 0.09 standard deviation change in Time 1 life satisfaction due to pathways thinking. The conceptual model and parameter estimates for each pathway are presented in Figure 3.

#### **Research Question Four**

Model 4 tested the  $c$  pathway between positive emotion at Time 1 and life satisfaction at Time 2. Covariates and Time 1 life satisfaction were entered in Step 1 of a hierarchical multiple regression predicting life satisfaction at Time 2, and together they accounted for 36.32% of the variance in Time 2 life satisfaction [ $F(6, 561) = 47.48, p < .05$ ]. Positive emotion was added in Step 2 of the hierarchical multiple regression and accounted for an additional 0.10% of the variance in Time 2 life satisfaction over and above the covariates and Time 1 life satisfaction [ $F(7, 553) = 0.12, p > .05$ ]. Parameter estimates for this model are presented in Table 4.

#### **Research Question Five**

To test the  $\alpha$  pathway in the longitudinal mediation model, demographic covariates and Time 1 life satisfaction were entered in the first step of a hierarchical multiple regression predicting pathways thinking, and they jointly accounted for 18.49% of the variance in pathways thinking [ $R^2 = 0.18, F(6, 561) = 22.52, p < .05$ ]. In Step 2 of

the model, positive emotion was added as a predictor, and there was a small effect of positive emotion on pathways thinking. Specifically, positive emotion accounted for an additional 2.20% of the variance in pathways thinking [ $\Delta R^2 = 0.02$ ,  $F(7, 553) = 2.19$ ,  $p < .05$ ]. Parameter estimates for this model are presented in Table 5.

The  $\beta$  and  $c'$  pathways for the longitudinal model were tested in Model 6. The covariates and life satisfaction at Time 1 were entered in Step 1 of a hierarchical multiple regression predicting life satisfaction at Time 2, and they jointly accounted for 36.32% of the variance in Time 2 life satisfaction [ $F(6, 561) = 47.48$ ,  $p < .05$ ]. Time 1 positive emotion and pathways thinking were added in Step 2 and together accounted for an additional 0.20% of the variance in Time 2 life satisfaction [ $F(8, 552) = 0.16$ ,  $p > .05$ ]. Parameter estimates for Model 6 are displayed in Table 6.

The parameter estimates for the  $\alpha$  and  $\beta$  pathways were multiplied in order to calculate the mediation term. The product was less than 0.01, which indicated the absence of a mediated effect ( $SE = 0.02$ , 95%  $CI = -0.03, 0.04$ ). This finding suggests that a standard deviation change in positive emotions was associated with less than a 0.01 standard deviation change in life satisfaction at Time 2 due to pathways thinking. The conceptual model and parameter estimates for each pathway are presented in Figure 4.

### **Research Question Six**

The final research question examined the relation between negative emotions and pathways thinking at Time 1, as well as between negative emotions and life satisfaction at Time 2. As hypothesized, there was a weak, negative correlation between negative emotions and concurrent pathways thinking ( $r = -0.10$ ,  $p < .05$ ). A moderate negative relation emerged between negative emotions and life satisfaction at Time 2 ( $r = -0.35$ ,  $p$

< .05). Conversely, there was a moderate positive relation between positive emotions and concurrent pathways thinking ( $r = 0.37, p < .05$ ). Furthermore, there was a large positive relationship between positive emotions and later life satisfaction ( $r = 0.61, p < .05$ ).

Table 3.1

*Summary of Regression Analyses for the c Pathway between Covariates, Positive Emotions, and Time 1 Life Satisfaction (N = 567)*

Step	$\Delta R^2$	$\beta$	SE $\beta$	df	t	Fraction of Missing Info.
Step 1	0.08*					
Intercept		-0.24	0.14	562	-1.74	0.01
Female		0.11	0.04	562	2.42*	0.01
Grade 7		-0.09	0.05	562	-1.77	0.01
Grade 8		-0.26	0.05	562	-5.01*	0.01
African-Amer.		0.13	0.04	562	2.96*	0.11
Asian		-0.10	0.14	562	-0.73	0.07
Step 2	0.32*					
Intercept		-0.09	0.12	561	-0.73	0.08
Positive Emotion		0.58	0.04	561	15.92*	0.11

*Note.* For Step 1,  $F(5, 562) = 9.36, p < .05$ . For Step 2,  $F(7, 553) = 42.13$ . Demographic variables were not standardized.  $\Delta R^2$  deviate from values reported in text due to rounding. \* $p < .05$

Table 3.2

*Summary of Regression Analyses for the  $\alpha$  Pathway between Covariates, Positive Emotion, and Pathways Thinking at Time 1 (N = 567)*

