Continuity, Stability, and Change in Daily Emotional Experience across Adolescence

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This longitudinal study examined change in adolescents’ daily range of emotional states between early and late adolescence. A sample of 220 youth provided reports on their daily emotions at random times during two 1-week periods. At Time 1 they were in the fifth through eighth grades; 4 years later, at Time 2, they were in the ninth through twelfth grades. Results showed that average emotional states became less positive across early adolescence, but that this downward change in average emotions ceased in grade 10. The results also showed greatest relative instability between youth in the early adolescent years—correlations over time were lower—with stability increasing in late adolescence. Lastly, the study found that adolescents’ average emotions had relatively stable relations to life stress and psychological adjustment between early and late adolescence. As a whole, the findings suggest that late adolescence is associated with a slowing of the emotional changes of early adolescence.

INTRODUCTION

Questions of continuity versus change are among the most basic of developmental life-span psychology (Block, 1971; Brim & Kagan, 1980; McCrae & Costa, 1990). To what extent is a person’s behavior, personality, and experience stable versus discontinuous over time? Adolescence is often described as a period of flux: a time when previously well-adjusted and happy youth can become distressed (Freud, 1946; Gurian, 1996; Pipher, 1994), as well as a time for “second chances” and opportunities to reinvent oneself (Csikszentmihalyi & Larson, 1984; Erikson, 1968). Research suggests that discontinuity may be greatest in early adolescence, a time when a pile-up of normative life changes and events is disruptive for many youth (Petersen, Kennedy, & Sullivan, 1991; Simmons, Burgeon, Carlton-Ford, & Blyth, 1987), but research is unresolved as to whether late adolescence is a time of greater stability.

This study examined questions of constancy versus change in adolescents’ emotional experience—in their daily range of positive and negative affect. Experiencing greater happiness than unhappiness is important both as an element of mental health and, in its own right, as a fundamental “good” of human existence. High rates of negative emotion are also related to problem behavior and lower prosocial behavior (Eisenberg et al., 1996; Rothbart & Bates, 1998). The present study examined the extent to which the daily range of adolescents’ positive-to-negative emotion remained constant versus changed across the period of adolescence, particularly late adolescence. Constancy was evaluated, first, in terms of similarity of group means across ages. Does average emotional experience become more negative or positive? Following the nomenclature used by other authors (McCall, 1977; Moss & Susman, 1980), this is referred to in this article as “continuity.” Second, constancy was evaluated in the relative ranking of individuals (i.e., degree of correlation) across time, which has been called “stability” or “relative stability.” Do happy people remain happy or does reordering take place? Third, constancy was examined across this age period in the association of emotional experience with other variables, specifically life stress and adjustment. Does emotional experience have a consistent relation to distress and well-being over time?

To investigate these issues, a cross-sequential study was performed in which in situ data on hour-to-hour emotions were gathered at two points in time across the span from fifth to twelfth grades. At Time 1, the sample of 220 included students in the fifth through eighth grades—representing the pre- and early adolescent age periods. At Time 2, four years later, these youth were in the ninth through twelfth grades, the period of middle and late adolescence. At both Time 1 and 2, data were collected using the Experience Sampling Method (ESM; Csikszentmihalyi & Larson, 1987), in which participants carried electronic pagers and provided reports on their immediate emotions at random times when signaled by the pagers. The sample was limited to European American working- and middle-class Chicago suburban youth; hence, generalizations are limited to that cultural and socioeconomic population frame. This article...
is a follow-up to prior reports on a larger sample of fifth- through ninth-grade students who were studied cross-sectionally at Time 1 (Larson & Ham, 1993; Larson & Lampman-Petraitis, 1989; Larson & Richards, 1994a).

The contribution of this study is to examine age changes in daily affect into the high school years. Although past studies have employed global questionnaire reports on affect (particularly depressive affect) to examine trends into high school, this study went further by examining data on immediate emotions as reported during daily experience. Global questionnaire reports on affect are subject to distortions due to people’s poor memory for attentive experiences and response sets, such as impression management (Diener, Suh, Lucas, & Smith, 1999; Kahneman, 1999; Thomas & Diener, 1990), thus it was imperative to verify patterns in emotional experience using immediate reports. The discrepancy between global and immediate reports was illustrated in a small 2-year longitudinal study by Freeman, Csikszentmihalyi, and Larson (1986), in which, on a global report, high school juniors and seniors almost unanimously perceived themselves to be happier than they were 2 years earlier, although immediate ESM reports collected at both points in time showed no change in average daily happiness.

Early Adolescence as a Time of Disruption and Transition

Past and current theory has focused on early adolescence as a time of greatest changes in emotional experience. Psychoanalytic theorists attributed this to internal psychological changes. Anna Freud (1946, 1958) presented early adolescence as a time when unpredictable increases in libidinal drive related to puberty and new demands of the superego create emotional upheaval.

Recent literature has given more emphasis to the role of external factors in driving emotional changes. Petersen, Kennedy, and Sullivan (1991) described early adolescence as a time of “developmental transitions,” including the change from elementary to middle or junior high school, changes in peer expectations, increased life stress, and changes in relationships and roles within the family and other contexts. These authors also pointed to internal changes in cognitive abilities and the physical transformations of puberty; however, they and others (Brooks-Gunn, Graber, & Paikoff, 1994) have found evidence that the impact of puberty is due more to changes in how the adolescent and others react to the new body than to direct biological impacts on the brain. Like Anna Freud, Petersen and colleagues emphasized the unpredictability of these transitions; they cited Hamburg’s (1974) comparison of the changes of this age period to a lottery. Adolescents are subject to a set of transformations that are, in part, outside of their control (Buchanan, Eccles, & Becker, 1992; Graber & Brooks-Gunn, 1996; Petersen & Leffert, 1995).

