

# Does Infant Happiness Forecast Adult Life Satisfaction? Examining Subjective Well-Being in the First Quarter Century of Life

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**Abstract** Few empirical studies have focused on young children’s happiness (high positive affect and low negative affect) and specifically whether it is related to adult well-being. Adult well-being indices (e.g., life satisfaction, workplace hope, and optimism) may have developmental roots in early affect. In the 28-year Fullerton Longitudinal Study ( $N = 129$ ) we examined positive affect and negative affect as independent constructs during infancy (parent report) and adolescence (self-report) to determine their relationship to global adult life satisfaction (self-report). In addition, we tested the generalizability of the effects of positive and negative affect in relation to domain-specific adult well-being constructs (i.e., workplace hope and optimism), which hold utility for concurrent and prospective well-being. Structural equation modeling revealed that positive affect during infancy and adolescence each uniquely predicted adult life satisfaction. In a separate model for a subsample of employed adults, infant positive affect showed significant positive associations with workplace hope and optimism. Neither infant nor adolescent negative affect predicted any adult well-being outcomes. Our results highlight the need for more developmental studies examining the relationship between children’s positive and negative affect and long-term well-being.

**Keywords** Happiness · Positive affect · Negative affect · Life satisfaction · Development · Hope · Optimism

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## 1 Introduction

Parents want their children to be happy (Diener and Lucas 2004), and happiness is a primary goal of the majority of adults worldwide (Diener 2000). Part of the larger, multidimensional phenomenon of well-being (Delle Fave et al. 2011; Keyes 2005; Ryan and Deci 2001), happiness—or subjective well-being (SWB)—consists of both affective (i.e., high positive affect, low negative affect) and cognitive (i.e., high life satisfaction) components (Diener and Emmons 1984; Lyubomirsky et al. 2005b). Research has demonstrated that SWB is not merely a pleasurable state, but it also predicts concurrent and prospective mental and physical health (e.g., Lyubomirsky et al. 2005a; Tugade et al. 2004). Despite mounting evidence of the benefits of SWB for adults, and calls for research on positive development across the lifespan (Lerner 2006; Kirschman et al. 2009; Olsson et al. 2013), evidence for the role of childhood SWB as one potential antecedent of adult well-being is limited (Saarni et al. 2006; Shin et al. 2011).

Although well-being is conceptualized in numerous ways (e.g., Keyes 2005; Lerner 2006; Lyubomirsky et al. 2005b), the focus of this study is on an aspect of well-being that submits to reasonably valid measurement in the very young: SWB. Specifically, we conceptualize infants' happiness using the affective components of SWB, not cognitive evaluations of life satisfaction which require not-yet-developed capacities, and examine whether these serve as precursors to adult life satisfaction.

Despite strong evidence that positive and negative affect are independent constructs with unique correlates (e.g., Diener and Emmons 1984; Joiner et al. 1996), they are rarely studied simultaneously as distinct constructs in children's literature, and even more rarely to predict outcomes decades later. For example, children's affect is sometimes studied as a personality trait or form of temperament, yet most of these studies focus on one type of affect (usually negative affect) or include aspects of affect in broader constructs such as surgency (a combination of activity level, approach, high-intensity pleasure, impulsivity, a lack of shyness, and smiling) or negative affectivity (a combination of specific negative emotions, reactivity, and discomfort; e.g., Guerin et al. 2003; Rothbart 2011). Other work has studied affect in the context of emotion regulation or emotion communication or as an outcome rather than an antecedent (for a review, see Saarni et al. 2006). Thus, research examining the independent long-term consequences of both positive and negative affect experienced during infancy is limited. Therefore, it makes much sense to investigate links between the early indicators of SWB (namely positive and negative affect) and a later indicator of SWB (life satisfaction).

In the current investigation, we used data from the Fullerton Longitudinal Study (Gottfried et al. 2006), which was collected from infancy through 29 years of age, to investigate whether early positive and negative affect predict life satisfaction in adulthood. In order to examine the robustness our results, we also examined links between early affect and two additional available indicators of adult well-being: workplace hope and workplace optimism.

### 1.1 Positive and Negative Affect

Affect is generally theorized to have specific action tendencies (i.e., discrete behavioral response patterns) that are associated with particular feeling states (e.g., Frijda et al. 1989; Izard 2007). For example, fear prompts individuals to escape threatening situations. Furthermore, research has also indicated that positive and negative affect have distinct physiological responses managed by different regions of the brain (e.g., Davidson and Fox 1982). In addition to these distinct physiological responses and action tendencies (Ahern

and Schwartz 1985; Izard 2007), positive affect is theorized to have distinct long-term benefits (Fredrickson 1998, 2013).

The broaden-and-build theory postulates that positive affect broadens one's repertoire of thoughts and behaviors, allowing more flexibility in decision making (Fredrickson 1998). In turn, people then build useful resources (e.g., social connections) that endure even after the initial positive affective experience has passed (Fredrickson 1998, 2013). For example, joy creates an open disposition to an increased range of actions, such as play or learning (Fredrickson 2013; Izard 2007), which often leads to interacting with others and the development of social relationships. Furthermore, positive affect is associated with life satisfaction, as well as better health and longevity (Cohen et al. 2003; Danner et al. 2001; Fredrickson 2013; Pavot and Diener 2008). Despite the growing evidence of the benefits of sustained positive affect and the evidence that positive affect builds resources over time, to our knowledge no existing longitudinal studies have linked infant affect with important indicators (e.g., life satisfaction, workplace hope, workplace optimism) of adult well-being.

Negative affect also serves adaptive functions via specific action tendencies. The fight or flight response, for example, is well documented in the literature (e.g., Frijda et al. 1989; Taylor 2006). When a person is in a stressful situation, negative affect (e.g., anger, fear) narrows the person's attention, which allows the individual to respond quickly (and, presumably, more effectively), such as fighting in cases of anger, or escaping in cases of fear (Frijda et al. 1989; Izard 2007; Keller and Nesse 2006). New research also shows stress can lead people to "tend and befriend" such that individuals protect offspring or seek out others for increased security (Taylor 2006). All of these may be viewed as adaptive responses to dangerous or stressful stimuli. Yet, prolonged negative affect can lead to maladaptive states and behaviors (e.g., anhedonia, withdrawal from social activities), and to unhealthy physiological responses (e.g., overactive cortisol), both of which can initiate a downward spiral of decreasing well-being (Peterson and Seligman 1984). Accordingly, prolonged negative affect is associated with physical and psychological health concerns (Barefoot et al. 1996; Coryell et al. 2012). Thus, negative affect is adaptive in specific situations, but can be hazardous when it is extended over long periods of time.

