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Change in Coping and Defense Mechanisms across Adulthood :
Longitudinal Findings in a European-American Sample

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Abstract

This study examined longitudinal changes in coping and defense mechanisms in an age- and gender-stratified sample of 392 European-American adults. Nonlinear age-related changes were found for the coping mechanisms of sublimation and suppression and the defense mechanisms of intellectualization, doubt, displacement, and regression. The change trajectories for sublimation and suppression showed that their use increased from adolescence to late middle age and early old age, and remained mostly stable into late old age. The change trajectory for intellectualization showed that the use of this defense mechanism increased from adolescence to middle age, remained stable until late midlife, and started to decline thereafter. The defense mechanisms of doubt, displacement, and regression showed decreases from adolescence until early old age, with increases occurring again after the age of 65. Linear age-related decreases were found for the coping mechanism of ego regression and the defense mechanisms of isolation and rationalization. Gender and socioeconomic status were associated with the mean levels of several coping and defense mechanisms, but did not moderate age-related changes. Increases in ego level were associated with increased use of the defense mechanism intellectualization and decreased use of the defense mechanisms of doubt and displacement. Overall, these findings in a European-American sample suggest that most individuals showed development in the direction of more adaptive and less maladaptive coping and defense strategies from adolescence until late middle age or early old age. However, in late old age this development was reversed, presenting potential challenges to the adaptive capacity of older adults.

Keywords: coping and defense mechanisms, age-related change, developmental covariates, adult development and aging.

Change in Coping and Defense Mechanisms across Adulthood:

Longitudinal Findings in a European-American Sample

Coping and defense mechanisms, conceptualized as behavioral dispositions to cope with life stress and adverse situations, are important building blocks of adult personality and are integral to adults' social-emotional functioning (Carver & Connor-Smith, 2010; McCrae & Costa, 2003). As such, coping and defense mechanisms are critical for how individuals deal with the day-to-day challenges of adult life and for long-term developmental outcomes (Costa, Zonderman, & McCrae, 1991; Folkman, 1991; Vaillant, 1993). However, knowledge of how coping and defense mechanisms change over the adult life span and the factors that contribute to developmental continuity or discontinuity is fairly limited (Cramer, 2009). The current study aims to advance the literature by presenting findings from a 12-year longitudinal study on coping and defense mechanisms in a community sample of European Americans who ranged in age from adolescence to old age. Furthermore, this study examined the role of covariates, such as ego level and intellectual abilities that have been shown to be associated with developmental change in coping and defense mechanisms at earlier ages.

Coping and Defense Mechanisms in Adulthood

Although coping and defense mechanisms have been studied primarily in the context of life stress (Carver & Connor-Smith, 2010; Lazarus & Folkman, 1984), life-span researchers have often adopted a broader view than is common in stress research (Folkman, 1991). This broader view is rooted in models of ego psychology (Freud, 1936/1966; Hartmann, 1958) and emphasizes the role of coping and defense mechanisms as behavioral dispositions relevant for self-regulation, adjustment, and adaptation (Costa et al., 1991; Cramer, 2008; Diehl, Coyle, & Labouvie-Vief, 1996; Haan, 1977; Vaillant, 1992, 1993). The major criteria that have been applied by theorists to distinguish between coping and defense mechanisms are their level of consciousness, intentionality, and adaptiveness (Cramer, 2008; Haan, 1977; Vaillant, 1992, 1993). Thus, coping strategies tend to be viewed as being conscious, intentional and mostly adaptive, whereas defense mechanisms are seen as being nonconscious, unintentional, and potentially maladaptive (Costa et al., 1991; Cramer, 2008).¹

Although the debate about these distinguishing features and the nature of coping and defense mechanisms is not entirely settled (Newman, 2000), there seems to be reasonable consensus across different areas of psychological research with regard to several important points (Cramer, 2008). First, coping and defense mechanisms are linked to a variety of human behaviors, including cognitive processes, such as memory and decision making, and interpersonal relations (Jacoby, Lindsay, & Toth, 1992; Lewicki, Hill, & Czyzewska, 1992). In particular, it is widely acknowledged that more mature coping and defense mechanisms are associated with more complex cognitive processes, a higher level of self-reflective and planful behavior, and more satisfying and less conflicted interpersonal relations (Blanchard-Fields, Mienaltowski, & Seay, 2007). Second, coping and defense mechanisms represent dynamic and multidimensional processes (Folkman, 1991). Third, it is worthwhile to study the development of coping and defense mechanisms across the life span in order to understand their chronology and how individuals respond to challenges associated with situations of stress and adversity at different points of the life course (Costa et al., 1991; Cramer, 2008; Diehl et al., 1996; Folkman, 1991).