Evaluation of the role of these internal and external factors in changing adolescents’ emotional experience was beyond the scope of the present study and not possible with the data available. Thus, the focus was on the more limited goal of assessing whether such changes occur, and particularly whether they continued or diminished in middle and late adolescence.

Continuity versus Discontinuity in Normative Patterns across Adolescence

The first question was whether, as an aggregate, adolescents show a trend toward more positive or dysphoric affect across this age period. The trend across the adult life span is for people to experience fewer negative emotions as they get older, and most studies show less frequent intense positive emotions (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Diener, Sandvik, & Larsen, 1985; Diener et al., 1999; Lawton, Kleban, Rajagopal, & Dean, 1992; Mroczek & Kolarz, 1998). Three studies that employed immediate reports on experience have confirmed that rates of negative affect and extreme positive affect are lower among adults than adolescents (Larson, Csikszentmihalyi, & Graef, 1980; Larson & Richards, 1994b; Verma & Larson, 1999). Carstensen attributes the trend toward diminished negative affect with age to the developing capacity for emotional regulation and greater priority given to emotional regulation as people get older (Carstensen & Charles, 1998; Carstensen, Isaacowitz, & Charles, 1999).

Early adolescence appears to be an anomaly to the general developmental trend toward diminished frequency of negative emotion. Larson and Lampman-Petraitis (1989) analyzed a set of 18,000 ESM reports on emotions provided by a cross-sectional sample of 483 suburban, European American fifth- through ninth-grade students (the dataset from which the present study’s Time 1 data were drawn). They found a significant downward trend in average emotional states for both boys and girls across this age period, attributable to both decreased frequency of extreme positive states and increased frequency of negative states. Larson and Richards (2000) analyzed a set of 8,500 ESM reports from a sample of 253 urban African American fifth- through eighth-grade students and
found the same trends toward less extreme positive and more negative affect across this period. Other research that used questionnaire and clinical interviews also found an increase in reported negative affect, especially depression, across the transition into adolescence (Elliott, Huizinga, & Menard, 1989), particularly for girls (Magnusson, 1988; Petersen, Sargiani, & Kennedy, 1991; Rutter, 1980, 1986).

Research on whether this downward trend in emotions continues or reverses in middle and late adolescence is less complete and conclusive. The largest factor associated with increased dysphoria in early adolescence is stressful life events (Brooks-Gunn & Warren, 1989; Larson & Ham, 1993; Simmons & Blyth, 1987), and research indicates that the number of stressful life events levels out or even declines in later adolescence (Brooks-Gunn, 1991; Compas, Davis, & Forsythe, 1985; Ge, Lorenz, Conger, Elder, & Simmons, 1994; Graber & Brooks-Gunn, 1996). Perhaps as a result of this trend for stress, existent research suggests that the rise in negative affect in early adolescence levels out and may even begin to reverse at the end of adolescence. The one prior ESM study that spanned early and late adolescence found that average reports of happiness (versus sadness) declined across early adolescence but then leveled out in the high school years, with no gender differences (Moneta, Schneider, & Csikszentmihalyi, 2001). This study, however, relied on a single-item measure of affect and, although longitudinal, only 13% of the sample provided complete data, thus permitting large but unknown effects of self-selection. Using a questionnaire measure, a recent longitudinal study of Norwegian youth found that girls' depressive affect increased from age 13 to 15, leveled out until age 18, and then declined at age 19; whereas boys' depressive mood was stable across this period until age 18, and then declined at age 19 (Holsen, Kraft, & Vittersø, 2000). However, a longitudinal questionnaire study of New Jersey youth found this inverted-U pattern in depressed mood to occur for both boys and girls (Chen, Mechanic, & Hansell, 1998).

The current study employed longitudinal ESM data to evaluate the trajectory of adolescents' average daily, immediate emotional states into and through the high school years. The Time 1 data for the current study was a subset of the fifth- through eighth-grade students used in the report by Larson and Lampman-Petraitis (1989); hence, this study examined whether the cross-sectional downward trend in emotional experience across that age span continued or leveled out into the ninth- through twelfth-grade period. Also examined was whether these age trends differed for boys versus girls.

Relative Stability versus Instability in Daily Emotional States

This study's second question was whether individuals change relative to each other. Irrespective of the group age trends evaluated under the first question, are there shifts among youth in their average level of affect, or are differences among people stable? Do specific individuals maintain the same relative ranking in how happy-to-unhappy their daily lives are?

Discussions of early adolescence have emphasized that individuals may differ greatly in their experience of this transitional period. Coleman (1974) theorized that some adolescents experience the life changes of this period as spaced out over time, allowing them to cope and adjust to each one without experiencing major disruption. Other youth, however, experience multiple changes at once, which may overtax their ability to cope, and have more negative effects on their well-being. Simmons and colleagues (1987) obtained support for this theory, showing that young adolescents who experience a "pile up" of life changes show negative effects on their self-esteem, school grades, and participation in extracurricular activities. These differences between individuals could be expected to create instability in emotional experience (i.e., changes with age in the relative rankings among youth in levels of happiness to unhappiness).