## 1.2 Life Satisfaction

In addition to positive and negative affect, life satisfaction is a relevant indicator of adult well-being (Pavot and Diener 2008). Over the last three decades, hundreds of studies have linked life satisfaction with numerous benefits (for a review, see Pavot and Diener 2008), including better health, more prosocial behaviors, better social relationships, lower rates of depression, and reduced risk of suicide (Diener et al. 1999; Koivumaa-Honkanen et al. 2001; Matthews et al. 2006). Notably, most of these studies focused on life satisfaction in adults, presumably because infants and young children lack the cognitive ability to provide life satisfaction judgments. Nevertheless, there may be early, measurable determinants of adult life satisfaction rooted in young children's affective experiences.

## 1.3 Workplace Hope

Adult well-being is a multidimensional phenomenon, including subjective, psychological, and social elements (e.g., Coffey et al. 2014; Delle Fave et al. 2011; Keyes 2005; Ryan and Deci 2001). In addition to life satisfaction, workplace hope and optimism have gained noteworthy attention in the adult well-being literature. Generally speaking, hope is an increasingly valued adult asset that is associated with happiness (Luthans et al. 2007a;

Snyder et al. 1999; Youssef and Luthans 2007) and is thought to hold prospective benefits for multiple life domains (Youssef-Morgan and Luthans 2013). General hope is defined as the belief and motivation that one has a realistic plan to achieve his or her desired goals (Rand and Cheavens 2009). General hope is also associated with concurrent and prospective mental and physical health outcomes (Rand and Cheavens 2009). Research on workplace hope (i.e., hope in the work domain) is also growing in prevalence due to its links with numerous beneficial domain-specific outcomes, including job satisfaction, performance outcomes, and happiness (Luthans et al. 2007a; Youssef and Luthans 2007). Given the great amount of time adults spend at their jobs, workplace hope and its consequences hold considerable weight in characterizing adults' well-being. Yet, as with life satisfaction, no research appears to have linked early affect to later workplace hope.

#### 1.4 Workplace Optimism

Similar to hope, optimism is becoming an increasingly valued asset (Seligman 1998; Luthans et al. 2007a) that is associated with adult well-being and is likely to benefit multiple life domains (Youssef and Luthans 2007; Youssef-Morgan and Luthans 2013). General optimism is defined as making positive attributions—both present and future (Luthans et al. 2007b)—but is distinguished from hope in that optimism does not necessarily involve a realistic plan that motivates a person to reach a goal (Sweetman and Luthans 2010). Broadly, adult optimism is associated with mental and physical well-being (e.g., Brissette et al. 2002; Carver and Gaines 1987). In the work context, optimism is positively associated with performance, job satisfaction, resilience, and happiness (Luthans et al. 2007a; Seligman 1998; Youssef and Luthans 2007). Despite the link between happiness and optimism, we are unaware of any studies that have explored the relationship between early affect and adult workplace optimism.

While it was desirable to include both general and domain specific measures of hope and optimism (cf. Diener et al. 2003) only domain specific (i.e., in the workplace) measures of hope and optimism were available. Nevertheless, Youssef-Morgan and Luthans (2013) proposed a model suggesting that well-being from one domain (e.g., work, health) would have a reciprocal relationship with other domains. Because infants and (some) adolescents are not yet participants of the work domain, we felt a model using infant and adolescent affect to predict adult workplace outcomes would offer a rigorous test as to whether general affect from earlier in life might predict later domain-specific outcomes.

#### 1.5 Affect During Infant and Adolescent Development

Theory and research indicate that the first few years of life furnish a life-long foundation for a person's well-being (e.g., Bowlby 1982; Power et al. 2006), yet little is known about how both positive and negative affect during the formative years of infancy uniquely contribute to later long-term well-being outcomes. Temperament studies have focused primarily on infant negative affect as a predictor of later outcomes, such as behavioral problems (e.g., Guerin et al. 2003; Guerin and Gottfried 1994). Of the less frequent temperament studies examining positive affect (often focused on infant smiling), none examine links with adult life satisfaction and workplace hope and optimism (e.g., Rothbart 2011), suggesting that research needs to examine whether and how infant positive and negative affect relate to these indicators of adult well-being (Saarni et al. 2006).

Despite the limited research examining both positive and negative affect, several studies suggest that infant positive and negative affect can be investigated, and that each may be

related to long-term outcomes. First, mothers recognize a broad range of different affective responses in their infants soon after birth (Johnson et al. 1982). Second, affect is somewhat stable over several years (Guerin et al. 2003; Schaefer and Bayley 1963), indicating that it might predict later SWB. Third, despite its relative stability, affect is related to (and likely altered by) external factors such as parent–child interactions (Feldman 2007; Waters et al. 1979), suggesting that interventions to improve infant affect might be useful.

During adolescence, a stage during which youth integrate early experiences with emerging role demands as a nascent member of the adult world, a slew of biological, cognitive, social, and environmental changes may be powerfully related to concurrent and prospective well-being. Notably, adolescents' positive affect has received more attention than infants' positive affect. For example, adolescent positive affect is associated with better parent–child relations and fewer behavioral problems (e.g. Guerin et al. 2003). Some research links preadolescent (9–12 years old) happiness with other dimensions of temperament and other well-being indicators. For example, preadolescents that were more social (with friends and family) and more active were also happier (e.g., Holder and Coleman 2009; Holder and Klassen 2010). In addition, researchers have examined how changes experienced by adolescents (e.g., onset of puberty) are related to their happiness and well-being (e.g., Reynolds and Juvonen 2012). Finally, other research has found that adolescents' use of happiness-increasing behaviors is related to SWB (Eryilmaz 2012).

