Differential Age Trajectories of Positive and Negative Affect: Further Evidence From the Berlin Aging Study

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In cross-sectional and longitudinal samples from the Berlin Aging Study, fellow researchers and I examined performance-based and self-evaluative indicators of functioning in two realms as predictors of individual differences and intrapersonal changes in positive and negative affect. Cross-sectional and longitudinal structural equation models suggested that performance-based indicators (level of social involvement and test intelligence) were associated with positive affect, but not with negative affect. Evaluative indicators (self-reported quality of social life and mental fitness) showed stronger relations to negative affect than to positive affect. The present evidence provides an explanation for the differential stability of positive versus negative affect in old age: Positive affect may decline because it requires objective competencies, which seem to decrease in old age. Negative affect may remain stable because it is associated with self-evaluations, which seem to change less with age.

Key Words: Berlin Aging Study—Negative affect—Positive affect.

Affective well-being is usually defined as the presence of positive feelings and the absence of negative feelings over time. Because of their relative independence, positive affect and negative affect have been considered two different phenomena that should be studied individually (e.g., Diener & Larsen, 1993; Lawton, Kleban, Rajagopal, & Dean, 1992; Lucas, Diener, & Suh, 1996).

Age Differences in Positive and Negative Affect

Although the evidence for individual age trajectories in positive versus negative affect has been somewhat mixed, several studies have suggested that negative affect decreases during adulthood (Barrick, Hutchinson, & Deckers, 1989; Gross et al., 1997; Vaux & Meddin, 1987), whereas positive affect remains stable (Gross et al.) or even increases in subgroups such as in extraverted men (Mroczek & Kolarz, 1998). This evidence, however, does not generalize to old and very old age. Cross-sectional and longitudinal studies with samples including sufficient numbers of older individuals have documented that negative affect decreases only until the person reaches the age of 60 years or so and then remains stable during late life (e.g., Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Charles, Reynolds, & Gatz, 2001; Kunzmann, Little, & Smith, 2000; Stacy & Gatz, 1991). There also is cross-sectional and longitudinal evidence suggesting that the stability in positive affect lasts only until the person reaches about the age of 60, when decline begins to accelerate (Bradburn, 1969; Charles et al.; Diener & Suh, 1997; Kunzmann et al.; Shmotkin, 1990; Stacy & Gatz).

Together these findings point to nonlinear and multidirectional age-related changes in affective well-being: Negative affect seems to decrease until a person reaches about the age of 60 and then remains stable, while positive affect shows stability until a person reaches about the age 60 and then declines. The goal of this study was to propose an explanation for the differential age trajectories of positive and negative affect in late life, proceeding from work on the predictors of individual differences in positive and negative affect.

Predictors of Individual Differences in Positive Versus Negative Affect

Studies in the field of personality and social psychology suggest that individual differences in positive affect are associated with various indicators of social behavior, including frequency of contact with friends and relatives, making new acquaintances, involvement in social organizations, and overall level of social activity (Clark & Watson, 1988; Harlow & Cantor, 1996; Lawton, 1983; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Watson & Clark, 1996). In contrast, individual differences in negative affect, but not positive affect, have been shown to be linked to self-reported physical health such as health complaints or self-reported physical symptoms (Brief, Butcher, George, & Link, 1993; Watson, 1988; Watson & Pennebaker, 1989). There also is research suggesting that extraversion is related to positive affect (but not negative affect), whereas neuroticism relates to negative affect (but not positive affect; see Costa & McCrae, 1980, 1984; DeNeve & Cooper, 1998; Heady & Wearing, 1989; McCrae & Costa, 1991).

The Present Theoretical Framework

Outward focus, objective competence, and positive affect in old age.—The evidence that extraversion and social involvement go hand in hand with positive affect suggests that an outward focus involving actual interactions with the external world is critical to the experience of positive affect. On a trait level of analysis, this outward focus can be defined as the degree to which a person engages the environment successfully (e.g., sees friends, relatives, and family; has hobbies; engages in
continuing education). Given that an outward focus involves actual interactions with the environment, objective health-related and cognitive competencies, which facilitate (or restrict) an older person’s level of engagement with the external world, should be central predictors of positive affect.

**Inward focus, self-evaluation, and negative affect.**—The evidence that neuroticism and self-ratings of poor health are linked to negative affect suggests that an inward focus involving evaluations of the self may be a central predictor of negative affect. On a trait level of analysis, this inward focus can be defined as the degree to which a person typically evaluates self-relevant aspects negatively.\(^1\)\(^2\)

**Past Evidence on Age Differences in Positive and Negative Affect Revisited**

The empirical findings in the field of personality and social psychology and the theoretical framework just discussed provide one explanation for the age-related decrease in positive affect and the age-related stability in negative affect during late life. On one hand, there is ample evidence for age-related decline in health-related and cognitive competencies (Baltes & Mayer, 1999). Given their limited physical and cognitive resources, older people may become increasingly less likely to adopt an outward focus and engage in many and varied interactions with the external world. As a result of this reduced outward focus and the relative absence of external stimulation, they may experience a decline in positive affect. On the other hand, there is a large body of evidence for age-related stability in global self-evaluations, despite the well-documented increase in age-related losses in multiple realms of functioning. This stability has been attributed to older people’s capacity to cope with loss so that it does not compromise their sense of self (Baltes & Baltes, 1990). Coping strategies such as self-protective causal attributions or strategic social downward comparisons, which have been labeled secondary control strategies (Heckhausen & Schulz, 1997) or accommodative modes of coping (Brandstädter & Greve, 1994), have been shown to help older individuals maintain their global self-evaluations. This in turn may explain why they do not experience an increase in negative affect in late life, when losses become increasingly more likely and competencies decline objectively.