On the other hand, to the extent that daily emotions are a product of underlying temperament, attributable to genes or early experience, greater stability would be expected as adolescents get older. Questionnaire research establishes a clear role of genetic and early experience in shaping emotional experience (Chorpita & Barlow, 1998; Diener et al., 1999). Stability in adolescents' daily environments—for example, in their family environments—might also contribute to stability in emotional experience (Diener et al., 1999; Kozma, Stone, & Stone, 2000). In two studies in the United States and India in which young adolescents and their parents provided ESM reports, correlations for average affect between young adolescents and their mothers were $r = .53$ (United States) and .43 (India), and between young adolescents and their fathers were $r = .46$ and .37, respectively (Larson & Richards, 1994b; Verma & Larson, 1999). Although there is no way to parse out the contribution of genetic and environmental factors to these correlations, they do suggest the role of either or both in adolescents' daily affective experience. It should also be noted, however, that gene expression can be timed to occur at any point in development or can be triggered at any point in the life span as a result of environmental factors (Brown, 1999). Thus, both
genes and environments could contribute to instability at any point.

Prior questionnaire research that focused on other variables provides some evidence that early adolescence may be a life stage of greater relative instability (Chess & Thomas, 1984; Eccles et al., 1989; Kagan & Moss, 1962; Schaefer & Bayley, 1963; Simmons & Blyth, 1987). Little research is available, however, that indicates whether stability in affect increases in later adolescence. Holsen et al. (2000) found cross-time correlations in depressed mood scores to rise slightly for intervals across older age periods, but reported no tests of whether this rise was statistically significant.

The current study permits assessment of the stability of emotions across the period from fifth to twelfth grade using hour-to-hour data on emotions. Because it was cross-sectional, the earlier data did not permit analyses of within-person trends over time. The new longitudinal data allow for these analyses, including comparison of cohorts that were making transitions across different age spans. A limitation of the current study is that the 4-year gap between Time 1 and 2 restrained the ability to evaluate narrow time periods. Nonetheless, instability was expected to be greater for youth traversing earlier age spans.

An important related question is, how many youth show negative versus positive changes across the adolescent period? A number of authors have shown that extreme emotional turmoil is experienced by only a minority of adolescents (Offer, Ostrov, & Howard, 1981; Rutter, 1980; Rutter & Rutter, 1993). It is possible that age changes in the frequency of happy and dysphoric affect for the sample as a whole could be due to a subgroup of youth. In the current study, longitudinal data allowed for the ability to evaluate what proportion of youth experienced increased negative affect with age.

Stability in the Correlates of Daily Emotions

The third question of the present study was whether daily emotional experience has stable correlates with life stress and adjustment across this 8-year age span. Although the design of this study did not permit evaluation of causal relations, examination of age differences in correlations could be used to test whether the concurrent correlations between affect and these other variables differed with age.

Prior research suggests that the negative emotion of early adolescent is partly a result of life stress (Brooks-Gunn & Warren, 1989; Merikangas & Angst, 1995; Simmons & Blyth, 1987; Simmons et al., 1987). Yet, using the Time 1 data from this study, Larson and Ham (1993) found that the correlation between stress and negative affect emerged between the fifth and sixth and seventh and ninth grade. For the younger age period, life stress was not significantly related to negative affect. To explain this finding, they proposed that developmental changes across this age span, such as increased cognitive awareness of the implications of negative events, may make older youth more sensitive and emotionally vulnerable to negative life events. The question, then, is does this apparent increased vulnerability continue to increase, stabilize, or diminish in later adolescence?

Negative affect is also conceptualized as a cause and a symptom of mental health problems, and it is important to ask whether this linkage to mental health may change across the adolescent years. Using the Time 1 data, Larson, Raffaeli, Richards, Ham, and Jewell (1990) found that emotional states had a weaker relation to other depressive symptoms in the preadolescent than the early adolescent age period. One explanation that they suggested was that negative affect was a less cardinal feature of depression prior to adolescence, an explanation supported by some research (Ushakov & Girich, 1972). This raises the question of whether the relation of negative affect with depression and behavioral indicators of psychological maladjustment continues to increase, or stabilizes beyond early adolescence. Another possibility is that depressed preadolescents may be less able to label their negative affect (Kovacs, 1986) and thus report it less often and less reliably, a phenomenon that would reduce correlations for this age group.

The analyses performed in the present study employed longitudinal data from a subsample of the youth examined in Larson and Ham (1993) and Larson et al. (1990); hence, the new contribution of this study is to evaluate whether the strength of the correlations found for the early adolescent period continued to rise or stabilized as youth moved into the high school years.

METHOD

Sample

Data were obtained from 220 working- and middle-class European American youth from four suburban Chicago neighborhoods. At Time 1, these youth were almost evenly distributed across the fifth through eighth grades (ages 10–14). At Time 2, which occurred approximately 4 years later, they were in the ninth through twelfth grades (ages 13–18). In two of the neighborhoods, students were in small kindergarten through eighth-grade schools at Time 1 and a large 4-year high school at Time 2. In the two other neighbor-
hools, students were spread across small elementary and middle schools at Time 1 (one school had a fifth–sixth grade transition, the other a sixth–seventh grade transition), and were in a large 4-year high school at Time 2. Thus, all students went through the transition to a large high school between Time 1 and Time 2.

This longitudinal sample of 220 represented a subsample of the fifth through eighth grade students who were studied at Time 1. The original sample was selected randomly with stratification by time of year, grade, gender, and neighborhood. Data collection at Time 1 was conducted in eight “waves” so that different students participated at different seasons of the year (see the Appendix). To reduce researcher labor, these eight waves were collapsed at Time 2 into three “rounds” of data collection. These three rounds were timed so that students would participate in approximately the same season at Time 2 as they did at Time 1, and so that the interval between Time 1 and 2 would be as close as possible to 4 years. The interval between Time 1 and 2 varied from 42 to 56 months. Two groups of students (those in Wave 1 and 2 at Time 2) were in a school grade that was 5 years greater than their grade at Time 1 (for all others it was 4 years, except for 4 students, including 1 in the 5-year group, who had been held back a grade). These students did not differ substantially or significantly from other students on any of the measures used in this study. The collapsing of groups at Time 2 also meant that some students provided data at different times of the year at Time 1 and 2; however, analysis showed that scores for the central variable—affect—did not vary significantly by time of year. It should be also noted that students who were beyond twelfth grade at Time 2 (i.e., students who were in the eighth grade and in Waves 1 and 2 at Time 1, and a subsample of 73 ninth-grade students who were studied at Time 1) were not followed at Time 2 and thus were not included in the sample examined in the present study.