Step	$\Delta R^2$	$\beta$	SE $\beta$	df	t	Fraction of Missing Info.
Step 1	0.01					
Intercept		-0.17	0.14	562	-1.22	0.02
Female		0.06	0.04	562	1.42	0.003
Grade 7		-0.08	0.05	562	-1.52	0.01
Grade 8		-0.08	0.05	562	-1.56	
	0.003					
African-Amer.		0.01	0.04	562	0.22	0.01
Asian		-0.11	0.14	562	-0.80	0.02
Step 2	0.13*					
Intercept		-0.07	0.13	561	-0.52	0.03
Positive Emotion		0.37	0.04	561	9.26*	0.002

*Note.* For Step 1,  $F(5, 562) = 1.12$ . For Step 2,  $F(7, 553) = 11.94$ . Demographic variables were not standardized.

\* $p < .05$

Table 3.3

*Summary of Regression Analyses for the  $\beta$  and  $c'$  Pathways between Covariates, Positive Emotion, Pathways Thinking and Time 1 Life Satisfaction ( $N = 567$ )*

Step	$\Delta R^2$	$\beta$	$SE \beta$	$df$	$t$	Fraction of Missing Info.
Step 1	0.08*					
Intercept		-0.24	0.14	562	-1.74	0.06
Female		0.11	0.04	562	2.42*	0.05
Grade 7		-0.09	0.05	562	-1.77	0.07
Grade 8		-0.26	0.05	562	-5.01*	0.05
African-Amer.		0.13	0.04	562	2.96*	0.11
Asian		-0.10	0.14	562	-0.73	0.07
Step 2	0.35*					
Intercept		-0.07	0.11	560	-0.61	0.08
Positive Emotion		0.49	0.04	560	13.17*	0.09
Pathways Thinking		0.25	0.04	560	6.26*	0.22

*Note.* For Step 1,  $F(5, 562) = 9.36$ . For Step 2,  $F(8, 552) = 42.37$ . Demographic variables were not standardized.  $\Delta R^2$  deviate from values reported in text due to rounding.

\* $p < .05$

Table 3.4

*Summary of Regression Analyses for the c Pathway between Covariates, Positive Emotion, and Time 2 Life Satisfaction (N = 567)*

Step	$\Delta R^2$	$\beta$	SE $\beta$	df	t	Fraction of Missing Info.
Step 1	0.36*					
Intercept		-0.32	0.14	561	-2.34*	0.32
T1 Life Sat.		0.51	0.06	561	8.56*	0.67
Female		0.09	0.05	561	2.06*	0.39
Grade 7		-0.09	0.05	561	-1.74	0.39
Grade 8		-0.05	0.05	561	-0.95	0.37
African-Amer.		0.06	0.04	561	1.42	0.03
Asian		-0.27	0.13	561	-2.06*	0.27
Step 2	0.001					
Intercept		-0.06	0.51	560	-0.70	0.32
Positive Emotion		0.03	0.07	560	0.49	0.50

*Note.* For Step 1,  $F(6, 561) = 47.48, p < .05$ . For Step 2,  $F(7, 533) = 0.12, p > .05$ . Demographic variables were not standardized.

\* $p < .05$

Table 3.5

*Summary of Regression Analyses for the  $\alpha$  Pathway between Covariates, Positive Emotion, and Pathways Thinking ( $N = 567$ )*

Step	$\Delta R^2$	$\beta$	$SE \beta$	$df$	$t$	Fraction of Missing Info.
Step 1	0.18*					
Intercept		-0.06	0.13	561	-0.49	0.03
T1 Life Sat.		0.44	0.05	561	8.79*	0.40
Female		0.01	0.04	561	0.38	0.01
Grade 7		-0.04	0.05	561	-0.79	0.03
Grade 8		0.04	0.05	561	0.70	0.04
African-Amer.		-0.05	0.04	561	-1.23	0.03
Asian		-0.06	0.12	561	-0.52	0.02
Step 2	0.02*					
Intercept		-0.06	0.51	560	-0.70	0.03
Positive Emotion		0.17	0.06	560	3.40*	0.15

*Note.* For Step 1,  $F(6, 561) = 22.52, p < .05$ . For Step 2,  $F(7, 553) = 2.19, p < .05$ .

Demographic variables were not standardized.