**Predictions**

Fellow researchers and I tested the present outward–inward framework in two realms of functioning, that is, social and intellectual, on the basis of cross-sectional and longitudinal data from the Berlin Aging Study (BASE). In each realm of functioning, we employed descriptive or performance-based measures and global self-evaluative measures to assess competence objectively and subjectively.

Our central predictions were as follows: Older people’s tendency to adopt an outward focus and interact with the environment successfully (as indicated by social network size and number of social activities) will be related to positive affect but not negative affect; and older people’s tendency to adopt an inward focus and evaluate their social interactions positively (as indicated by their global feelings of social integration and satisfaction) will be related to negative affect but not positive affect. Given that marked cognitive decline is almost normative in old age, reduced cognitive functioning may be one factor that limits social engagement in this life period. Therefore, we predicted that older people’s actual test intelligence would be associated with positive affect but not negative affect, whereas older people’s tendency to evaluate their intellectual functioning positively (as indicated by self-ratings of mental fitness) would be related to negative affect but not positive affect.

We also tested the interplay of the present variables with age and gender. On the basis of past work, we predicted the following: age should have negative zero-order correlations with the present indicators of an outward orientation and positive affect; the correlation between age and positive affect should be mediated by the indicators of an outward orientation; and age should be related to neither negative affect nor the present indicators of an inward orientation. We analyzed gender for explorative purposes only.

Finally, to test the generality of our findings, we analyzed the role of performance-based functional health (mobility, visual acuity, and auditory acuity) as an additional predictor of positive affect. We predicted that, similar to test intelligence and social involvement, functional health should have significant (and positive) zero-order correlations with positive affect, but not with negative affect, and functional health should share considerable amounts of predictive variance with social involvement and test intelligence.

**METHODS**

This study was based on data from the first and second wave of BASE; the sample, procedures, and the effects of survivorship have been described in previous publications (Baltes & Mayer, 1999; Lindenberger et al., 1999; Smith et al., 2003).

**Participants**

The first-wave sample was an Age × Gender stratified probability sample of 516 community-dwelling and institutionalized persons (age range = 70–103 years). From the first-wave sample, 256 persons participated in a longitudinal follow-up that took place approximately 4 years later (M = 3.77 years; SD = 0.68). The majority of the 260 dropouts died between the two waves (i.e., 203 persons were deceased, 48 individuals refused to take part in the longitudinal study, 8 persons moved out of the area, and 1 person was unreachable). In addition, 50 participants of the longitudinal follow-up sample (n = 256) were excluded because of incomplete data at the second wave. Thus, the longitudinal analyses were based on information from 206 individuals.\(^3\) All measures of the present study were employed at the first and second wave.

**Measures**

**Affective well-being.**—Positive and negative affect were assessed by a German translation of the Positive and Negative Affect Schedules (Watson, Clark, & Tellegen, 1988). Participants were asked to indicate on a 5-point scale ranging from 1 (not at all) to 5 (very often) how frequently they had experienced each of 10 high-activation positive feelings and 10 high-activation negative feelings during the past year.
Cronbach’s alphas were satisfactory for both scales (first-wave data: positive affect, \( \alpha = 0.78 \); negative affect, \( \alpha = 0.81 \)). For the present analyses, the 10 items indicating positive affect and the 10 items indicating negative affect were each grouped to build three subscales indicating positive affect and negative affect, respectively. Our subscales were identical to those reported by us elsewhere (Kunzmann et al., 2000; see also Table 1).

**Social involvement.**—Two indicators of social involvement were assessed: number of social activities and number of social network partners. These indicators were concrete and descriptive of specific behaviors and persons rather than global and evaluative as was true for the indicators of the quality of social life.

Researchers assessed social activity level by presenting participants with 12 cards consecutively, each illustrating one social activity (e.g., sports, restaurant visits, attending cultural events). Participants were asked to indicate on a dichotomous scale (1 = yes; 0 = no) whether they had engaged in an activity during the past 12 months. Overall social activity level was calculated as the number of different activities a person had engaged in during the past 12 months (scores ranged from 0 to 11, \( M = 3.82, SD = 2.64 \), in the first-wave sample).

The number of social network partners was assessed in a procedure adapted from Kahn and Antonucci’s (1980) work on social convoys. Participants were asked to place people into one of three concentric circles on the basis of whether they felt very close (first circle), close (second circle), or less close (third circle) to each one. Participants were allowed to nominate as many people as came to mind. A count of the total number of social partners in all three circles was used in the present analyses (scores ranged from 0 to 49, \( M = 10, SD = 7 \), in the first-wave sample).