The 220 students represented 50.2% of the randomly selected youth who were invited to participate and would have been eligible to be in the longitudinal sample. From an initial pool of 438 invitees, 328 obtained parental consent and participated at Time 1. Among these, 67.1% participated at Time 2. Sixty-seven had moved and were unreachable at Time 2, 3 had died, and 38 participated but provided data at either Time 1 or 2 that did not meet minimum quality criteria. Nonparticipation at Time 2 was not related to parents’ education level, employment, or the SES ranking of their jobs, nor to adolescents’ grade at Time 1. Nonparticipation at Time 2 was somewhat higher among boys, $\chi^2(1, N = 328) = 8.60, p = .002$; thus, there were more girls ($N = 123$) than boys ($N = 97$) in the final sample. Nonparticipation was also somewhat higher among students who at Time 1 reported lower average affect on the ESM, $t(322) = 2.05, p = .041$, reported more negative life events, $t(324) = 2.18, p = .030$, had higher depression scores, $t(271) = 2.29, p = .032$, had lower self-esteem, $t(327) = 2.43, p = .016$, had lower school grade point averages (GPAs), $t(321) = 4.28, p < .001$, and were rated by their parents as having more behavioral problems, $t(330) = 2.05, p = .041$ (the specific measures used in these analyses are identified below). Therefore, attrition was greater among youth who were more distressed and had higher problem behavior at Time 1. However, it should be noted that the majority of distressed youth did participate at Time 2. The participation rate among youth whose average affect was in the lowest third of the Time 1 sample was 62.0% (as compared with 69.6% for the remaining youth). It should also be emphasized that although the differences just reported were significant, they were not of great magnitude and not likely to have had major effects on the findings. The students who did not participate at Time 2 had somewhat lower average Time 1 affect ($M = .98$ versus 1.16), but their average was well within the range of positive affect, and on a scale that spanned from −3 to +3, this difference was not very great.

Procedure

Participants provided data on their emotional states for 1 week at Time 1 and Time 2, via the ESM (Csikszentmihalyi & Larson, 1987). For each 1-week period, they carried electronic pagers and self-report booklets and were instructed to fill out one self-report form each time they were signaled. One signal was sent at a random time within each 2-hour block of time. The self-report asked them to provide information about the situation they were in at the time of the signal and to rate their emotional state, as well as other dimensions of their experience on scaled items. At Time 1, signals occurred between 7:30 AM and 9:30 PM for the entire week. To accommodate the later bedtimes of older youth, at Time 2 signals occurred between 7:30 AM and 10:30 PM on weekdays and 8:00 AM and 12:00 AM on weekends. The minimum criteria for including students in the final sample was response to at least 15 signals at both Time 1 and 2, and response to at least 50% of the signals between their last report at each time (these criteria excluded students who provided reports sporadically over the week, but included a few students who did a good job of responding for 3 or 4 contiguous days and then stopped).

Self-reports were obtained in response to most signals. At Time 1, participants provided reports for a
mean of 85% of the signals. At Time 2, they provided reports for a mean of 76% of the signals. Estimates based on a subset of youth indicated that about 6% of signals were missed due to mechanical failure of the pager. Students reported that other signals were missed due to forgetting the pager or booklet at home or in their bedroom or being involved in an activity that could not be interrupted, such as taking a test. The students provided an average of 40.2 reports per person at Time 1 and 34.7 per person at Time 2. The complete data set included 16,477 ESM reports across the two data collections.

At both Time 1 and Time 2, participants also completed sets of questionnaires, and data were collected from the school and from one parent, typically the mother.

Measures

Affect. This study employed a three-item measure of immediate affect that has been used in much prior ESM research, and has a demonstrated record of validity and reliability (Csikszentmihalyi & Larson, 1987; Larson, 1989). At the moment of each signal, participants rated their emotional state on 7-point semantic differential items (happy–unhappy, cheerful–irritable, friendly–angry). Scores for responses to these three items were averaged to create a scale from −3 to +3, where negative scores represent negative affect, Cronbach’s α = .75. Although responses to this scale fluctuated from one report to the next, the stability of underlying central tendency was evident in split-half correlations. At Time 1, individuals’ mean responses for the first half of the week correlated with their mean response for the second half, r = .67; for Time 2 this correlation was r = .55. These correlations did not differ significantly by grade or gender. Standard deviations were also stable for individuals at both Time 1, r = .53, and Time 2, r = .66, with no significant difference by grade or gender. Past research shows that adolescents’ average scores on this scale are correlated with teachers’ ratings of emotional state (Larson & Ham, 1993), parents’ ratings of internalizing symptoms (Verma & Larson, 1999), depression, and other conceptually related variables (Larson, 1989).

It should be noted that this scale places positive and negative affect at opposite ends on a continuous scale, a positioning that has been challenged by some researchers who have conceptualized positive and negative affect as independent dimensions. In a careful factor analytic study, however, Tellegen, Watson, and Clark (1999) showed that a general happiness-to-unhappiness dimension accommodates much of the variance across different emotions.