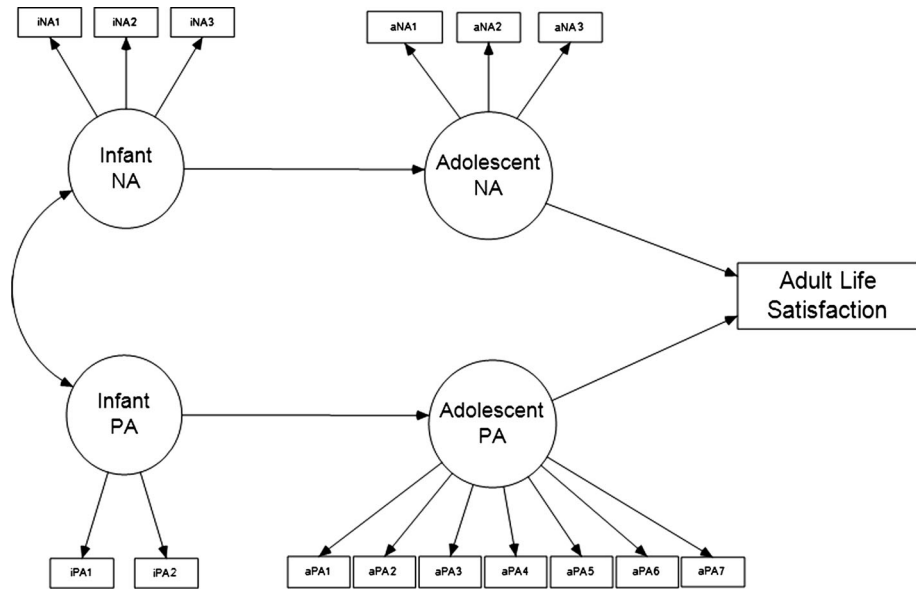
## 1.6 Current Study

This study investigates the early affective roots of several aspects of adult well-being. We begin by examining whether positive and negative affect during infancy and adolescence independently predict life satisfaction at 29 years of age (i.e., life satisfaction model), an age at which the majority of adults have undergone many major life transitions (e.g., completed education, settled into careers, started families). The gamut of complex, intervening life experiences between adolescence and age 29 (not to mention between infancy and age 29) provides a rigorous temporal context for assessing the predictive value of early positive and negative affect. Further, in a separate model (i.e., workplace model) using only employed participants, we explore the robustness of our findings by testing whether infant and adolescent positive and negative affect predict two additional domain-specific adult well-being outcomes: workplace hope and workplace optimism. Given the prevalence of the work domain in adult life, as well as research that found that workplace hope and optimism have a wide range of benefits that are thought to extend to other areas of life domains (Youssef-Morgan and Luthans 2013), these domain-specific outcomes seem particularly important for characterizing adult well-being. Finally, based on research that suggests that benefits of positive affect accrue over time (Fredrickson 2013; Lyubomirsky et al. 2005a), we hypothesized that positive affect (as compared to negative affect) would more strongly predict these adult well-being outcomes (Fig. 1).

## 2 Methods

### 2.1 Participants

This study is based on data from the Fullerton Longitudinal Study (FLS), which has followed 130 participants (48 % female) and their families from infancy through age 29. Participants were recruited using birth notifications from hospitals in Southern California.



**Fig. 1** Structural hybrid model with chronological pathways for infant NA, infant PA, adolescent NA, adolescent PA, and adult life satisfaction, with indicators displayed for each latent factor. *iNA* infant negative affect; *iPA* infant positive affect, *aNA* adolescent negative affect, *aPA* adolescent positive affect

All infants were full term, and all newborns demonstrated normal birth weight, visual status, and neurological status. Beginning in 1979, when participating children were age 1, testing occurred every 6 months through age 3.5, then annually from ages 5 through 17. In addition, participants were assessed at ages 24 and 29. Attrition was low, with at least 80 % of the original participants completing each wave. Attrition analyses were conducted on an extensive range of variables in the course of investigation (see Guerin et al. 2003), including all major standardized measures in this longitudinal study (Gottfried et al. 2006). At no point were there differences between those who continued to participate and those who did not (Gottfried et al. 2006).

The current research includes the 129 participants who were tested in at least one of the following three waves: 1.5 years old, 16 years old, and 29 years old. Participants were 47 % female, 90 % European-American, and the socioeconomic status of participants' families varied from high school drop-outs, to semi-skilled workers, to professionals. Further information on sample characteristics may be found in Gottfried et al. (1994, 2006).

For this study, participants were observed in their homes at 1.5 years old (parent reports) and in a lab at 16 years old (self-reports). For the 29 year-old wave, participants completed all measures online.

## 2.2 Measures

Several of our measures (infant positive and negative affect and adolescent negative affect) were comprised of available items from the FLS data that had not been previously validated as scales. To test the construct validity of these new scales, we examined their

**Table 1** Construct items for infant positive and negative affect and adolescent negative affect

| Construct/<br>Indicator              | Item  | Response scale   |
|--------------------------------------|---|--|
| Infant NA                            |   |  |
| iNA1                                 | “How much does your baby cry and fuss in general?”                                      | 1 = <i>very little; much less than the average baby</i> ; 4 = <i>average amount; about as much as the average baby</i> ; 7 = <i>a lot; much more than the average baby</i> |
| iNA2                                 | “How easily does your infant get upset?”  | 1 = <i>very hard to upset—even by things that upset most babies</i> ; 4 = <i>about average</i> ; 7 = <i>very easily upset by things that wouldn't bother most babies</i>   |
| iNA3                                 | “How easy or difficult is it for you to calm or soothe your baby when he/she is upset?” | 1 = <i>very easy</i> ; 4 = <i>about average</i> ; 7 = <i>difficult</i>   |
| Infant PA                            |   |  |
| iPA1                                 | “How much does your baby smile and make happy sounds?”                                  | 1 = <i>very little, much less than most infants</i> ; 4 = <i>an average amount</i> ; 7 = <i>a great deal much more than most infants</i>                                   |
| iPA2                                 | “What kind of mood is your baby generally in?”  | 1 = <i>serious</i> ; 4 = <i>neither serious nor cheerful</i> ; 7 = <i>very happy and cheerful</i>  |
| Adolescent NA                        |   |  |
| aNA1                                 | “I am a nervous person.”  | 1 = <i>False</i> ; 2 = <i>Mostly False</i> ;   |
| aNA2                                 | “I get upset easily.”   | 3 = <i>More False Than True</i> ;  |
| aNA3                                 | “I worry about a lot of things.”  | 4 = <i>More True Than False</i> ;  |
|                                      |   | 5 = <i>Mostly True</i> ; 6 = <i>True</i>   |
| Adolescent PA (Windle & Lerner 1986) |   |  |
| aPA1                                 | “Generally, I am happy.”  | 1 = <i>usually FALSE</i>   |
| aPA2                                 | “I laugh several times a day.”  | 2 = <i>more FALSE than true</i>  |
| aPA3                                 | “My mood is generally cheerful.”  | 3 = <i>more TRUE than false</i> ,  |
| aPA4                                 | “I do not find that I laugh often.”   | 4 = <i>usually TRUE</i>  |
| aPA5                                 | “I smile often.”  | ”  |
| aPA6                                 | “I do not laugh or smile at many things.”   | ”  |
| aPA7                                 | “I laugh and smile at a lot of things.”   | ”  |