Studying strategies of coping and defense across the life span raises questions about their developmental trajectories, their continuity or discontinuity, and whether they might become more or less adaptive with age. That coping and defense mechanisms might show different developmental trajectories was first suggested by Anna Freud (1936/1966) based on her clinical observations with children. Building on this work, Vaillant (1977) suggested a developmental hierarchy of coping and defense mechanisms, ranging from immature, neurotic, and maladaptive strategies (i.e., denial, projection, and distortion) to mature and adaptive strategies (i.e., sublimation, suppression, humor, and altruism). Drawing on the key concepts of ego psychology and Piaget's theory of development, Haan (1977) proposed another theoretical conceptualization of coping and defense mechanisms as ego processes that direct behavior and are involved in processes of accommodation and assimilation. Specifically, Haan defined 10 generic ego processes, each having a mature or adaptive (coping) expression as well as an immature or maladaptive (defense) expression. In this model, coping mechanisms are ego processes that involve the full use of cognitive and emotional capacities. In contrast, defense mechanisms lack the full use of cognitive abilities,

distort reality, and are covert in impulse expression. Table 1 provides a brief description of Haan's (1977) coping and defense mechanisms.

Evidence that coping and defense strategies may show developmental change across adulthood comes from cross-sectional (Diehl et al., 1996; Folkman, Lazarus, Pimley, & Novacek, 1987; Irion & Blanchard-Fields, 1987; Labouvie-Vief, Hakim-Larson, & Hobart, 1987; McCrae, 1982) as well as longitudinal studies (Cramer, 2009; Haan, 1977; McCrae, 1989; Vaillant, 1993) with primarily European-American samples. In terms of cross-sectional findings, several studies found that older adults used less hostile or avoiding coping strategies compared to younger adults (Folkman et al., 1987; Irion & Blanchard-Fields, 1987; McCrae, 1982). Conversely, older adults were more likely than younger adults to use problem solving, positive reappraisal and emotional distancing in stressful situations (Folkman et al., 1987; Irion & Blanchard-Fields 1987; Labouvie-Vief et al., 1987; McCrae, 1982). Diehl et al. (1996) reported significant age differences in the use of coping and defense mechanisms based on a measure derived from the California Personality Inventory (CPI; Gough, 1987). Specifically, this study showed increases across age groups for the coping mechanisms of sublimation and suppression, whereas decreases across age groups were found for the defense mechanisms of intellectualization, rationalization, isolation, regression, doubt, and displacement. Thus, overall these cross-sectional findings suggest that in European Americans the use of adaptive coping and defense mechanisms increases with age, whereas the use of maladaptive mechanisms decreases. However, these findings can only permit statements about age differences. Questions regarding developmental change require the analysis of longitudinal data.

Based on data from the Berkeley Guidance Study, Cramer (2007) showed that from age 11 to 18 there was a general progression from less to more cognitively complex defense mechanisms. In particular, the use of denial declined, whereas the use of projection and identification increased over this age range. In a subsequent study, Cramer (2012) reported developmental changes from late adolescence to adulthood, showing that from age 18 to 38 the use of identification decreased, the use of denial increased, and the use of projection remained stable. Similarly, Haan (1977) used data from the Oakland Growth and the Berkeley Guidance Study to examine her assumptions regarding developmental changes in coping and

defense mechanisms. She showed that the use of denial, the least differentiated defense mechanism, decreased between childhood and age 30. Conversely, adaptive forms of coping, such as logical analysis or suppression, were used more frequently during the adult years.

McCrae (1989) examined 7-year change in coping mechanisms in adults ranging in age from 20 to 93 years. Findings showed declines in the use of isolation of affect, fatalism, positive thinking, drawing strength from adversity, and faith. In contrast, an increase was found in the use of wishful thinking. Overall, McCrae (1989) concluded that the 7-year changes in adults' coping and defense mechanisms were rather subtle and offered only weak support for a maturation/growth hypothesis.

Finally, Vaillant (1977, 1993) and Soldz and Vaillant (1998) examined data from the Study of Adult Development, which included two longitudinal samples of men and one longitudinal sample of women. These authors found that as participants grew older, the use of immature and neurotic defenses decreased and the use of mature defenses increased. However, not all study participants developed mature defenses, and some participants continued to use immature and neurotic strategies. Vaillant (1993) also showed that, overall, the use of immature and neurotic defenses tended to be associated with maladaptive outcomes, such as marital instability, low job and life satisfaction, and depressive symptoms, whereas the use of mature defense mechanisms was associated with adaptive outcomes, such as mental health and job success (see also Soldz & Vaillant, 1998).