Stressful life events. On the questionnaire completed at the end of each week of ESM reporting, students completed a 51-item checklist of major life events (Larson & Ham, 1993), based on a measure originally developed by Coddington (1972). They were asked to check those events that had happened to them in the past 6 months. The score for this report was the total number of the 33 negative events that each student checked. At Time 1, these counts were found to be correlated with parents’ reports of the adolescents’ experience for the same set of events, r = .47.

Measures of adjustment. The following measures of adjustment were obtained at both Time 1 and Time 2. Depression was measured using the 27-item self-report Child Depression Inventory (Kovacs, 1986). Self-esteem was measured using the 10-item scale developed by Rosenberg (1965). Students’ current GPA for academic classes was obtained from the schools. Parents completed the Child Behavior Checklist (Achenbach, 1991), which was used to compute a score for total behavioral problems.

Analyses

Analytic procedures were selected that were suited to the two-level, hierarchical structure of the ESM data. These data included 16,477 reports on moments in time (Level 1) that were provided by 220 individuals (Level 2). Techniques were chosen that took into account the variations in emotional states that occurred both across moments and across individuals.

When feasible, multilevel modeling (ML), a regression procedure specifically designed for data with this type of hierarchical structure (Goldstein, 1987, 1995; see also Bryk & Raudenbush, 1992; Longford, 1993) has been used. For the present analysis, this modeling proceeded by fitting separate regressions for each individual to obtain an average regression model that was valid for the entire population from which the individuals were sampled. The estimation procedure is iterative and, at each iteration, provides improved estimates of both person-specific and population average regression coefficients until convergence is achieved. Thus, in the present study it made full use of the information provided by the 16,477 observations, while taking into account the unique patterns for each person. The final solution of the iterative process provides regression coefficients for the population, plus their standard errors—which allows for testing their statistical significance. Multilevel modeling is especially suited to the analysis of ESM data (Larson, Richards, Moneta, Holmbeck, & Duckett, 1996; Moneta & Csikszentmihalyi, 1996, 1999).
Multilevel modeling regression was used to evaluate the question of continuity in adolescents’ average affect across developmental periods. Based on past research (Larson & Lampman-Petraitis, 1989), we chose to use school grade (rather than age) as the index of developmental level. Given the appearance of gender differences in some past studies, it was essential to evaluate how grade trends might vary by gender. Thus, a multilevel model was tested with the following form:

\[
\text{Affect} = \beta_0 + \beta_1 \times \text{Grade (linear)} + \\
\beta_2 \times \text{Grade (quadratic)} + \beta_3 \times \text{Time} + \\
\beta_4 \times \text{Gender} + \beta_5 \times (\text{Grade} \times \text{Gender}),
\]

in which Affect was a Level 1 variable measure that varied within person across each ESM report; Gender was a Level 2 variable that remained constant within person across waves; and Grade and Time were variables that varied within person across the two data collection periods and thus were both Level 1 and Level 2 variables. Grade was school grade at the respective data collection period and Time was the indicator for the two data collection periods (0 and 1). The intercept and the term for Time were defined as random effects; this allowed each individual to have a unique intercept and Time 1 to Time 2 slope, and permitted the model to adjust for individual differences in the scaling of affect. The inclusion of terms for both Grade and Time allowed for estimation of the mean grade trend for affect across the whole sample, independent of any test–retest effect. A significant Time effect would indicate that the grade trend in affect differed between the first and second administration due to a test–retest method bias, whereas a nonsignificant effect would rule out such a possibility. The inclusion of Time, whether significant or not, made it possible to estimate the grade trend controlling for a possible test–retest method bias.

This model was estimated by means of the program ML3 (Prosser, Rasbash, & Goldstein, 1991). The significance of each term in the equation was evaluated by computing the ratio of the point estimate (the \( \beta \)s in the equation) to its standard error, then comparing these against the standardized normal distribution. Multilevel modeling also has the capability to test differences in between-person and within-person variance, which was employed to evaluate whether these changed between Time 1 and Time 2.

For analyses that were not suited to this ML model, other appropriate analytic techniques were employed, following guidelines suggested by Larson and Delespaul (1992) for analyzing ESM data. In all these analyses the within-person variation in responses was controlled by using the person, rather than the single ESM observation, as the unit of analysis. This was achieved by computing aggregate scores for each person (e.g., the person’s average affect) at one point of data collection. In several instances, ML was used to evaluate these scores. In other instances, traditional techniques such as paired-samples t tests and repeated-measures analysis of variance (ANOVA) were used. For several analyses, the sample was divided into grade cohorts, defined by their school grade at Time 1. These included those who started the study in grades 5 (\( n = 57 \)), 6 (\( n = 62 \)), 7 (\( n = 53 \)), and 8 (\( n = 48 \)). Descriptions of the specifics of these analyses are provided in the Results section.

RESULTS

Continuity versus Discontinuity in Group Means

The first question asked was whether the downward grade trend in average affect that was evident across the fifth- through eighth-grade period would continue through the high school years. To test this, we first evaluated a multilevel regression model with linear and quadratic terms for grade, along with gender and time (Time 1 versus Time 2).

These analyses showed a nonlinear grade trend in average affect (Table 1). The linear and quadratic terms for grade were significant. The quadratic curve was concave, with the grade trend toward less positive affect diminishing in the higher grades. As Figure 1 shows, the decline in average affect stopped at the tenth grade. A separate ML regression that employed only the Time 2 data found no significant grade trend for the high school period. The nonsignificance of the time effect in Table 1 indicates that the grade trend in

| Table 1 Final Multilevel Regression Model of Affect on Time, Gender, and Grade |
|-------------------|---------|---------|
|                  | Point Estimate | Standard Error |
| Mean regression coefficients (\( \beta \))               |         |         |
| Intercept        | 2.497*** | .493    |
| Grade linear     | -.321**  | .114    |
| Grade quadratic  | .014*   | .006    |
| Time             | .062     | .154    |
| Gender (female)  | 2.44***  | .076    |
| Within-persons variance components                     |         |         |
| Variance (intercept)                                   | 1.154***| .018    |
| Covariance (intercept, time)                           | .215*** | .016    |
| Between-persons variance components                     |         |         |
| Variance (intercept)                                   | .500*** | .051    |
| Covariance (intercept, time)                           | -.346***| .048    |
| Variance (time)                                         | .563*** | .063    |

\* \( p < .05 \); \*\* \( p < .01 \); \*\*\* \( p < .001 \).
affect estimated on the Time 1 data did not differ from that estimated on the Time 2 data; in other words, there was no test–retest effect.