associations with theoretically related constructs available in the FLS data set.<sup>1</sup> Below we describe each of our measures, and when appropriate we provide construct validity evidence for the new scales. Validity evidence for the remaining measures is provided elsewhere.

### 2.2.1 Infant Positive Affect

At 1.5 years of age, positive affect was measured with two items (see Table 1) from the Infant Characteristics Questionnaire (ICQ; Bates et al. 1979), a parent-report

<sup>1</sup> Items used to examine the construct validity of our measures are available upon request from the first author.



instrument of temperament. Parents responded to each item (e.g., “What kind of mood is your baby generally in?”) on a 7-point Likert scale (e.g., 1 = *serious*, 4 = *neither serious nor cheerful*, 7 = *very happy and cheerful*), such that higher scores indicated higher positive affect. The two items were highly correlated ( $r = .58$ ,  $p < .001$ ), suggesting internal consistency in measuring positive affect. Although researchers frequently measure affect with as little as one item (e.g., Bradley and Lang 1994; Holder and Klassen 2010), we use two items as indicators of a latent variable for infant positive affect.

Construct validity for the infant positive affect factor was examined by computing correlations with several available FLS variables measured at 2 years of age: sociability, negative mood, and fearfulness. As expected, infant positive affect was positively associated with sociability ( $r = .30$ ; Gottfried et al. 1994), and inversely associated with negative mood ( $r = -.45$ ; Fullard et al. 1984) and fearfulness ( $r = -.29$ ; Matheny et al. 1974) at 2 years old. All  $p$  values were  $< .05$ .

### 2.2.2 Infant Negative Affect

At 1.5 years of age, negative affect was measured using three items (see Table 1) from the parent-reported ICQ (Bates et al. 1979). Parents responded to each item (e.g., “How easily does your infant get upset?”) by using a 7-point Likert scale (e.g., 1 = *very hard to upset—even by things that upset most babies*, 4 = *about average*, 7 = *very easily upset by things that wouldn’t bother most babies*), such that higher scores indicated greater negative affect. The three negative affect items exhibited adequate internal consistency ( $\alpha = .70$ ) and served as indicators of an infant negative affect latent variable.

Construct validity for the infant negative affect factor was examined by computing correlations with the same variables used above: sociability, negative mood, and fearfulness. Consistent with expectations, infant negative affect was inversely associated with sociability ( $r = -.29$ ), and positively associated with negative mood ( $r = .52$ ), and fearfulness ( $r = .23$ ) at 2 years old. All  $p$  values were  $< .05$ . In addition, infant negative affect had a moderate inverse association with infant positive affect ( $r = -.64$ ). Importantly, while this association suggests that approximately 41 % of their variance was shared, the correlation was low enough to indicate that the positive and negative affect factors were empirically distinguishable from each other.

### 2.2.3 Adolescent Positive Affect

At 16 years of age, positive affect was assessed with seven items from the Revised Dimensions of Temperament Survey (DOTS-R; Windle and Lerner 1986). These seven items were collectively validated as a measure of mood in previous research (Windle 1992; Windle and Lerner 1986). Although infancy data was based on parent reports, we chose adolescent self-report measures because parent reports during adolescence are often at odds with how adolescents see themselves (cf. Sourander et al. 1999). Adolescents responded to various aspects of positive experience (e.g., “Generally, I am happy.”) by using a 4-point Likert scale (1 = *usually FALSE*, 2 = *more FALSE than true*, 3 = *more TRUE than false*, 4 = *usually TRUE*), such that higher scores reflected greater positive affect. The seven indicators of positive affect exhibited strong internal consistency ( $\alpha = .89$ ) and served as indicators of an adolescent positive affect latent variable.



### 2.2.4 Adolescent Negative Affect

At 16 years of age, negative affect was assessed with three items from the Emotional Stability subscale of the Self-Description Questionnaire-II (SDQ-II; Marsh 1990). Adolescents responded to each item (e.g., “I am a nervous person.”) by using a 6-point Likert scale (1 = *False*, 6 = *True*), such that high scores indicated greater negative affect. Internal consistency for these three items was adequate ( $\alpha = .73$ ) and the items served as indicators of an adolescent negative affect latent variable.

We also examined the construct validity of adolescent negative affect, because it consisted of a combination of available FLS items that had not been validated as a scale. In line with expectations, adolescent negative affect was inversely associated with adolescent self-esteem ( $r = -.49$ ; Rosenberg et al. 1995), pride ( $r = -.39$ ; Marsh 1990), feeling relaxed ( $r = -.66$ , Marsh 1990), competence ( $r = -.48$ , Marsh 1990), and feeling calm ( $r = -.53$ ; Marsh 1990). All  $p$  values were  $< .01$ . In addition, at odds with our infancy measures but consistent with past literature suggesting that positive and negative affect are independent constructs that are sometimes unrelated (cf. Diener and Emmons 1984; Froh et al. 2009), negative affect was not related to positive affect ( $r = -.07$ , *ns*).

### 2.2.5 Adult Life Satisfaction

The 5-item Satisfaction With Life Scale (SWLS; Diener et al. 1985) was used to assess participants' cognitive evaluations of life satisfaction (e.g., “In most ways my life is close to my ideal.”). Participants used a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*) to respond to each item. Internal consistency for the SWLS was high ( $\alpha = .92$ ). Since our sample was of modest size, we treated the SWLS (as well as the adult workplace optimism and hope scales) as observed (rather than latent) variables. This approach limited the complexity of our structural equation models<sup>2</sup> while allowing us to capitalize on the advantages of using latent variables (e.g., explicitly modeling error) for previously unvalidated measures.