In summary, although findings from cross-sectional studies suggest positive age differences in coping and defense mechanisms across adulthood, results from longitudinal studies are more mixed. That is, based on the findings from longitudinal studies it is less clear whether the data support a growth or maturation hypothesis. Specifically, it is still open whether European-American adults, as a group, indeed show greater use of adaptive and less use of maladaptive coping and defense mechanisms across adulthood.

Covariates of Age-Related Change in Coping and Defense Mechanisms

A major goal of developmental research is the examination of the causes and correlates of observed age-related change and interindividual differences in age-related change (Singer & Willett,

2003). The present study addressed these issues by examining whether changes in other developmentally relevant variables were associated with changes in coping and defense mechanisms.

Only a small number of studies have examined either correlates of age differences (Diehl et al., 1996; Labouvie-Vief et al., 1987) or predictors of longitudinal changes in coping and defense mechanisms (Cramer, 2009). Labouvie-Vief et al. (1987), for example, found in a sample of European-American adults that older individuals who scored higher on ego development and who provided more complex descriptions of the sources of stress were more likely to use mature coping and defense mechanisms as compared to younger individuals who scored lower on ego development and provided less complex descriptions of the sources of stress. Diehl et al. (1996) reported similar findings for another age-comparative sample of European-American adults. In particular, canonical correlation analysis showed that older individuals with higher verbal ability and higher ego level scores were less likely to report the use of immature defense mechanisms (i.e., projection, displacement, regression, or isolation) compared to younger individuals with lower verbal ability and lower ego level. Instead, older individuals who had higher verbal ability and ego level scores were more likely to report the use of adaptive coping and defense mechanisms, such as objectivity, logical analysis, sublimation, and suppression. Taken together, the findings from these two cross-sectional studies suggest that variables indicative of individuals' cognitive-emotional development, such as ego level or verbal ability, are significant correlates of coping and defense mechanism use. Therefore, it seems reasonable to assume that these variables are also linked to how coping and defense mechanisms change across the adult life span.

Cramer (2009) examined the role of general intelligence (IQ) and socio-economic status (SES) as predictors of change in the defense mechanisms denial, projection, and identification from pre-adolescence to early adulthood. Findings provided evidence that higher IQ at pre-adolescence was associated with increases in the use of identification and decreases in the use of projection in early adulthood. Lower SES in childhood predicted an increase in the use of denial from pre-adolescence to early adulthood, yet SES was not associated with changes in projection or identification. Based on data from the Study of Adult Development, Vaillant (1993) reported that SES or intellectual ability were not

associated with maturity of coping and defense mechanisms, as assessed by bivariate correlations. In summary, evidence about covariates of longitudinal change in coping and defense mechanisms is mixed and limited both in terms of the number of available studies and the age range covered by these studies.

The present study contributes to this literature by examining time-invariant and time-varying covariates of longitudinal change in coping and defense mechanisms across a wide age range and multiple times of measurement. In particular, the present study examined to what extent participants' SES at the beginning of the study, a time-invariant covariate, was associated with changes in coping and defense mechanisms over the 12-year period. We expected that SES would be positively associated with increases in adaptive coping mechanisms and negatively associated with decreases in maladaptive defense mechanisms. In addition, we examined the effects of three time-varying covariates, namely ego level, verbal ability, and inductive reasoning. These covariates were chosen because coping and defense mechanisms involve cognitive and social-emotional processes and theorists have argued that advances in cognitive and social-emotional development should result in the use of more adaptive coping and defense mechanisms (Cramer, 2008; 2012; Labouvie-Vief & Diehl, 2000). Given this theoretical and empirical background, yet also being aware of the findings reported by Vaillant (1993), we hypothesized that age-related increases in ego level, verbal ability, and inductive reasoning would be positively associated with increases in the use of coping mechanisms, but inversely associated with changes in the use of defense mechanisms.

Gender Differences in Changes in Coping and Defense Mechanisms

Findings from previous research suggest that European-American women and men differ in meaningful ways in their use of coping and defense mechanisms (Diehl et al., 1996; Labouvie-Vief et al., 1987). For example, Labouvie-Vief et al. (1987) reported that women were more likely than men to utilize turning against self, seeking social support, and escape-avoidance as coping behavior. Similarly, Diehl et al. (1996) found that women reported greater use of the defense mechanisms turning against self and doubt compared to men, whereas men scored higher on the defense mechanisms of projection and reaction formation. These findings suggest that men seem to be more likely to use externalizing coping

and defense mechanisms, whereas women seem to be more likely to react in internalizing ways. These findings suggest that more research is needed to learn whether coping and defense strategies change in a gender-specific way across the adult life span.