**Quality of social life.**—Two indicators of participants’ perceived quality of social life were available for analyses. The first was a single item on overall social satisfaction: “Think about all the relationships you have. How satisfied are you with the things you do together and the way you get along?” The response scale ranged from 1 (not at all satisfied) to 5 (very much satisfied).

The second indicator referred to feelings of social integration as assessed by the following two items: “I feel isolated from others” and “I feel left out.” Responses were given on a 5-point scale that ranged from 1 (applies very well to me) to 5 (does not apply to me at all). The items were coded so that higher scores indicated higher feelings of social integration.\(^4\)

**Test intelligence.**—Eight tests measuring four abilities, perceptual speed (Digit Letter and Identical Pictures), memory (Memory for Text and Paired Associates), knowledge (Spot-a-Word and Vocabulary), and fluency (Animals and Letter S), were administered by means of a Macintosh SE/30 with a touch-sensitive screen (Lindenberger & Baltes, 1997). Cronbach’s alpha was satisfactory for the eight tests (first-wave data: \( \alpha = 0.73 \)). For the present analyses, the tests were grouped to build four subscales representing four abilities: speed, memory, fluency, and knowledge, respectively.

<table>
<thead>
<tr>
<th>Indicator and Factor</th>
<th>Loading(^a)</th>
<th>T</th>
<th>SE</th>
<th>( R^2b )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social involvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size of social network</td>
<td>.69</td>
<td>19.41</td>
<td>.04</td>
<td>.53</td>
</tr>
<tr>
<td>Social activity level</td>
<td>.69</td>
<td>19.41</td>
<td>.04</td>
<td>.52</td>
</tr>
<tr>
<td>Self-rated quality of social life</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt outcast (recoded)</td>
<td>.79</td>
<td>17.18</td>
<td>.05</td>
<td>.37</td>
</tr>
<tr>
<td>Felt social isolation (recoded)</td>
<td>.71</td>
<td>15.51</td>
<td>.05</td>
<td>.49</td>
</tr>
<tr>
<td>Satisfaction with social relations</td>
<td>.29</td>
<td>5.94</td>
<td>.05</td>
<td>.92</td>
</tr>
<tr>
<td>Positive affect</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Subscale 1: excited, alert, active, proud</td>
<td>.48</td>
<td>16.02</td>
<td>.03</td>
<td>.53</td>
</tr>
<tr>
<td>Subscale 2: interested, strong, inspired</td>
<td>.44</td>
<td>14.94</td>
<td>.03</td>
<td>.46</td>
</tr>
<tr>
<td>Subscale 3: enthusiastic, determined, attentive</td>
<td>.55</td>
<td>17.33</td>
<td>.03</td>
<td>.64</td>
</tr>
<tr>
<td>Negative affect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscale 1: nervous, guilty, scared, hostile</td>
<td>.54</td>
<td>18.85</td>
<td>.03</td>
<td>.61</td>
</tr>
<tr>
<td>Subscale 2: distressed, irritated, ashamed</td>
<td>.58</td>
<td>18.75</td>
<td>.03</td>
<td>.60</td>
</tr>
<tr>
<td>Subscale 3: jittery, afraid, upset</td>
<td>.62</td>
<td>19.14</td>
<td>.03</td>
<td>.62</td>
</tr>
<tr>
<td>Test intelligence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed</td>
<td>.83</td>
<td>22.10</td>
<td>.04</td>
<td>.31</td>
</tr>
<tr>
<td>Memory</td>
<td>.74</td>
<td>18.52</td>
<td>.04</td>
<td>.46</td>
</tr>
<tr>
<td>Knowledge</td>
<td>.74</td>
<td>18.80</td>
<td>.04</td>
<td>.45</td>
</tr>
<tr>
<td>Fluency</td>
<td>.86</td>
<td>23.00</td>
<td>.04</td>
<td>.73</td>
</tr>
</tbody>
</table>

Notes: The factor loadings of social involvement, self-rated quality of social life, positive affect, and negative affects refer to the model that was specified to test the relations between social functioning and affect. Factor loadings of test intelligence refer to the model specified to test the relations of cognitive functioning and affect. Because mental fitness was specified as a one-indicator construct, it is not included in this table. The models are based on data from the first wave (\( N = 516 \); see the text for more information about the models).

\(^a\)Unstandardized factor loadings.

\(^b\)Communality \( (R^2) = 1 – \) standardized residual variance.

**Self-rated mental fitness.**—One domain-general single-item indicator of self-reported mental fitness was available in BASE. Specifically, participants were asked to answer, by using a 5-point scale ranging from 1 (poor) to 5 (very good), the following question: “How would you judge your mental fitness at the moment?”

**RESULTS**

We employed structural equation modeling techniques. Given that some of the present models examined longitudinal changes in the latent constructs, we standardized neither the observed nor the latent variables within groups or waves. We analyzed covariance matrices by applying the maximum likelihood procedure as a method of parameter estimation.