### 2.2.6 Adult Workplace Optimism

The 6-item Optimism subscale of the PsyCap Questionnaire (PCQ; Luthans et al. 2007a, b) was used to assess the extent to which participants' expectations and attributions of events at work were positive (e.g., “When things are uncertain for me at work I usually expect the best.”). Participants used a 6-point Likert scale (1 = *strongly disagree*, 6 = *strongly agree*) to respond, and the internal consistency of the scale was adequate ( $\alpha = .77$ ). Since the Optimism scale was specific to the workplace domain, unemployed participants ( $n = 10$ ) were not administered this measure.

### 2.2.7 Adult Workplace Hope

The 6-item Hope subscale of the PCQ, which assessed participants' beliefs that they have *agency* in achieving work success (e.g., “Right now I see myself as being pretty successful at work.”), and *pathways* to identify and reach one's goals in the workplace (e.g., “If I should find myself in a jam at work, I could think of many ways to get out of it.”).

<sup>2</sup> We also ran analyses that treated the outcomes as latent variables and we found comparable results to those presented here.

**Table 2** Means, standard deviations, and reliability coefficients

| Latent variable                                  | Indicator | Mean  | SD   | $\alpha$         |
|--|-----------|-------|------|------------------|
| Negative affect (1.5 years)                      | iNA1      | 2.73  | 1.29 | .70              |
|  | iNA2      | 3.43  | 1.04 |                  |
|  | iNA3      | 2.72  | 1.31 |                  |
| Positive affect (1.5 years)                      | iPA1      | 4.82  | 1.19 | .58 <sup>a</sup> |
|  | iPA2      | 5.16  | .90  |                  |
| Negative affect (16 years)                       | aNA1      | 2.68  | 1.27 | .73              |
|  | aNA2      | 2.95  | 1.31 |                  |
|  | aNA3      | 3.18  | 1.45 |                  |
| Positive affect (16 years)                       | aPA1      | 3.48  | .66  | .89              |
|  | aPA2      | 3.63  | .60  |                  |
|  | aPA3      | 3.35  | .64  |                  |
|  | aPA4      | 3.65  | .58  |                  |
|  | aPA5      | 3.57  | .66  |                  |
|  | aPA6      | 3.75  | .51  |                  |
|  | aPA7      | 3.54  | .62  |                  |
| Adult life satisfaction (29 years) <sup>b</sup>  |           | 25.25 | 6.03 | .92              |
| Adult workplace hope (29 years) <sup>b</sup>     |           | 4.92  | .68  | .82              |
| Adult workplace optimism (29 years) <sup>b</sup> |           | 4.46  | .82  | .77              |

Measurement model fit indexes for the life satisfaction model ( $N = 129$ ) were CFI = .95, RMSEA = .05 (90 % CI .025–.074),  $\chi^2(96) = 129.31$ ,  $p = .013$ ; and for the workplace model ( $N = 119$ ) were CFI = .95, RMSEA = .05 (90 % CI .014–.070),  $\chi^2(106) = 133.89$ ,  $p = .035$

*iNA* infant negative affect, *iPA* infant positive affect, *aNA* adolescent negative affect, *aPA* adolescent positive affect

<sup>a</sup> Pearson  $r$  correlation

<sup>b</sup> These were measured variables consisting of composites of several items

Participants used a 6-point Likert scale (1 = *strongly disagree*, 6 = *strongly agree*) to respond to each item, and the observed internal consistency was good ( $\alpha = .82$ ). Because the Hope scale was specific to the workplace domain, unemployed participants ( $n = 10$ ) were not administered this measure.

### 3 Results

Means and standard deviations for all measured variables are displayed in Table 2.

Mplus 6.11 (Muthén and Muthén 1998–2012) was used to test the measurement model and the structural model. A sample of this size has been deemed to be moderate and sufficiently large for modeling longitudinal data (Bentler 2007; Liu et al. 2012). Altogether approximately 12 % of the data were missing for the life satisfaction model and, after excluding the unemployed, 13 % were missing for the workplace model. Missing values

**Table 3** Factor loadings and correlations among latent variables in the measurement model

| Latent variable (with indicators beneath) | $\lambda$ | 1       | 2       | 3    | 4     | 5 | 6      | 7      |
|---|-----------|---------|---------|------|-------|---|--------|--------|
| 1. Infant negative affect                 |           | –       | –.66*** | –.05 | –.11  | – | –.11   | –.18   |
| iNA1                                      | .80***    |         |         |      |       |   |        |        |
| iNA2                                      | .63***    |         |         |      |       |   |        |        |
| iNA3                                      | .56***    |         |         |      |       |   |        |        |
| 2. Infant positive affect                 |           | –.64*** | –       | –.13 | .06   | – | .27**  | –.24*  |
| iPA1                                      | .67***    |         |         |      |       |   |        |        |
| iPA2                                      | .86***    |         |         |      |       |   |        |        |
| 3. Adolescent negative affect             |           | .03     | –.14    | –    | .00   | – | –.14   | –.18   |
| aNA1                                      | .82***    |         |         |      |       |   |        |        |
| aNA2                                      | .51***    |         |         |      |       |   |        |        |
| aNA3                                      | .77***    |         |         |      |       |   |        |        |
| 4. Adolescent positive affect             |           | –.13    | .04     | –.08 | –     | – | .21    | .17    |
| aPA1                                      | .66***    |         |         |      |       |   |        |        |
| aPA2                                      | .76***    |         |         |      |       |   |        |        |
| aPA3                                      | .67***    |         |         |      |       |   |        |        |
| aPA4                                      | .94***    |         |         |      |       |   |        |        |
| aPA5                                      | .81***    |         |         |      |       |   |        |        |
| aPA6                                      | .77***    |         |         |      |       |   |        |        |
| aPA7                                      | .55***    |         |         |      |       |   |        |        |
| 5. Adult life satisfaction <sup>a</sup>   |           | –.13    | .33**   | –.05 | .33** | – | .46*** | .39*** |
| 6. Adult workplace hope                   |           | –       | –       | –    | –     | – | –      | .64*** |
| 7. Adult workplace optimism               |           | –       | –       | –    | –     | – | –      | –      |

Values below the diagonal, including standardized factor loadings ( $\lambda$ ), are from the life satisfaction model ( $N = 129$ ); values above the diagonal are from the workplace model ( $N = 119$ ). Correlations between life satisfaction and each of hope and optimism were not part of the workplace model

*iNA* infant negative affect, *iPA* infant positive affect, *aNA* adolescent negative affect, *aPA* adolescent positive affect

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

<sup>a</sup> These were measured variables consisting of composites of several items

were implicitly handled by the program using full information maximum likelihood (FIML) to model the missing data within the context of the Mplus structural equation modeling framework. FIML uses all of the data present in a model to compute unbiased parameter estimates and standard errors in a single step (Graham 2009). Maximum likelihood estimation with robust standard errors was used so as to minimize the negative impact of non-normality in the data.