Currently there are, however, no data available that have examined to what extent women and men differ in how their coping and defense mechanisms *change* across adulthood. In the absence of such data, we relied on findings from the general personality literature (Helson, Kwan, John, & Jones, 2002; Helson & Moane, 1987) and derived two rivaling hypotheses. Although longitudinal within-person changes do not have to mirror cross-sectional between-person differences, the first hypothesis assumed that gender differences in age-related changes would be similar to the gender differences observed in cross-sectional studies. Under this hypothesis it would be expected that men and women would differ with regard to the age-related change they display for different internalizing vs. externalizing coping and defense mechanisms. For example, compared to men, women would be expected to show greater age-related change in internalizing coping and defense mechanisms, such as suppression, doubt, or repression. Conversely, men would be expected to show greater age-related change in externalizing mechanisms, such as projection or displacement.

The second hypothesis assumed that the gender differences in coping and defense mechanisms that have been shown in European-American samples for earlier parts of the life span may disappear in adulthood. This assumption was supported by several empirical studies. Helson and Moane (1987) and Haan (1977) reported longitudinal findings showing that women who changed in a positive way during early and middle adulthood showed decreases in femininity and increases in independence, social assertiveness, and intellectuality. Conversely, Haan (1977) reported findings showing that for men, positive changes during midlife often involved the re-evaluation of assertive and dominating behaviors and the adoption of caring and self-reflective behaviors (see also Haan, Millsap, & Hartka, 1986). In summary, the present study examined whether and to what extent age-related changes in coping and defense mechanisms across adulthood differed for women and men.

The Present Study

The present study addressed three major issues. First, we focused on describing age-related changes in a number of coping and defense mechanisms for which significant age differences had previously been documented (Diehl et al., 1996). In particular, we examined *longitudinal growth trajectories* in three coping (i.e., ego regression, sublimation, and suppression) and six defense mechanisms (i.e., isolation, intellectualization, rationalization, doubt, regression, and displacement).² Given the availability of four waves of data, the present study extended previous research by examining *linear and quadratic change trajectories* in adults' coping and defense mechanisms. Examination of nonlinear patterns of change is important as different coping and defense strategies may show increases or decreases at different ages.

Second, we examined *time-invariant* and *time-varying covariates* of age-related change in individuals' coping and defense mechanisms. Participants' SES at the start of the study served as a time-invariant predictor, whereas ego level, verbal ability, and inductive reasoning were time-varying predictors. This part of the study extended previous research by examining whether and to what extent age-related change in coping and defense strategies was coupled with, and potentially caused by, changes in other developmentally relevant variables. Third, we examined to what extent the age-related change trajectories of participants' coping and defense mechanisms differed between men and women.

Method

Participants

The age- and gender- stratified sample ($N = 392$ at Time 1) consisted of adolescents and adults of primarily European-American descent (95.2%) recruited in a Midwestern metropolitan area. The sample was assessed in 1992, 1994, 1998, and 2004. Data for pertinent measures were available for the following number of participants: 1992: $N = 392$ (aged 10 to 87 years, $M_{\text{age}} = 45.35$ years, $SD_{\text{age}} = 20.01$ years, 51.5% women); 1994: $N = 327$ (aged 15 to 88 years, $M_{\text{age}} = 48.14$ years, $SD_{\text{age}} = 19.19$ years, 53.2% women); 1998: $N = 260$ (aged 16 to 92 years, $M_{\text{age}} = 50.46$ years, $SD_{\text{age}} = 19.64$ years, 57.3% women); 2004: $N = 171$ (aged 23 to 94 years, $M_{\text{age}} = 54.61$ years, $SD_{\text{age}} = 18.19$ years, 57.3% women). In 1992, the majority of the adults were married (57%), 22% were single, 11% were divorced, and 10% were widowed.

Participants' annual household income ranged from less than \$10,000 to over \$150,000, with a mean of \$51,500. Most of the 43 adolescents (91%) were in junior high or high school at the start of the study. Of the 349 adults, 4% had not graduated from high school, 14% had graduated from high school, 31% had attended some college, 18% had received a college degree, 14% pursued education beyond the bachelor level, and 20% had earned a graduate degree.

Of the original 392 participants, 129 participants (32.9%) had complete data for all four occasions of measurement, 120 participants (30.6%) had complete data on three occasions, 71 participants (18.1%) had complete data for two occasions, and 72 participants (18.4%) had complete data for only one occasion, resulting in a total of 1,150 observations. Detailed recruitment procedures and results of attrition analyses from the first three waves were reported by Labouvie-Vief, Diehl, Jain, and Zhang (2007). Overall, the pattern of attrition from Waves 1 through 3 was similar to the pattern reported from other longitudinal studies with adults (Schaie, 2005).