**Social Functioning and Affect**

**Cross-sectional analyses.**—We specified social involvement, quality of social life, positive affect, and negative affect as four multiple-indicator latent factors (see Table 1). We specified residual variances to be uncorrelated. For purposes of identification, we fixed all latent factor variances to 1.0 and we forced the loadings of the social involvement indicators to be of equal size. We specified the relationships among the four latent factors as zero-order correlations. This specified model
showed an acceptable fit with the data of the first-wave sample (see Figure 1). All estimates of factor loadings are presented in Table 1.

As we predicted and as seen in Figure 1, social involvement was positively related to positive affect but was unrelated to negative affect. Quality of social life was negatively associated with negative affect but also showed a positive relation to positive affect. Notably, however, the correlation of quality of social life with negative affect was significantly stronger than it was with positive affect ($\Delta z = 4.4$). As we expected, the relation between social involvement and quality of social life was significant but only moderate.

To analyze the joint effects of social involvement and quality of social life, we respecified the relationships among the predictor and outcome factors as beta paths. After quality of social life was controlled, we found that social involvement was associated with high positive affect and high negative affect (see Figure 1). This effect was significantly stronger for positive affect than for negative affect, however ($\Delta z = 3.4$). The effect of quality of social life on negative affect remained unchanged after we controlled for social involvement, whereas the effect on positive affect was significantly reduced.

Additional analyses involving age and gender.—As seen in Table 2, age and gender showed significant and meaningful zero-order correlations with the present predictor and outcome factors. To test the univariate effects of age and gender on positive and negative affect, we specified models that included, in addition to social involvement and quality of social life, one of these variables as a latent factor (i.e., as an alternative predictor of positive and negative affect). We specified the relations among all predictor and outcome factors as beta paths.

The effects of social involvement and quality of social life on positive and negative affect remained significant and basically unchanged after we statistically controlled for age and gender separately. As we predicted, the negative correlation between age and positive affect ($r = -.24; p < .01$) was mediated by social involvement ($\beta = .12$, ns; $\Delta z = 5.14$), and the effect of age on negative affect was not significant ($r = -.06$, ns). There was a significant correlation between age and quality of social life ($r = -.27; p < .01$), but this correlation was smaller than the correlation between age and social involvement ($r = -.61; p < .01$; $\Delta z = 6.80$).

Additional analyses involving functional health.—We measured functional health by performance-based tests of mobility, visual acuity, and auditory acuity (for details, see Kunzmann et al., 2000). Raw correlations among the three test scores ranged from $r = .42$ to $r = .56$. Confirmatory factor loadings on the functional health factor were as follows: $\beta = .73$, mobility; $\beta = .60$, vision; $\beta = .77$, hearing.

As we expected, functional health was associated with positive affect ($r = .42; p < .01$) but not with negative affect ($r = .04$, ns). Moreover, the correlation between functional health and social involvement was significantly higher ($r = .83; p < .01$) than the correlation between functional health and

![Figure 1. Cross-sectional structural models: Social functioning and affect. Here, $N = 516$; $\chi^2(39) = 57.50$; root mean square error of approximation = 0.03; Normed Fit Index = 0.97; Non-Normed Fit Index = 0.99. Models were based on data of the first-wave sample. Zero-order correlations were estimated in a model in which all the paths among the latent construct were specified as psi paths ($^{*}p < .05$, $^{**}p < .01$).](image-url)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test Intelligence</th>
<th>Mental Fitness</th>
<th>Social Involvement</th>
<th>Quality of Social Life</th>
<th>Positive Affect</th>
<th>Negative Affect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>$-59^{**}$</td>
<td>$-07$ ns</td>
<td>$-61^{**}$</td>
<td>$-27^{**}$</td>
<td>$-24^{**}$</td>
<td>$-06$ ns</td>
</tr>
<tr>
<td>Gender</td>
<td>$-07$ ns</td>
<td>$-10^{*}$</td>
<td>$-07$ ns</td>
<td>$-11^{*}$</td>
<td>$-04$ ns</td>
<td>$.19^{**}$</td>
</tr>
</tbody>
</table>

Notes: Here, $N = 516$. Values represent correlations among latent factors disattenuated for measurement error. The response format of the gender variable was 1 (male) and 2 (female).

$p < .05$; $^{**}p < .01$. 

Table 2. Intercorrelations Among the Present Study’s Central Constructs and the Additional Variables of Age and Gender in the Original Cross-Sectional Sample
self-reported quality of social life \((r = -.41, p < .01; \Delta z = 9.34)\). Analyzing the joint effects of functional health and social involvement on positive affect revealed that the effects of functional health were reduced and nonsignificant \((\beta = .05, ns)\), whereas the effects of social involvement remained unchanged \((\beta = .56; p < .01)\).

Together this evidence suggests that social involvement and performance-based functional health show a similar differential prediction pattern. Moreover, social involvement and functional health share predictive variance; the effects of functional health on positive affect were fully mediated by social involvement.