### 3.1 Measurement Model

We first tested the parameter and goodness of fit estimates of the measurement model. Factor loadings and correlations among constructs are displayed in Table 3. The four latent variables and one measured variable exhibited discriminant validity, as no correlations were close to 1.0 (max  $r = -.64$ ). Thus, empirical underidentification was not a problem. Also,

several correlations were moderate to high and were statistically significant, suggesting convergent validity among several constructs. These results suggest that a structural model may usefully depict developmental associations over time among the constructs.

The measurement model also exhibited adequate fit, CFI = .95, RMSEA = .05 (90 % CI .025–.074),  $\chi^2(96) = 129.31$ ,  $p = .01$ . Although no consensus has been reached in standards for determining goodness of model fit (cf. McDonald and Ho 2002), these indices collectively suggest that the measurement model was an adequate fit to the observed covariance matrix (Byrne 2012).

### 3.2 Life Satisfaction Model

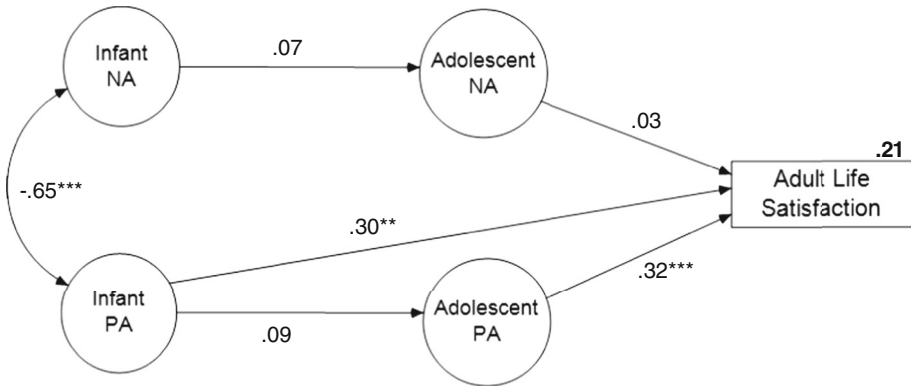
To examine our research question as to whether early affect predicts later life satisfaction, chronological pathways were then added to the measurement portion of the model to form the structural model. Casual paths were added from infant positive and negative affect to their respective adolescent counterparts and then from adolescent positive and negative affect to adult life satisfaction (see Fig. 2). Initial model fit was adequate, CFI = .94; TLI = .93, RMSEA = .051 (90 % CI .025–.073);  $\chi^2(100) = 134.06$ ,  $p = .01$ . Next we examined the Mplus modification indices as a way to determine if any other chronologically relevant paths were indicated to improve model fit. A direct path from infant positive affect to adult life satisfaction was indicated. Because it is theoretically plausible that infant positive affect (and not infant negative affect) may build resources (e.g., physical health) that contribute to adult life satisfaction without necessarily enhancing adolescent positive affect, we added this path to the model. After adding this path to the model, the model exhibited adequate fit, CFI = .95; TLI = .94; RMSEA = .047 (90 % CI .017–.070);  $\chi^2(99) = 127.66$ ,  $p = .03$ , and a Satorra-Bentler scaled Chi square difference test revealed the second model fit significantly better than the initial structural model,  $\chi^2_{diff}(1) = 6.37$ ,  $p = .01$ .

The standardized path coefficients of the final model<sup>3</sup> indicate that positive affect in infancy had a moderate positive association with life satisfaction in adulthood,  $\beta = .30$ ,  $p = .007$ . That is, positive affect at 18 months of age significantly predicted life satisfaction approximately 27 years later. Likewise, adolescent positive affect had a moderate positive association with adult life satisfaction,  $\beta = .32$ ,  $p < .001$ . Together, the two positive affect variables accounted for approximately 21 % of the variance in adult life satisfaction. On the other hand, negative affect during infancy and adolescence did not have significant associations with adult life satisfaction. These results underscore the role of infant and adolescent positive affect in forecasting adult life satisfaction (Fig. 2).

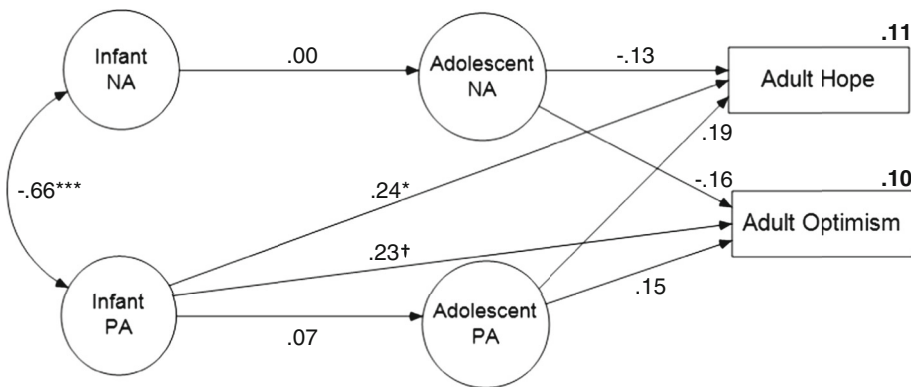
### 3.3 Workplace Model

In order to provide a rigorous test of the reliability of these findings, we examined the roles of the same infant and adolescent affect variables in predicting two new, workplace-specific dependent variables in adulthood: hope and optimism (see Fig. 3). This is an important step for more rigorously testing our findings because life satisfaction, although correlated with workplace hope ( $r = .39$ ,  $p < .001$ ) and optimism ( $r = .46$ ,  $p < .001$ ), is conceptually and empirically distinct from these constructs. Also, in our sample workplace

<sup>3</sup> The final models were also estimated with gender and SES serving as covariates predicting each endogenous variable. Because inclusion of these covariates did not change the pattern of results, we report findings for the parsimonious final models that excluded these variables.