The returning 171 participants assessed in 2004 represented 43.6% of the original sample, 52.3% of the Wave 2 sample, and 65.8% of the Wave 3 sample. Attrition analyses showed that compared with participants who returned for testing in 2004, non-returnees had a significantly lower level of education, $t(390) = 2.64, p < .01$, and scored lower on numerical ability, $t(396) = 3.22, p < .01$, and inductive reasoning, $t(398) = 4.71, p < .001$, at the beginning of the study. Attrition analyses for the 1998-2004 interval showed that compared with returnees in 2004, non-returnees showed similar levels of education, $t(249) = -.18, p > .05$, and verbal ability, $t(209) = 1.59, p > .05$. However, the returnees and non-returnees differed in 1998 significantly from each other in terms of numerical ability, $t(209) = 3.64, p < .05$, and inductive reasoning, $t(208) = 5.01, p < .001$. Non-returnees had significantly lower mean scores compared to returnees. Participants who did not return in 1994, 1998, or 2004 also reported more use of the defense mechanism projection at baseline compared to returnees (1994: $t(311) = -2.63$; 1998: $t(247) = -2.95$; 2004: $t(362) = -3.27$; all p 's $< .05$). Returnees and non-returnees did, however, not differ significantly in average age, gender, marital status, household income, life satisfaction, or self-rated health.

Procedure

At each occasion of testing, participants completed two 2-hour sessions that were scheduled, on average, two weeks apart. Testing was conducted by trained graduate students and was held in small groups of 2-10 individuals at locations in the participants' communities. In 1992 and 1994, participants received a remuneration of \$50.00; in 1998 and 2004, participants received \$75.00 and \$50.00, respectively, as compensation for the completion of the testing sessions. The intervals of measurement were primarily dictated by available funding for the study and, hence, were not spaced equally. The amount of remuneration in each wave was determined by the length of the testing protocol, the availability of funds, and the general guidelines of the funding agency.

Measures

Coping and defense mechanisms. The coping and defense scales were scored from the California Psychological Inventory (CPI; Gough, 1987). The CPI is a self-report personality inventory that assesses the everyday folk-concepts that ordinary people use to describe the behavior of people around them (Gough, 1987). As such, the CPI assesses personality in terms of observable behaviors and focuses on midlevel units of personality. The CPI was administered to participants aged 15 or older at all four times of measurement.³ Using the scoring procedures developed by Joffe and Naditch (1977), scores for the 10 coping and 10 defense mechanisms described in Table 1 were calculated.

In the present study, we examined a subset of the 20 coping and defense mechanisms, namely those for which a previous study had documented significant age differences (Diehl et al., 1996). Thus, we included three coping (i.e., ego regression, sublimation, and suppression) and six defense mechanisms (i.e., isolation, intellectualization, rationalization, doubt, regression, and displacement) in the analyses. These coping and defense mechanisms are marked with an asterisk in Table 1.

The CPI-based coping and defense scales have been examined in previous research with European-American samples (Helson & Moane, 1987; Helson & Wink, 1987) and adequate test-retest reliability and validity have been demonstrated (Joffe & Naditch, 1977). Because the coping and defense scales for women and men contain a different number of items, scores were scaled to a common metric to allow for valid comparisons.

Ego level. Ego level was assessed at waves 1, 2, and 4, using the short form of Loevinger's Washington University Sentence Completion Test (Hy & Loevinger, 1996). Participants provided written responses to 18 sentence stems. For each sentence stem, responses were scored by an experienced rater. Each response was classified according to the nine-level system of six main and three transitional levels of ego development: (1) Presocial (2) Impulsive, (3) Self-Protective, (4) Conformist, (5) Self-Aware, (6) Conscientious, (7) Individualistic, (8) Autonomous, and (9) Integrated. The total item sum score was used; higher scores indicate higher ego development (Hy & Loevinger, 1996).

Two trained raters independently coded participants' responses. Rater 1 coded the data from all three waves, and Rater 2 coded a subset of responses from the first two waves. Inter-rater reliability was $r = .90$ for Wave 1 and for Wave 2. Rater 1 also demonstrated high intra-rater reliability (i.e., 95% consistency).

Verbal ability and inductive reasoning. The vocabulary and letter sets test from the Educational Testing Service (ETS) Kit of Factor-Referenced Cognitive Tests (Ekstrom, French, Harman, & Derman, 1976) were used to assess participants' verbal and inductive reasoning abilities, respectively. The vocabulary test has 18 items, and participants are asked to identify which word of five possible choices has the same meaning as a target word. The letter sets test has 15 items and participants are asked to cross out the set of letters that does not fit the pattern displayed in the sequence of letter sets. Participants' scores on these two tests were calculated by summing the total items answered correctly. Both tests are widely used in studies with adults and their reliability and validity is well established (Schaie, 2005).