**Longitudinal analyses.**—We specified a two-wave covariance structure model with social involvement, quality of social life, positive affect, and negative affect as latent factors. We residualized positive affect and negative affect at the second wave for the corresponding first-wave latent factors. On the measurement level, we specified the latent factors in the same way as in the cross-sectional model described herein. To take retest effects into account, we allowed each indicator’s corresponding residual variance to correlate over time. The baseline longitudinal model testing configural invariance showed acceptable fit: \(\chi^2(172) = 214.44\) (root mean square error of approximation or RMSEA = 0.03; Normed Fit Index or NFI = 0.91; Non-Normed Fit Index or NNFI = 0.98). Hierarchical model testing showed that the loadings of each factor’s indicators were metrically invariant over time: \(\Delta \chi^2(10) = 5.61\). We placed no constraints on the structural level.

To facilitate the interpretation of the central findings, descriptive information about stability and change of the present constructs is presented first (see Table 3). The mean levels of positive and negative affect remained stable, whereas social involvement and quality of social life, on the average, slightly declined over time. The stability of individual differences in positive affect, negative affect, social involvement, and quality of social life were considerable, whereby covariance stability was higher for social involvement than for quality of social life.

As we predicted, and consistent with the cross-sectional findings, social involvement at the first wave was positively associated with differential changes in positive affect \((r = .22; p < .01)\), but it did not show an association with differential changes in negative affect \((r = -.05)\). Thus, participants with higher levels of social involvement as assessed at the first wave were likely to experience an increase in positive affect over time. First-wave levels of quality of social life were related to differential changes in negative affect \((r = .25; p < .01)\) but not to differential changes in positive affect \((r = .04)\). Notably, the correlation between first-wave levels of quality of social life and differential changes in negative affect was positive. In other words, those participants who rated the quality of their social life more favorably at the first wave were more likely to experience an increase in negative affect over time.

Testing alternative directional hypotheses showed that the relation between first-wave positive affect and change in social involvement (i.e., social involvement at Wave 2 when residualized for the corresponding first-wave factor) was nonsignificant \((r = -.12)\). The relationship between first-wave levels of negative affect and differential changes in quality of social life was significant \((r = -.16; p < .05)\) but somewhat weaker than the correlation between first-wave levels of quality of social life and differential changes in negative affect \((r = .25; p < .01; \Delta z = 5.12)\).

We also tested possible associations between the differential changes in social involvement and quality of social life and the differential changes in positive and negative affect. These analyses showed that differential changes in social involvement were associated with differential changes in positive affect \((r = .15; p < .05)\) but not in negative affect \((r = -.07)\). Differential changes in quality of social life were related to both differential changes in positive affect \((r = .22; p < .01)\) and differential changes in negative affect \((r = -.42; p < .01)\). In other words, participants who experienced an increase in quality of social life were also likely to experience an increase in positive affect and a decrease in negative affect over time. Note, however, that the relationship of differential changes in quality of social life to differential changes in negative affect was significantly stronger than the relationship to differential changes in positive affect (\(\Delta z = 2.5)\).

When we allowed first-wave social involvement and first-wave quality of social life to predict differential changes in positive and negative affect jointly, the effects of social involvement on positive affect remained significant \((\beta = .15; \Delta z = 1.6)\). The relationship between first-wave levels of negative affect and negative affect at the second wave for the corresponding first-wave latent factors. On the measurement level, we specified the latent factors in the same way as in the cross-sectional model described herein. To take retest effects into account, we allowed each indicator’s corresponding residual variance to correlate over time. The baseline longitudinal model testing configural invariance showed acceptable fit: \(\chi^2(172) = 214.44\) (root mean square error of approximation or RMSEA = 0.03; Normed Fit Index or NFI = 0.91; Non-Normed Fit Index or NNFI = 0.98). Hierarchical model testing showed that the loadings of each factor’s indicators were metrically invariant over time: \(\Delta \chi^2(10) = 5.61\). We placed no constraints on the structural level.

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When we allowed first-wave social involvement and first-wave quality of social life to predict differential changes in positive and negative affect jointly, the effects of social involvement on positive affect remained significant \((\beta = .15; \Delta z = 1.6)\).
p < .05). The effect of quality of social life on negative affect also remained significant (β = .22; p < .05), but the effect of quality of social life on positive affect became nonsignificant (β = .02).

Additional analyses involving functional health.—Adding the three-indicator factor of functional health factor (performance-based measures at Time 1) to the longitudinal model revealed that functional health predicted differential change in positive affect (r = .33; p < .01) but not in negative affect (r = .00). Analyzing the joint effects of functional health and social involvement at Time 1 on differential change in positive affect revealed that both effects became nonsignificant (functional health r = .33, p < .01; β = .15, ns; social involvement r = .21, p < .01; β = .04, ns). This longitudinal evidence was consistent with the respective cross-sectional findings in that social involvement and functional health predicted change in positive affect but not change in negative affect. In the longitudinal analyses, social involvement and performance-based functional health fully shared their predictive variance.