**Fig. 2** Final life satisfaction model of infant NA, infant PA, adolescent NA, adolescent PA, and adult life satisfaction, with indicators displayed for each latent factor ( $N = 129$ ). Standardized path coefficients are shown on the causal arrows. The *bold value* in the *upper right corner* of adult life satisfaction is a squared multiple correlation. For simplicity, indicators for each latent affect variable are not shown. Indicators all loaded between .51 and .94 ( $p < .001$ ). Model fit was adequate: CFI = .95; TLI = .94; RMSEA = .047 (90 % CI .017–.070);  $\chi^2(99) = 127.66, p = .03$ .  $**p < .01$ ;  $***p < .001$



**Fig. 3** Workplace model of infant NA, infant PA, adolescent NA, adolescent PA, adult hope, and adult optimism ( $N = 119$ ). Standardized path coefficients are shown on the causal arrows. The *bold values* in the *upper right-corners* of the adult hope and adult optimism variables are squared multiple correlations. For simplicity, indicators for each latent affect variable are not shown. Indicators all loaded between .50 and .82 ( $p < .001$ ). Model fit was good: CFI = .96; TLI = .95; RMSEA = .044 (90 % CI .000–.067);  $\chi^2(111) = 136.19, p = .05$ . <sup>†</sup> $p = .06$ ;  $*p < .05$ ;  $***p < .001$

hope and optimism were correlated with each other at  $r = .62, p < .001$ , showing a high degree of similarity, but not so high as to suspect they represent the same construct. Other research further documents their discriminant validity (Luthans et al. 2007a, b). The model exhibited good fit to the observed covariance matrix, CFI = .96; TLI = .95; RMSEA = .044 (90 % CI .000–.067);  $\chi^2(111) = 136.19, p = .05$ .

The standardized path coefficients indicated that infant positive affect was positively associated with adult workplace hope,  $\beta = .24, p = .02$ . Adolescent positive affect had a marginally significant association with adult hope ( $\beta = .19, p = .08$ ). However,

neither infant nor adolescent negative affect predicted hope. Altogether, about 11 % of the variance in adult hope was accounted for. These results partially replicate the findings from our primary analysis such that infant positive affect predicts adult workplace hope.

With respect to adult workplace optimism, infant positive affect had a marginally significant positive association with optimism,  $\beta = .23$ ,  $p = .06$ , but neither infant negative affect nor adolescent positive or negative affect predicted adult optimism. Altogether, about 10 % of the variance in optimism was explained by the affect variables. As was found for hope, these results provide evidence that infant positive affect may be a precursor for adult workplace optimism.

## 4 Discussion

This study provides longitudinal evidence concerning the early developmental roots of adult life satisfaction, hope, and optimism, using data that spans from infancy to adulthood. Consistent with the broaden-and-build theory of positive emotions, we found links between early positive affect and a range of adult well-being constructs in a sample of participants assessed from infancy through 29 years of age. Using multiple reporting methods, we found that positive affect during infancy and adolescence each independently predicted adult life satisfaction. However, neither infant nor adolescent negative affect predicted life satisfaction. These findings suggest that life satisfaction may have its roots in early affective experiences, prior to the development of the cognitive processes thought necessary for making life satisfaction judgments. We also examined additional indicators of adult well-being to provide a rigorous test of the generalizability of the role of early affect, and found that infant positive affect (but not negative affect) predicted domain-specific adult outcomes—workplace hope and optimism.

### 4.1 Positive, But Not Negative, Affect Predicts Adult Well-Being

In this study, infant positive affect predicted adult life satisfaction and workplace hope and optimism; adolescent positive affect, independent of infant positive affect, predicted adult life satisfaction. Given that positive affect in adults is known to broaden one's thought-action repertoire and hence build useful resources over time (e.g., expanded social networks) and that positive affect can undo the effects of negative affect (Fredrickson 2013), our results are consistent with past research that indicates many long-term, prospective benefits of positive affect. While our study did not directly test the operation of broaden-and-build mechanisms (e.g., broadened thinking), our positive affect findings do offer preliminary evidence that is consistent with the idea that broaden-and-build mechanisms may operate in infancy, and may account for far-reaching consequences for well-being.

The fact that positive affect in infancy and adolescence was associated with adult well-being bears similarity to recent work that found behavioral activity in childhood and adolescence predicted personality factors approximately three decades later (Pulkkinen et al. 2012). Interestingly, in that study adult personality factors were related to behavioral activity at age 8 for *males* (but not females), whereas adult personality was related to age 14 behavioral activity for *females* (but not males). Based on these findings, it may be worth utilizing a sufficiently large sample to examine whether gender similarly moderates the effects of infant and adolescent positive affect on adult well-being.

Interestingly, positive affect, but not negative affect, early in life was linked to greater adult life satisfaction, workplace hope, and workplace optimism. These findings have several implications. First, this study offers evidence that infant and adolescent positive affect is a stronger predictor than negative affect, regarding certain long-term well-being outcomes. Second, our findings suggest that infant and adolescent negative affect hold little instrumental value in the development of adult life satisfaction, workplace hope, and workplace optimism, perhaps because the protective benefits of negative affect (e.g., fight or flight) are more proximal in time to moments of stress. Alternatively, approximately half of the variance in adult happiness is biologically determined (Lykken and Tellegen 1996; Lyubomirsky et al. 2005b) and infant positive affect may represent a general positivity predisposition. Therefore, future studies should test the idea that infant positive affect could indicate an underlying genetic positivity predisposition.