Socioeconomic status. An index of participants' socioeconomic status (SES) was calculated using household income and father's education level as reported at Wave 1. Household income was reported using a 12-point scale, ranging from 1 = less than \$10,000 to 12 = more than \$150,000. Father's education level was assessed on an 8-point scale, ranging from 1 = 6th grade or less to 8 = finished a graduate degree. Participants' own education level was not used as an indicator of SES because a sizeable number of participants were adolescents and young adults who were still in school at Wave 1 or Wave 2.

Household income and father's education level were summed to create the index of SES. Higher scores indicate higher SES.

Data analyses

Multilevel modeling was used to examine the trajectories of change of the coping and defense strategies (Singer & Willett, 2003). All analyses were performed using SAS PROC MIXED (SAS Institute, 2008). The unconditional means models and unconditional growth models were first tested for each coping and defense variable. Testing the unconditional means models allows the examination of systematic within- and between-person variability (Singer & Willett, 2003). For the unconditional growth models, time was the only predictor, permitting the examination of a linear change trajectory in each person's data across the 12-year period. In estimating the unconditional growth models and subsequent models, time was clocked in terms of participants' age, with the age variable grand-mean centered at the sample mean age of 45.35 years at Wave 1. Thus, the fixed effect of the level-1 intercept in these models can be interpreted as the initial status of the person of average age at Wave 1. In addition, the fixed effect of the level-1 coefficient of age (grand-mean centered at 45.35 years) can be interpreted as the average person's annual rate of change.

The unconditional growth model can be represented in the following way:

Level-1:

$$Y_{ij} = \pi_{0i} + \pi_{1i}(Age - 45.35)_{ij} + \varepsilon_{ij}$$

Level-2:

$$\pi_{0i} = \gamma_{00} + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \zeta_{1i}$$

The level-1 equation specifies that individual i 's observed score on occasion j , Y_{ij} , is a function of (a) this individual's initial status in 1992, as represented by π_{0i} , (b) this individual's rate of change, π_{1i} , and (c) a random within-person error, ε_{ij} . The level-2 equations specify that individual i 's initial status is a function of the population average true initial status, γ_{00} , and the random between-person residual, ζ_{0i} .

Similarly, individual i 's person-specific rate of change is a function of the population average true rate of change, γ_{10} , and the random between-person residual, ζ_{1i} . It is assumed that the level-1 residuals, ε_{ij} , are normally distributed with mean 0 and variance σ_{ε}^2 . It is also assumed that the two level-2 residuals, ζ_{0i} and ζ_{1i} , have a bivariate normal distribution with mean 0, unknown variances, σ_0^2 and σ_1^2 , and unknown covariance σ_{01} .

To examine possible nonlinear age-related growth trajectories of the coping strategies and defense mechanisms, subsequent models were examined with the quadratic term of age (grand-mean centered at the mean age at Wave 1) entered in the level-1 equation. To examine gender differences in the growth trajectories, gender was entered in the level-2 model. The main effect of gender and the cross-level interaction of gender with age were tested.

SES at Wave 1 was added into the level-2 model as a time-invariant covariate. Ego level, verbal ability, and inductive reasoning were added as time-varying covariates into the level-1 model to examine the possible coupling of changes of coping and defense mechanisms with changes in ego level and intellectual functioning. Fit indices were examined to compare the goodness of fit of the unconditional growth models and the quadratic models. The quadratic term of age was retained if the model fit was significantly improved compared to the linear model. All models were estimated using the unstructured error covariance structure.

Results

Rank-Order Stability and Between- and Within-Person Variability

To examine the extent to which the coping and defense mechanisms showed stability over time, we calculated rank-order stabilities for consecutive waves and across the entire 12-year period (see Table 2). The observed stabilities across the 12-year period ranged from .38 for the coping mechanism of suppression to .84 for the defense mechanism of intellectualization. The average stability across the 12-year period was .55. The average rank-order stabilities for the 2-year, 4-year, and 6-year intervals, were .61, .63, and .64, respectively.

To establish that the estimation of within-person growth models was an appropriate analytic strategy (Singer & Willett, 2003), we first calculated unconditional means models to obtain an estimate of the intraclass correlation for each coping and defense mechanism. Inspection of the intraclass correlations permits the evaluation of the amount of overall variability that is between- vs. within-person variance. For example, if individuals were completely stable over time on these coping and defense mechanisms, then the only variability that could be observed would be between-person variation, simply reflecting individual differences and no within-person change. In that instance the intraclass correlation would be 1.0 or close to 1.0. However, if a substantial portion of the variability is due to within-person change, then the intraclass correlation will be considerably lower than 1.0, justifying the use of individual growth models.