It must be noted that despite the downward grade trend across early and late adolescence, throughout the entire period covered by the study, the average score for affect remained consistently on the positive side, above the neutral value of 0.0. This finding raises the issue of whether adolescents experienced increased negative affect, decreased positive affect, or both. To clarify this, an ordinary paired-sample t test was performed on the relative frequencies of positive and negative affect experienced at Time 1 and 2. For each participant, the percentage of times the composite affect score was greater than 0.0 (positive affect) and less than 0.0 (negative affect) were computed. The average percentage of positive affect declined from 73.9% at Time 1 to 70.7% at Time 2, t(219) = 1.93, \( p = .056 \), whereas the average percentage of negative affect increased from 12.7% to 19.6%, \( t(219) = -6.20, \ p < .001 \). Thus, the decline in average affect was attributable to decreased frequency of positive affect and, to a larger extent, increased frequency of negative affect.

Further permutations of the basic ML regression tested for interactions among the independent variables; none were found. As shown in Table 1, there was a main effect for gender, with girls reporting more positive average affect. However, when terms were added to the equation for the interaction between gender and both the linear and quadratic grade trends, neither was found to be significant. This meant that the concave grade trends for girls and boys were parallel, as shown in Figure 2. The evaluation of terms for the interaction of time and the linear and quadratic terms for grade showed that they did not account for significant additional variance.

The ML analyses, however, did indicate changes in variance in affect between Time 1 and Time 2. The estimated within-person variance components, shown in Table 1, indicated that the within-person variance significantly increased between Time 1 and 2, rising from 1.154 to 1.584, and the between-person variance significantly diminished between Time 1 and Time 2, contracting from .500 to .371. This indicates that individuals reported a wider range of positive and negative emotions at Time 2 and that there was less difference among individuals in their average affect at Time 2. To more closely examine the within-person change, an ordinary repeated-measures ANOVA was conducted that used the person as the unit of analysis and had each person’s standard deviation as the dependent variable, with time as the within-person factor and gender as the between-person factor. The interaction between time and gender was highly significant, \( F(1, 218) = 11.4, \ p < .001 \), as was the effect for gender, \( F(1, 218) = 25.1, \ p < .001 \). A plot of the estimated marginal means indicated that the age change in within-person variance was almost entirely attributable to girls. Furthermore, when separate paired-sample t tests were performed, boys’ mean standard deviation in affect showed no significant increase between Time 1 and Time 2, whereas girls’ mean standard deviation significantly increased from 1.01 to 1.32. In contrast to this pattern for within-person variance, follow-up tests of the change from Time 1 to Time 2 in between-person variance did not suggest that this change differed markedly by gender.

In conclusion, these findings indicate that the downward trend in affect found across the transition into early adolescence did not continue into late adolescence. Rather, late adolescence appeared to be associated with little change in the average level of positive- to-negative affect, with girls showing an increase in the variance of affect in the high school years.
Stability versus Instability in Comparative Ranking

The second question of the present study was how stable individuals were in comparison with each other over the 4-year period between Time 1 and Time 2. To evaluate this question, the person was used as the unit of analysis. Mean affect scores were computed separately for each person for Time 1 and Time 2, and then the correlations between these values were calculated. Findings showed substantial instability. For the entire sample, the correlation between Time 1 and Time 2 was modest, \( r(210) = .35, p < .001 \), indicating that for many individuals, mean affect changed relative to other individuals over the 4 years.

Further analyses indicated differences in stability between cohorts. We had predicted that the cohorts who were younger at Time 1—and for whom the 4-year span included the fifth and sixth grade—would show lesser stability. To test this hypothesis, regressions were computed that predicted Time 2 affect from Time 1 variables. The independent variables included Time 1 mean affect, Time 1 grade, gender, the interaction of Time 1 affect and Time 1 grade, and the interaction of Time 1 affect and gender.

This regression showed differences in stability across the four grade cohorts. As in the prior analyses, Time 1 affect and gender were significant predictors of Time 2 affect. The interaction term for gender and for Gender \( \times \) Grade were not significant predictors of Time 2 affect. The important finding was that the term for the interaction of Time 1 affect and Time 1 grade (cohort) was a significant predictor of Time 2 affect, \( \beta = .112, SE = .038, p = .027 \). To interpret these differences between cohorts, separate regression lines were computed for each (see Figure 3). As is apparent, the slopes of these regressions lines are progressively steeper for each older cohort. This indicates that there was greater stability for the older grade cohorts.

The same procedures were used to examine stability in the within-person variability in affect between Time 1 and 2. Standard deviations were computed for each individual's reports at Time 1 and reports at Time 2. The correlations between these scores across the 4-year period was small, \( r = .20 \). In regression analyses, the strength of this association did not vary as a function of cohort or gender.