Cognitive Functioning and Affect

Cross-sectional analyses.—We defined test intelligence as a four-indicator factor represented by speed, memory, fluency, and knowledge. We defined mental fitness as a one-indicator construct. All other specifications resembled those of the first cross-sectional model. This second model again showed acceptable fit with the data of the original first-wave sample (see Figure 2). All estimates of factor loadings are presented in Table 1.

As we predicted and as shown in Figure 2, test intelligence was positively associated with positive affect, but it did not show a significant association with negative affect. Mental fitness was negatively associated with negative affect but also showed a positive relation to positive affect. As we expected, the association between test intelligence and mental fitness was significant but relatively weak.

After we controlled for mental fitness, we found that test intelligence was associated with high positive affect and high negative affect. This effect was, however, significantly stronger for positive affect than for negative affect (Δz = 4.8). The effects of mental fitness on positive affect and negative affect remained significant after we controlled for test intelligence. When test intelligence was controlled, mental fitness had a significantly stronger effect on negative affect than on positive affect (Δz = 3.8; see Figure 2).

Additional analyses involving age and gender.—The effects of test intelligence and mental fitness on positive and negative affect remained significant and basically unchanged after we statistically controlled for age and gender. As we predicted, the negative correlation between age and positive affect (r = -.24; p < .01) was fully mediated by test intelligence (β = .00, ns; Δz = 4.36). Also as we expected, the effects of age on mental fitness and negative affect were both nonsignificant (see Table 2 for the zero-order correlations among the factors).

Additional analyses involving functional health.—As we expected, the zero-order correlation between functional health and test intelligence was considerably higher (r = .83; p < .01) than the correlation between functional health and self-reported mental fitness (r = .18; p < .01). Analyzing the joint effects of functional health and intelligence on positive affect revealed that the effects of functional health were reduced but remained significant (r = .42, p < .01; β = .25, p < .05; Δz = 2.55), whereas the effects of test intelligence were reduced and became nonsignificant (r = .41, p < .01; β = .20, ns; Δz = 2.19). Together this evidence suggests that test intelligence and functional health show a similar differential prediction pattern. Moreover, test intelligence and functional health share predictive variance; the effects of test intelligence on positive affect were fully mediated by functional health.

Longitudinal analyses.—We specified a two-wave covariance structure model parallel to the first longitudinal model.
The baseline longitudinal model testing configural invariance showed acceptable fit: $\chi^2(173) = 221.50$; RMSEA = 0.03; NFI = 0.92; NNFI = 0.97. Hierarchical model testing revealed that the loadings of each factor’s corresponding indicators were metrically invariant over the two waves: $\Delta\chi^2(11) = 7.43$. We placed no constraints on the structural level.

As shown in Table 3, test intelligence and mental fitness, on average, slightly declined over time. The stability of individual differences in test intelligence was of considerable size. Covariance stability for mental fitness, however, was somewhat lower.

As we predicted, and consistent with the cross-sectional findings, test intelligence at the first wave was positively related to differential changes in positive affect ($r = .32; p < .01$), but it was not related to differential changes in negative affect ($r = .09$). Thus, participants with higher test intelligence as assessed at the first wave were more likely to experience an increase in positive affect over time. First-wave levels of mental fitness were related neither to differential changes in positive affect ($r = .00$) nor to differential changes in negative affect ($r = -.05$).

To test an alternative directional hypothesis about the relationship between test intelligence and positive affect, we specified a path between first-wave positive affect and change in test intelligence (i.e., test intelligence at Wave 2 when residualized for the corresponding first-wave factor). In this model, first-wave positive affect was not significantly associated with differential changes in test intelligence ($r = .05$).

The high covariance stability of test intelligence might have worked against finding support for the idea that differential changes in test intelligence are associated with differential changes in positive affect. Differential changes in mental fitness were associated with differential changes in negative affect ($r = -.20; p < .01$). Thus, participants who experienced an increase in mental fitness were likely to experience a decline in negative affect over time. There was no significant association between differential changes in mental fitness and differential changes in positive affect.

When we allowed first-wave test intelligence and first-wave mental fitness to predict differential changes in positive and negative affect jointly, the effects of test intelligence on positive affect remained significant and basically unchanged ($\beta = .18; p < .05$) and the effects of mental fitness on positive and negative affect remained nonsignificant.

Additional analyses involving functional health.—Analyzing the joint effects of functional health and intelligence at Time 1 on differential changes in positive affect revealed that both effects became nonsignificant (functional health: $r = .34, p < .01; \beta = .14, ns$; intelligence: $r = .32, p < .01; \beta = .06, ns$). This longitudinal evidence was consistent with the respective cross-sectional findings in that test intelligence and functional health predicted change in positive affect but not change in negative affect. In the longitudinal analyses, test intelligence and performance-based functional health fully shared their predictive variance.

**DISCUSSION**

The goal of this study was to provide empirical support for the idea that positive affect is related to an outward focus and objective competencies, whereas negative affect is associated with an inward focus and self-evaluated competencies. There was striking consistency in the findings across the two realms of functioning investigated. As we predicted, indicators that were performance based and largely free of subjective evaluations (i.e., social involvement, test intelligence, and functional health) were associated with positive affect but not negative affect. Indicators that were self-evaluated and global (i.e., self-rated quality of social life and mental fitness) were more strongly associated with negative affect than with positive affect.