The last column in Table 2 shows the intraclass correlations resulting from these analyses. As can be seen, the intraclass correlations ranged from .47 for the defense mechanism of isolation to .77 for the defense mechanisms of intellectualization and doubt. This means that 47% of the total variation in isolation was due to between-person variability and 53% was due to within-person variability (i.e., 77% and 23% respectively for intellectualization and doubt). The mean intraclass correlation across the coping and defense mechanisms was .61. This means that, on average, 61% of the total variation was due to between-person variability, whereas, on average, 39% was due to within-person variability. Thus, these results showed that although between-person variation accounted, on average, for the majority of variability in coping and defense mechanisms, substantial portions of variation were within person, indicating that change had occurred over the course of the 12-year observation period.

Age-Related Change in Coping Strategies and Defense Mechanisms

To investigate whether change was related to age, we calculated multilevel models with age and age² as level-1 predictors. Table 3 provides the resulting estimates for the three coping mechanisms of ego regression (Model 1a), sublimation (Model 2a), and suppression (Model 3a). Ego regression showed a linear within-person decline for individuals from adolescence to old age ($\beta_{10} = -.06, p < .001$). In contrast, sublimation ($\beta_{20} = -.001, p < .01$) and suppression ($\beta_{30} = -.001, p < .001$) showed a within-person increase

for individuals in young and middle adulthood, followed by a decline for individuals from about age 60-65 on. Figure 1 shows the age-related trajectories of change for the three coping strategies.

In terms of the defense mechanisms, the results of Models 4a and 6a indicated that both isolation ($\beta_{10} = -.03, p < .001$) and rationalization ($\beta_{10} = -.03, p < .001$) showed a linear within-person decline across adulthood. In contrast, intellectualization ($\beta_{20} = -.001, p < .05$) increased within individuals from young adulthood to middle-age and then declined from about age 50 on. Conversely, the use of the defense mechanisms of doubt, regression, and displacement decreased within individuals from young adulthood until late middle age or early old age ($\beta_{s20} = .002, p$'s $< .001$). With regard to doubt, the self-reported use of this defense mechanism was lowest at about age 55 and started to increase again for adults older than 55. For the defense mechanisms of regression and displacement self-reported use declined until age 65, but after age 65 the change trajectories showed an upturn again, suggesting an increase in the use of these defense mechanisms in late adulthood. The age-related growth trajectories for the defense mechanisms are presented in Figure 2.

Effects of Time-Invariant and Time-Varying Covariates

In the analyses reported above, we found systematic age-related change in the coping and defense mechanisms at the group level. To investigate whether these effects may be accounted for by time-invariant (i.e., gender, SES) and/or time-varying covariates (i.e., ego level, intellectual abilities), we performed corresponding multilevel analyses. Table 3 presents the results for the 3 coping mechanisms (i.e., Models 1b, 2b, and 3b).

As can be seen from Model 1b, none of the covariates had a significant effect on the growth trajectory of ego regression. For sublimation (Model 2b) and suppression (Model 3b), the quadratic effect of age remained significant after the covariates were entered into the model. Specifically, gender and SES showed significant main effects. Substantively this means that women reported more use of sublimation and suppression than men across adulthood. Also, individuals of higher SES reported more use of sublimation and suppression compared to individuals of lower SES. However, gender and SES showed no significant cross-level interactions with age, indicating that men and women and individuals of different

SES changed in similar ways on these coping mechanisms across adulthood. The time-varying covariates of ego level, verbal ability, and inductive reasoning showed no significant associations with the coping mechanisms.

Tables 4 and 5 display the corresponding results for the 6 defense mechanisms. First, SES had a significant effect on all 6 defense mechanisms. Consistent with theoretical assumptions, individuals of higher SES reported less frequent use of isolation, rationalization, doubt, regression, and displacement compared to individuals of lower SES. In contrast, SES was positively associated with the use of intellectualization, indicating that individuals of higher SES utilized intellectualization more frequently than individuals of lower SES. Second, gender differences were found for the defense mechanisms of intellectualization, rationalization, and doubt. Compared to men, women reported more use of rationalization and doubt, but less use of intellectualization. Third, SES and gender did not show any significant cross-level interactions with age, indicating that women and men and individuals of different SES changed in similar ways on the examined defense mechanisms.

With regard to the effect of the time-varying covariates, the analyses showed that ego level was a significant predictor of change in intellectualization, doubt, and displacement. Increases in ego level over the 12-year period were coupled with increases in the use of intellectualization and with decreases in the use of doubt and displacement. As with the coping strategies, the time-varying covariates of verbal ability and inductive reasoning were not significantly associated with change in any of the defense mechanisms.