Although the two types of affect are often inversely related (cf. Diener et al. 2003), only positive affect was related to adult life satisfaction, workplace hope, or workplace optimism in our study, adding further support that positive and negative affect are separate constructs (cf. Diener and Emmons 1984), and implying that interventions targeting positive affect versus negative affect may have separable long-term outcomes. Interventions with children, adolescents, and adults have been able to boost short-term well-being (Froh et al. 2009; Layous et al. 2012; Nelson et al. 2013). Furthermore, studies have shown that environmental factors (e.g., interactive or responsive parents) are related to changes in infant positive affect (Feldman 2007; Waters et al. 1979). Thus, our results indicate that because positive affect in infancy and adolescence predicted life satisfaction, future research may explore these developmental periods as potentially fruitful intervention windows during which increasing frequency of positive affect may have long-term benefits.

Negative affect may have also been unrelated to adult well-being outcomes in the current study because of the ability of humans to cope with negative experiences and thereby minimize their impact. For example, by the time people reach adulthood, they may have reframed negative events experienced earlier in life, such that they no longer impact adult well-being (cf. Folkman 2008). Thus, adolescent negative affect might not be as important for later life satisfaction judgments if they are subsequently reframed as growth experiences.

Neither positive nor negative affect during infancy predicted their respective counterparts during adolescence, nor were positive and negative affect significantly related in adolescence. We explore two possible explanations for the former null finding. First, this could indicate a lack of stability between infant affect and affect experienced during adolescence. Past studies have found weak to moderate stability in affect over shorter periods (e.g., 2 years) of time during infancy, childhood, and adolescence (e.g., Guerin et al. 2003; Rothbart 2011). Adult literature suggests the stability of affect decreases as the time interval between measurements increases (Diener et al. 2003). Notably, a small correlational study of positive affect did not find relationships between multiple positive affect ratings from infancy to adolescence, and the authors argued that rapid changes in social and emotional behaviors during adolescence likely account for this non-relationship (Schaefer and Bayley 1963). Between 18 months and 16 years of age, children experience many biological (e.g., puberty) and environmental changes (e.g., school transitions) coupled with a 14.5 year gap that could explain this lack of stability in affect. In addition, there could be numerous other studies with similar correlations that have not been published because they are regarded as null findings (see Rosenthal 1979). Second, differences in



reporting method may have contributed to an apparent lack of stability in affect. Whereas infant happiness was reported by parents, adolescent happiness was self-reported, so the null associations may be attributable to the use of different reporters.<sup>4</sup> With regard to the nonsignificant relationship between adolescent positive and negative affect, this correlation often varies (Diener et al. 2003) and several studies of adolescent participants found nonsignificant associations between positive and negative affect (Froh et al. 2009; Joiner et al. 1996). Perhaps the unreliable association between positive and negative in adolescence is a reflection of the complexity of adolescence, or of the overwhelming influence of contexts (as compared with internal resources) in determining adolescent affect, although this is just conjecture.

#### 4.2 Limitations and Future Directions

Despite the strengths of this study, some limitations are worth considering. This study examined a limited number of well-being constructs as dependent variables (i.e., life satisfaction, hope, optimism), yet well-being is a much more varied and multidimensional construct (e.g., Coffey et al. 2014; Delle Fave et al. 2011; Keyes 2005; Ryan and Deci 2001). Indeed, research has shown that positive and negative affect uniquely relate to many other outcomes, including physical and mental health (Lyubomirsky et al. 2005a). Also, we used long time intervals that skipped other developmental stages because the available FLS data did not contain similarly reported affect measures in early and middle childhood, which would have allowed for greater understanding of affect and its stability across childhood. Similarly, the FLS data did not contain other adult measures of affect, general hope, or general optimism that would have made additional relevant analyses possible. Furthermore, our modest sample size was somewhat limited for SEM analyses such that we used observed rather than latent outcome variables. In addition, this sample was primarily European American and past research has shown that associations between affect and life satisfaction may differ across cultures. For example, members of individualistic cultures rely more heavily on their affect experiences when making life satisfaction judgments than do members of collectivistic cultures (Suh et al. 1998).

This study offers initial evidence regarding the early roots of adult well-being, and in so doing suggests a need for several additional lines of investigation. Future research should explore factors that might explain individual differences in SWB at different ages in a similar longitudinal design with more frequent measures of affect and life satisfaction and a greater array of measures of adult well-being. For example, research should investigate whether our findings on the role of affect variables generalize to outcomes more closely aligned with negative affect, such as anxiety, or to other positive psychological and physical health outcomes. Further, more frequent measures of positive and negative affect and measures that test for broaden-and-build mechanisms (e.g., broadened thinking and action) throughout development may help test whether positive affect builds resources across the lifespan as suggested by the broaden-and-build theory (Fredrickson 1998, 2013).

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<sup>4</sup> When we tested the association between parent reports of *both* infant positive affect and adolescent positive affect, we found a statistically significant link. The data set did not contain parent reports for adolescent negative affect at this age. While the positive affect finding would lend partial support the notion of continuity in affect over time, adolescents' reports of their own well-being are likely to more accurately reflect their internal states (cf. Sourander et al. 1999), as compared with parent reports of adolescent affect. Parent reports of adolescent positive and negative affect did not predict any of our adult outcomes. Further, these associations may reflect shared method variance rather than true covariation between infant and adolescent affect.

More frequent measurement would also help to understand why the infant positive and negative affect pathways were not related to their adolescent counterparts. In addition, developmental studies of positive and negative affect should be conducted across different cultures that might experience or value positive and negative affect differently than our sample and across populations of hardships (e.g., poverty, wartime conditions) where negative experiences are prolonged or ongoing. Future studies should investigate if the results hold in the same way for older adults. Furthermore, researchers have identified different affect predispositions and affective profiles (e.g., high positive affect and high negative affect, low positive affect and high negative affect) in adults (e.g., Norlander et al. 2002) that could be used to gain further understanding of individual differences by testing whether one's affective profile in earlier developmental periods predicts later well-being or buffers against negative experiences. Finally, interventions that cultivate positive affect in infancy and adolescence should be tested as ways to boost long-term well-being. Together, research on these topics will extend the understanding of SWB throughout development.

By assessing well-being across 28 years, this study sheds empirical light on the significance of infant and adolescent affect on adult well-being. This study found moderate independent effects of positive affect during infancy and adolescence on adult life satisfaction using other- and self-reported data. Moreover, the salutary role of positive affect in infancy seems to generalize across several adult well-being outcomes, which in their own right have been found to have prospective benefits. Along with the fact that parents place high value on their children's happiness, these results underscore the importance for developmental scientists to better understand the long-term consequences of early SWB.

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