The findings from these and the previous analyses led to the question of how many youth showed downward change in their average emotional state between Time 1 and 2. Findings from the first set of analyses (Figure 1) indicated that emotional states were, on average, less positive at Time 2. The question, however, was whether this was attributable to most youth or just to a minority who experienced a large downward change. When the entire sample of 220 students was examined, it was found that 63%—approximately five-eighths—reported less positive average affect at Time 2 than at Time 1, and the remaining 37% reported more positive affect (no student had exactly the same mean affect at both times). This rate of 63% was identical for boys and girls and did not differ significantly between grade cohorts. To estimate how many youth showed a major change, each student's Time 2 mean was evaluated relative to his or her Time 1 mean and standard deviation. Thirty-four percent reported a mean at Time 2 that was below their Time 1 mean by more than .5 standard deviation units, and 16% reported a Time 2 mean that was .5 standard deviation units above their Time 1 mean. Thus, one third of students showed a major downward change in their average emotional state, and one sixth showed a major upward change.

Stability in the Correlates of Daily Emotions

The final question asked in the current study was whether the correlations between mean affect and measures of life stress and adjustment changed between early and late adolescence. To test this question, the individual was used as the unit of analysis. Table 2 displays the correlations between scores for mean affect at Time 1 and 2, with concurrent measures of stressful events and adjustment.

The findings showed that affect was associated with life stress at both age periods, but the strength of this relation did not change between periods. To test whether this relation differed between age periods, an ML regression was performed in which the composite affect scores for Time 1 and Time 2 were repeated measures within individuals. The dependent
variable in this regression was average affect at the respective time of measurement. The independent variables were time, stress, and the interaction term for Time × Stress. The Time × Stress term was the test of the age difference: Was the strength of the association different between Time 1 and Time 2? The term for this interaction was not significant, which indicated an absence of difference. To summarize the relation between life stress and daily affective experience appeared to be consistent across early and late adolescence.

The relations between affect and the adjustment variables were also found to be stable across early and late adolescence (Table 2). As with the analyses of life stress, an ML regression was tested in which the individual was the unit of analysis, with time as a repeated within-person variable. For all dependent variables the interaction term for time was not significant, indicating stability in the strength of association between affect and these variables across this age span. There were also no significant two-way interactions with gender, or three-way interactions with gender and time for any of these dependent variables.

DISCUSSION

The findings of this study indicate that change in young people’s daily range of emotions slows between early and late adolescence. Past research has shown that early adolescence is a time when the average youth experiences a downward shift in this range—in the direction of more negative and fewer extreme positive states. It also has shown that early adolescence is a period of low stability among youth in their range of emotions: there is flux in which the relative happiness of different individuals shifts. The findings of this longitudinal research suggest that this change and flux slows in late adolescence. The downward shift in average states was not found to continue into late adolescence and there was greater stability among youth in their relative levels of happiness. Many of the present study’s results reinforce findings from prior studies, but they also go beyond prior studies in demonstrating these age trends with intensive data on emotional experience obtained during random moments in adolescents’ daily lives.

It should be emphasized that these results came from a sample of European American suburban youth from the United States, and may not generalize to youth living in differing life situations or cultural worlds. Early adolescence may not be a peak time of change among other groups, or this slowing of change in late adolescence may not occur, or may occur earlier or later. It should also be noted that the longitudinal sample used in this study had a higher rate of attrition among more distressed youth. Although most youth with lower average affect, as well as less positive scores on measures of stress and adjustment, remained in the sample, these youth were somewhat underrepresented. This underrepresentation is likely to have created slightly more positive values for average affect in the sample and to have slightly reduced the strength of correlations (as a result of more restricted ranges) than would have been expected for a perfectly representative sample.

Before discussing the differences that were found between early and late adolescence, it is useful to note the similarities, as revealed in the third set of analyses. This set found stable relations across these two periods—first, between adolescents’ average daily emotions and their experience of stressful events. Stressful events in past longitudinal research appear to have a causal relation to negative daily emotion (Merikangas & Angst, 1995). The stability of the present study’s correlation for stressful events suggests that the contribution of stress to negative emotion does not change markedly from early to late adolescence, and that adolescents’ degree of emotional sensitivity or vulnerability to stressful events remains the same. Second, stable relations were found across the two periods between average emotional experience and adjustment variables such as self-esteem and problem behaviors. Adjustment is generally conceptualized as being affected by and affecting emotional experience. The finding of cross-age stability in the strengths of correlations between adjustment and emotions suggests another constancy between early and late adolescence in the underlying causes and conceptual significance of daily emotional experience. These underlying constancies provide a backdrop to the age changes found in the first and second sets of analyses.

The first set of findings concerned age changes in the average emotions experienced across all youth, a dimension of change referred to as continuity/discontinuity. The downward shift in average emo-
tions in early adolescence—toward more dysphoric and less extreme positive affect—was found to level out in late adolescence. It should be emphasized that the average emotional state after this bottoming out was still in the positive range: 9 on a scale from +3 to −3. Negative affect was reported for only one fifth of random moments sampled during the high school age period. Nonetheless, late adolescents appeared to experience a higher rate of negative affect and an average level of happiness that was somewhat less positive than that experienced in the happier days before adolescence began. The good news was that the decline in this average level of happiness stopped at around grade 10, with no further downward change.