\* $p < .05$

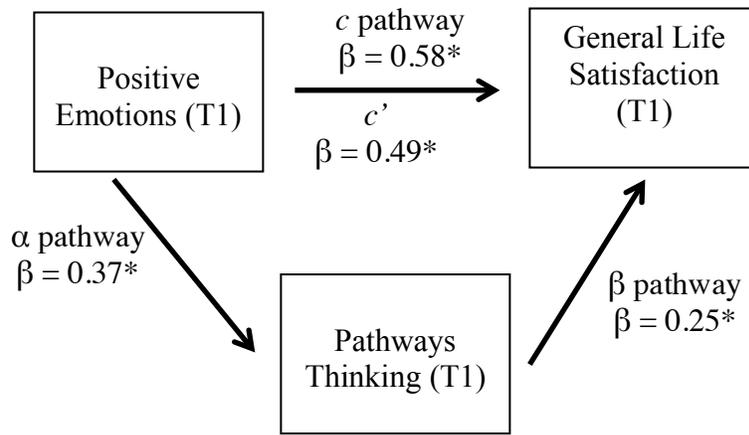
Table 3.6

*Summary of Regression Analyses for the  $\beta$  and  $c'$  Pathways between Covariates, Positive Emotion, Pathways Thinking and Time 2 Life Satisfaction ( $N = 567$ )*

Step	$\Delta R^2$	$\beta$	$SE \beta$	$df$	$t$	Fraction of Missing Info.
Step 1	0.36*					
Intercept		-0.32	0.14	561	-2.34*	0.32
T1 Life Sat.		0.51	0.06	561	8.56*	0.67
Female		0.09	0.05	561	2.06*	0.39
Grade 7		-0.09	0.05	561	-1.74	0.39
Grade 8		-0.05	0.05	561	-0.95	0.37
African-Amer.		0.06	0.04	561	1.42	0.03
Asian		-0.27	0.13	561	-2.06*	0.27
Step 2	0.002					
Intercept		-0.32	0.14	559	-2.32*	0.32
Positive Emotion		0.02	0.06	559	0.28	0.48
Pathways Thinking		0.01	0.05	559	0.30	0.34

*Note.* For Step 1,  $F(6, 561) = 47.48, p < .05$ . For Step 2,  $F(8, 553) = 0.19, p > .05$ . Demographic variables were not standardized.

\* $p < .05$



*Figure 3.1.* Conceptual model and parameter estimates for the relations between positive emotions, pathways thinking, and general life satisfaction at Time 1.

\* $p < .05$

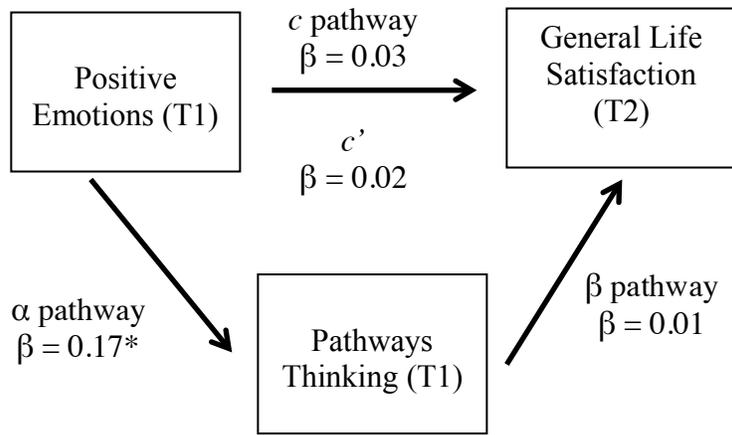


Figure 3.2. Conceptual model and parameter estimates for the relations between positive emotions, pathways thinking, and general life satisfaction over time.

\* $p < .05$

## Chapter 4: Discussion

The results of the present study partially supported the hypotheses. Positive emotion at Time 1 accounted for significant variance in life satisfaction at Time 1 after controlling for demographic information, and there was a small mediation effect of pathways thinking on the relation between positive emotions and concurrent life satisfaction. Furthermore, there was a small, but still significant, negative correlation between negative emotions and pathways thinking at Time 1. However, positive emotions at Time 1 did not predict later life satisfaction after controlling for demographic information and life satisfaction at Time 1, and pathways thinking did not significantly mediate the relation between positive emotions at Time 1 and life satisfaction at Time 2. Although the effect sizes were small in the present study and the data do not allow strong causal inferences, the findings inform the application of the broaden-and-build theory to middle school students, and they indicate that positive emotions, more than negative emotions, are related to increased pathways thinking and life satisfaction at a single time point for middle school students. The negative relationship between negative emotions and pathways thinking indicates that higher frequencies of negative emotions are related to lower levels of pathways thinking, and this finding is also not inconsistent with broaden-and-build theory. Students who experience negative emotions may experience narrowed thought-action sequences, and thus perceive fewer pathways to reach their goals.