As we expected, in both realms of functioning, the relations between the indicators of the outward focus and the indicators of the inward focus were small but significant. Therefore, it was important to analyze the unique effects of each focus on the two dimensions of affective well-being. Two findings of these analyses deserve note. First, after control of the performance-based indicators, the relationship between the self-evaluative measures and negative affect remained unchanged, whereas the relationship between the self-evaluative measures and positive affect became significantly smaller. This finding held in both structural equation models (i.e., independently of the realm of functioning being considered); it provides further support for the idea that self-evaluations per se are primarily involved in the regulation of negative affect. Their contribution to the regulation of positive affect seems to be minor.

Second, in the analyses of the joint effects of performance-based and self-evaluative predictors, there was a small but significant positive effect of social involvement and test intelligence on negative affect, which was not evident on the level of zero-order correlations. High social engagement and high test intelligence per se (i.e., if they were not reflected in subjective evaluations at all) may be double-edged swords: They do not only make the processing of positive information and, therefore, positive experiences more likely but also the processing of negative information and, therefore, negative experiences. Similar findings have been reported for the personality trait “openness to experience” (e.g., Kling, Ryff, Love, & Essex, 2003). Consistent with a dual-component model of affective well-being and the present theoretical framework, however, the unique effects of social involvement and test intelligence on negative affect were relatively small.

Taken together, the cross-sectional evidence supported a “weak” version of the present predictions, stating that indicators of an outward orientation primarily predict positive affect, whereas indicators of an inward orientation primarily predict negative affect. The present longitudinal evidence, however, was entirely consistent with the “strong” version of the predictions in that the subjective measures predicted differential changes in negative affect but not positive affect and the performance-based measures predicted differential changes in positive affect but not negative affect.

**Implications for Work on Age Differences in Positive and Negative Affect**

This study provides one explanation for the finding that positive affect declines in late life, whereas negative affect remains stable (e.g., Charles et al., 2001; Diener & Suh, 1997). Specifically, the present analyses revealed a substantial negative correlation between age and those characteristics that are
involved in the regulation of positive affect, that is, social involvement, test intelligence, and functional health. In contrast, the associations between age and those factors that primarily regulate negative affect were significantly lower, and, in the case of self-evaluated mental fitness, nonsignificant. Further, the effects of age on positive affect were mediated by social involvement and test intelligence.

This evidence also points to one qualification to the so-called stability-despite-loss paradox of affective well-being, which has been attributed to the enormous resiliency of older people (i.e., to their capacity to adjust to age-related loss through self-regulatory mechanisms, including accommodative and secondary modes of coping with loss; see Brandstätter & Greve, 1994; Heckhausen & Schulz, 1995). Specifically, it may be that negative affect will not increase as people become older and face an increasing number of losses because secondary and accommodative coping mechanisms help reorganize the self so that global self-evaluations remain stable. For positive affect to be maintained over time, however, it may not be enough to evaluate self-relevant aspects positively. Positive affect seems to be more related to what people actually can do, that is, to their objective competencies allowing them to engage the environment. These competencies considerably decline in late life.

Implications for Personality and Social Psychology Research

As reviewed previously, past studies in the field of personality and social psychology have suggested that it is physical health that predicts negative affect, whereas it is social engagement that predicts positive affect. In contrast, the present framework proposes that it is in each realm of functioning that one can identify variables that are more relevant to positive affect and others that are more relevant to negative affect. More specifically, it is the subjective evaluation of how one is doing in terms of physical health, cognition, or some other competence that is thought to be more relevant to negative affect; it is the objective level of competence in any of these realms of functioning that is thought to be more relevant to positive affect. Therefore, the present theoretical framework suggests that it is not necessarily the realm of functioning that is central when one tries to understand the differential predictors of positive versus negative affect but rather the mode of assessment (performance based vs subjective).

A question that the present framework, which is thought to describe and integrate past research, does not answer refers to possible explanations for the differential links between outward focus and positive affect versus inward focus and negative affect. Moreover, past dual-process frameworks of affect have suggested that positive and negative affect are both primarily regulated on the behavioral level (i.e., by approaching positive events and by avoiding negative events; see end note 2). Extending these ideas, this study implies that, especially in very old age, downregulating negative affect may be primarily a matter of cognitive adjustment rather than prevention and intervention on the behavioral level. One interesting avenue for future research will be to study the proposal that negative affect becomes increasingly decoupled from behavior and linked to cognition as people age.