This leveling off of downward change in late adolescence is consistent with and reinforces the findings of questionnaire studies. The one point of difference is that some questionnaire research has found the early adolescent age increase in depressive affect to occur only for girls (Holsen et al., 2000; Petersen, Sargiani, & Kennedy, 1991), whereas the current research found the downward trend to occur for both boys and girls. This study also found girls’ affect to be more positive than boys’ affect across this age period (see Figure 2). This discrepancy in findings may be partly attributable to differences in what was being measured. The present study measured only the experience of immediate affect, whereas questionnaire studies often measure a wide range of symptoms associated with clinical depression, such as sleep disturbance. Possibly the discrepancy in findings was because girls, but not boys, show age increases in these other symptoms. Indeed, it is widely accepted that girls, but not boys, show an increase in clinical depression during this age period (Angold & Rutter, 1992; Petersen et al., 1993). A second related explanation is suggested by the finding that the within-person variability in girls’ (but not boys’) emotions increased into late adolescence. With age, girls reported wider daily variations on the scale of negative-to-positive emotions. As a result, a study that focuses only on rates of depressive affect (as many questionnaire studies do) would show an exaggerated age trend for girls, because it would show only one tail of a widening emotional distribution. Yet for most girls, the age increase in negative affect appears to be partly counterbalanced by their frequent experience of positive affect.

Looking across the life span, early adolescence for both genders is an exception in the long-term trend toward reduced negative emotion. As youth enter and move through adolescence they experience greater negative emotion, possibly as a result of the increased stressful events of this transitional period and their heightened sensitivity to this stress due to cognitive change (Larson & Asmussen, 1991). The present study found that late adolescents’ average daily emotions were not higher than those of younger adolescents—suggesting that they were still affected by stress. The age trend toward increased negative affect stopped, but it did not reverse. However, questionnaire research suggests that negative affect begins to diminish after age 18, in the period immediately after this study’s coverage (Chen et al., 1998; Holsen et al., 2000). Studies that compared adults and adolescents indicate that intense positive affect also diminishes in the years after adolescence (Diener et al., 1999; Larson & Richards, 1994b), so that the longer term trend is toward less variable daily emotions around a mildly positive baseline. Thus, middle and late adolescence is a low point—a nadir—in emotional experience.

The second set of findings was congruent with the first in suggesting that change in affective experience slows down between early and late adolescence. The second set of findings dealt with changes in the relative ranking between individuals—what has been called relative stability. Stability is evidenced when there is a correlation in scores over a time interval: a higher correlation indicates stability. The present study found that these correlations differed for cohorts in the sample who made a transition across different age periods. The youth who went from fifth to ninth grades across the study showed less correlation than those who went from eighth to twelfth. This suggests that the early years, grades 5 through 7, are associated with the largest instability. A shortcoming of this study is that the 4-year span between Time 1 and 2 and the fact that all cohorts traversed the transition into high school limited the ability to isolate specific periods. Research that examines shorter time spans would better isolate transitions of greatest instability.

Nonetheless, the present findings clearly suggest that stability in emotional experience increases with age. One explanation for this increased stability is methodological (i.e., with age, adolescents become better reporters of their emotional states), resulting in more stable scores. It is conceivable that cognitive changes in early adolescence alter response style or sensitivity to emotions, creating changes in emotional experience that are more apparent than real. Using Time 1 data from the same participants, Larson and Lampman-Petratis (1989) partly addressed this possibility. They showed that when asked to rate the emotions depicted in a series of drawings of faces, there was no age difference between fifth to ninth grade in how these emotions were rated. This suggests no change in response tendency. Holsen et al. (2000) also argued that measurement is stable across
this age period, based on their finding that the internal reliability of their scale of depressed affect did not change with age. For these reasons, we think that the increased stability in adolescents’ daily emotions is not an artifact of measurement, but rather a real change.

The more likely explanation for the increased stability in later adolescence is that this is a more stable period, and there are fewer changes in the conditions that affect youths’ daily lives. In interpreting similar data for changes in self-esteem, Alsaeker and Olweus (1992) theorized that later adolescence is associated with the gradual consolidation of unspecified underlying “structures.” However, it is not possible to determine from these data whether the increased stability was due to consolidation of endogenous or exogenous structures, or both. It is possible that the slowing of change is due to slowing of internal psychological or physiological changes, or to greater constancy in gene expression. It is also possible that higher relative stability in late adolescence is due to reduced change in adolescents’ daily environments, or in how they experience these daily environments. There is much to be learned about the factors underlying change and stability across this age period.

Thus far, the issues of the present study’s first and second sets of analyses have been separated; however, they need to be thought of together. An analysis that combined the two issues found that many, but by no means all, youth showed a downward change in their average daily emotions from the fifth- through eighth-grade period to the ninth- through twelfth-grade period. Five eighths of the students (63%) reported lower average affect in the later age period. By pure chance, 50% would have been expected to report lower affect at Time 2; thus, the striking finding may be that 37% reported higher average affect at this time. Perhaps the more meaningful figures are that one third of the youth showed a downward change that was greater than half of their Time 1 standard deviation, and one sixth showed an upward change of more than half a standard deviation. Of course, any individual’s scores are likely to have been affected by week-to-week and month-to-month variations at both times. The important point, however, is that the trend was not universally downward; there were many youth who did not show this trend. Future research needs to continue to consider differing individual trajectories as a topic of study.

For those individuals who experience major changes from early to late adolescence, this may be a significant turning point. The present findings showed that as adolescents get older, their average emotional level becomes more stable relative to other teens. This suggests that individuals’ baseline emotional states may be less easily changed after they pass early adolescence. Thus, future efforts to understand what influences stability and change in adolescents’ emotions need to focus on what factors account for the largest downturns in early adolescence and what can be done to avert them, as well as look for what factors promote lasting upturns in baseline emotional state.

ACKNOWLEDGMENTS

This research was supported by National Institute of Mental Health grant R01 MH53846 awarded to Maryse H. Richards.

APPENDIX

Study Design

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<th>Time 1</th>
<th>Time 2</th>
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Note: The Time 1 study consisted of eight waves of students, each consisting of approximately equal numbers of boys and girls from two separate schools (one working class and one middle class). These eight waves were studied in three “rounds” of participation at Time 2.
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