It should be noted that although this study was informed by broaden-and-build theory, it did not directly test the theory. As noted by Nickerson (2007), a comprehensive evaluation of the broaden-and-build theory would require within-person across occasion analyses whereas this study reflects within occasion across-persons analyses. Nevertheless, the findings are informative. The finding that the mediation model was significant when tested cross-sectionally, but not longitudinally, merits further research. The cross-sectional finding indicates that positive emotions, pathways thinking, and general life satisfaction are related at a single time point in a manner that is not inconsistent with the broaden-and-build theory of positive emotions. Nevertheless, the null longitudinal finding was unexpected and warrants speculation to guide further research. One possibility is that, unlike with adults, positive emotions do not function in the hypothesized manner with middle school students over time. This null finding would significantly contribute to the literature by demonstrating a developmental difference in the impact or function of positive emotions between youth and adults; emotional experiences may function differently or be more transient across development. Larson, Csikszentmihalyi, and Graef (1980) found that adolescents experienced more intense emotions and more frequent changes in affect than did adults. Because adolescents experience both positive and negative emotions in a different intensity and frequency than do adults (Larson, Csikszentmihalyi, & Graef, 1980), they could garner fewer benefits from the experience of positive emotions over time than adults.

Alternatively, the present study may have been unable to detect a longitudinal across persons association among positive emotions, pathways thinking, and general life satisfaction because of the time period used in the study. The results of the present study

may have also been limited by the relatively lengthy time period over which data were collected. Specifically, the period of 12 months between data collection points may have been too long for the effects of positive emotion to remain in middle school students. Previous research has measured the relation between positive emotions and general life satisfaction over much shorter durations of time, such as three weeks (Cohn et al., 2009). Also, Marques, Lopez, and Mitchell (2013) found that hope at Time 1 predicted life satisfaction at Time 2, even after controlling for life satisfaction at Time 1, when there were 6 months between data collection points. It is possible that students' general life satisfaction accommodated to the positive emotions and broadened pathways thinking one year later when the second wave of data was collected. Pathways thinking may actually mediate the relation between positive emotions and life satisfaction in this population over shorter periods of time, but the present study may have been unable to detect this effect due to the time points at which data were collected. However, the results may also reflect King's (2008) concern that over time, the upward spiral of positive emotions proposed by Fredrickson (1998) should ultimately result in a maladaptive state of unending positive emotions (and related high life satisfaction), precluding a full array of emotional experiences in response to the vicissitudes of life. Perhaps there are differences in the effects of positive emotions on different variables across varying time periods for different age groups. However, studies with frequent, repeated measurements using a broad array of criterion measures are needed further illuminate the effects of positive emotions among adolescents (Nickerson, 2007).

One contribution of the present study is that the cross-sectional analysis provides preliminary support for positive emotions as a potential origin for the pathways thinking

domain of hope. However, this result should be interpreted with caution as positive emotions and pathways thinking were measured at a single time point. Furthermore, it provides evidence for a relation between increased pathways thinking and later general life satisfaction in middle school students, although the relation between positive emotions and life satisfaction was not significant over the relatively lengthy period of time used in this study. Because higher levels of both pathways thinking and life satisfaction have been previously shown to be associated with a variety of positive outcomes, such as improved academic performance and positive coping strategies, psychologists working with children may intervene to improve students' pathways thinking and general life satisfaction by implementing focused programs designed to increase pathways thinking (e.g., Ciarrochi, Heaven, & Davies, 2007; Feldman & Dreher, 2012; Onwuegbuzie & Snyder, 2000). For example, middle school students who participated in an intervention designed to increase hope reported greater levels of hope when compared to controls for 18 months after the intervention (Marques, Lopez, & Pais-Ribeiro, 2011). Such interventions may be as short as 90 minutes, inexpensive, and subsequently lead to increases in pathways thinking and goal-directed behavior (Feldman & Dreher, 2012).

There were limitations to the present study in addition to the 12-month period between time points. As noted previously, the study was limited by including only two waves of data. Because of this limitation, causal inferences could not be made regarding the relations among positive emotions, pathways thinking, and general life satisfaction. The use of multiple time points (e.g., minimum of three or more) would have resulted in a stronger test of the mediation model. An additional limitation included the lack of racial

diversity within the present study's sample; the results of the present study should be interpreted with caution for students who do not identify as African-American or White due to the low representation of other races within the present study. Nevertheless, this study provides useful information, especially with regard to highlighting the need for additional studies of the nature and impact of positive emotions in the lives of early adolescents and the possible dangers of generalizing findings from studies of adults.

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