Caveats

A first limitation of this study is that some constructs were assessed by relatively few items (i.e., quality of social life and mental fitness). Although there is no doubt that single items can have unacceptably low reliability and validity, the following may be worthwhile to note. First, the BASE battery generally consists of well-established measures that were carefully screened in terms of their psychometric qualities on the basis of past work (Baltes & Mayer, 1999). Second, consistent with the idea that an inward focus refers to global self-evaluations, all present single-item indicators of this focus were domain general and situation unspecific, ensuring their representativeness for the constructs they were selected for. Third, the present indicators of the inward focus most likely were unambiguous to the participants (i.e., the respective items have high face validity). This was explicitly tested for two items assessing social integration that were selected from the UCLA Loneliness scale (see end note 4). Fourth and especially relevant to the present item assessing mental fitness, there is work suggesting that single items assessing physical health do exhibit excellent reliability and predictive validity (e.g., Mossey & Shapiro, 1982; also see Idler, Kasl, & Lemke, 1990). In terms of face validity, these single items (e.g., “how would you rate your physical health at present: excellent, good, fair, poor?”) appear to be highly comparable to the present mental-fitness item. Despite these considerations, one avenue for future research is to assess the present constructs more comprehensively than was possible here.

A second limitation refers to the present design and the positive selectivity of the sample. There were several inconsistencies between the cross-sectional and longitudinal findings. For example, although there was a negative association between age and positive affect, positive affect did not show mean level changes over time. These inconsistencies may be due to the relatively short test–retest interval of only 4 years, which was considerably more restricted than the age range of the sample covering a time period of approximately 30 years. In addition, 40% of the original sample did not continue their participation in the longitudinal follow-up, with the primary reason for dropout being mortality. It could be that the longitudinal changes would mirror the respective cross-sectional age effects if the study had a longer retest–interval and was based on a less positively selected sample.

Third, given that the present evidence is correlational rather than experimental, causal interpretations are, strictly speaking, not justified. Within the limitations of correlational data, however, this study provided evidence that social involvement and test intelligence are precursors of positive affect; there was no evidence for the reverse position. Evidence was less strong for the evaluative indicators being antecedents of negative affect. The low temporal stability of these indicators may be one problem. Differential changes in self-rated mental fitness and quality of social relations were, however, linked to differential changes in negative affect.

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**End Notes**

1 Whereas many past studies have focused on self-evaluated physical health as a predictor of negative affect, in the present study, evaluations of any self-relevant aspect (be it one’s physical health, cognitive functioning, or some other competence) are thought to predict negative affect.

2 As to positive affect, the present outward–inward framework is consistent with prominent dual-process models of affect proposing that positive affect is part of a motivational system designed to direct individuals toward situations that potentially yield pleasure and reward (for review, see Watson, 2000; Watson, Wiese, Vaidya, & Tellegen, 1999). This approach system has been given a variety of names, including behavioral activation system, behavioral engagement system, and behavioral facilitation system. Negative affect, in contrast, has been thought to be part of a system designed to inhibit behavior that might lead to undesirable consequence. Extending this line of thought, the present framework suggests that negative affect may not only be linked to behavior but also to cognition. Especially in very old age, when many negative events actually are unavoidable and beyond a person’s control, regulating negative affect may become primarily a matter of thought (i.e., cognitive adjustment) rather than action (i.e., actual prevention and intervention on the behavioral level; see also Lawton, 1983).

3 As reported in previous publications (e.g., Kunzmann et al., 2000; Smith et al., 2003), the longitudinal sample (n = 206) was younger, healthier, slightly more educated, more likely to live in private homes, more likely to be married, and less likely to be widowed than the group of dropouts (n = 310). Continuers and dropouts did not significantly differ in gender; in both samples, about half of the participants were female. In terms of the present central constructs, continuers were higher in test intelligence, social involvement, and positive affect than were the participants who dropped out. Continuers and dropouts did not differ in self-rated mental fitness, self-rated social satisfaction and integration, or negative affect. With minor exceptions, variances and covariance relations among the present constructs did not differ among the cross-sectional, longitudinal, and dropout samples. More detailed information about the selectivity analyses can be obtained from U. Kunzmann.

4 These two items were part of the BASE Loneliness scale, which is a short eight-item version of the revised UCLA Loneliness Scale (Russell, 1996). As compared with the remaining six items of the BASE Loneliness scale, the two selected items were more global and less ambiguous in terms of their evaluative quality. This was supported by a questionnaire study with 30 adults who were asked to read the eight items of the BASE Loneliness scale and answer two questions for each item: (a) “On a scale from 1 (very specific) to 5 (very broad), how global or specific is the meaning of each item?” and (b) “On a scale from 1 (very ambiguous) to 5 (not at all ambiguous), how ambiguous is the meaning of each item?” Analyses of variance showed that the present two items were significantly broader in meaning and less ambiguous than the remaining six loneliness items. More information is available from U. Kunzmann.

5 To test if the strength of the two paths significantly differed from one another, we used the following formula: $\Delta z = |b_1|/\sqrt{(SE_{1}^2 + SE_{2}^2)/2}$. Note that $b_1$ and $b_2$ are the two estimated paths to be compared; $SE_{1}$ and $SE_{2}$ are their respective standard errors. $\Delta z$ is the resulting test statistic; a value greater than ±1.96 indicates that the two paths to be compared differ at the $p < .05$ level (cf. Casella & Berger, 1990, p. 346).