Discussion

The goal of the present study was to investigate age-related changes in coping and defense mechanisms across adulthood in a sample of European-American men and women, and to examine possible covariates of observed age-related changes. Three major findings emerged from this study: First, despite a good deal of rank-order stability, the coping and defense mechanisms showed systematic age-related change across the adult life span. For the majority of the coping and defense mechanisms, this observed change was nonlinear in nature. Second, of the selected time-varying covariates only ego level emerged as significant predictor of age-related change in coping and defense mechanisms. In particular,

increases in ego level were significantly coupled with increases in intellectualization, and decreases in doubt and displacement. However, changes in coping and defense mechanisms were not associated with changes in intellectual abilities. Third, women and men differed in the use of the coping mechanisms of sublimation and suppression across the adult life span, with women reporting greater use of these mechanisms than men. Men and women also differed in the use of the defense mechanisms of intellectualization, rationalization, and doubt, with women reporting greater use of rationalization and doubt, but less use of intellectualization. Women and men's coping and defense mechanisms, however, changed in similar ways over the 12-year time span.

Age-Related Changes in Coping and Defense Mechanisms

The present study examined in a sample of European-American adults whether trajectories of age-related changes in coping and defense mechanisms mapped onto previously reported patterns of age differences (Diehl et al., 1996). Evidence for such a convergence would suggest that the reported age differences reflected actual age-related changes reasonably well, whereas a divergence of results would suggest that the reported pattern of age differences was an inadequate representation of age-related changes and was perhaps more indicative of cohort/generational effects. A comparison of the change trajectories shown in Figures 1 and 2 with the earlier reported pattern of age differences (see Diehl et al., 1996, Figure 2) showed that the pattern of age differences was fairly similar to the obtained longitudinal trajectories. For example, the coping strategy of ego regression and the defense mechanisms of isolation and rationalization had shown negative linear age differences in the cross-sectional study (Diehl et al., 1996) and this pattern was confirmed by negative linear change trajectories in the longitudinal data. Similarly, the nonlinear pattern of age differences that had been shown for the coping mechanisms of sublimation and suppression and for the defense mechanisms of intellectualization, regression, displacement, and doubt were also confirmed by the quadratic longitudinal trajectories.

Yet, there were also some differences between the pattern of age differences and the longitudinal change trajectories. The coping mechanisms of sublimation and suppression, for example, showed nonlinear increases from adolescence through midlife and into early old age and stayed at the same level

until late old age. In contrast to the cross-sectional findings, there was no marked downturn in these coping mechanisms in late old age (Diehl et al., 1996). In terms of the coping strategy of ego regression, the longitudinal trajectory did not show an upturn after the age of 70, whereas the cross-sectional findings had suggested such an upturn in the oldest age group. Also, the nonlinear trajectories for the defense mechanisms of intellectualization, regression, displacement, and doubt showed the developmental changes in a more concise way than the pattern of age differences. In summary, there was a good deal of congruence between the cross-sectional and longitudinal findings, suggesting that the previously reported age differences were a reasonable representation of age-related change.

From a life-span developmental perspective it is notable that in this sample of European Americans the increases in adaptive coping mechanisms were simultaneously accompanied by decreases in the use of maladaptive defense mechanisms. Specifically, the data showed linear age-related declines across adulthood for the defense mechanisms of isolation and rationalization and nonlinear changes for displacement, doubt, and regression. The form of the nonlinear change was similar for each of these three defense mechanisms with decreasing use from adolescence until late middle or early old age, followed by increases after the age of 65 and into late old age. Overall, these findings suggest that over the course of adulthood, the use of less adaptive defense mechanisms decreased until late middle age or early old age, followed by an upturn typically occurring after the age of 65. These results converge with findings from cross-sectional (Labouvie-Vief, Chiodo, Goguen, Diehl, & Orwoll, 1995) and longitudinal studies (Labouvie-Vief et al., 2007) showing that cognitive-emotional complexity peaks in late middle age and declines thereafter, and support the notion that the development of coping and defense mechanisms is linked to cognitive complexity (Cramer, 2008). Moreover, these findings are consistent with results from the personality development literature showing that European-American adults' experiences in different social roles (e.g., work, family, and community) contribute to changes in personality characteristics, potentially including coping and defense mechanisms (Folkman et al., 1987; Helson & Moane, 1987; Helson et al., 2002).

These findings are also noteworthy for three additional reasons. First, they extend the work of other researchers (Cramer, 2009) into the years of middle adulthood and old age. Second, the present findings are based on a sizeable study sample that was followed over a 12-year period and included individuals from a wide age range. Furthermore, the present study examined longitudinal change in a large set of coping and defense mechanisms, thus capturing this behavioral domain in a more comprehensive way than previous studies (Cramer, 2009, 2012). Third, the present findings suggest that the positive changes that characterize the development of coping and defense mechanisms in European Americans in late adolescence and early and middle adulthood do not necessarily continue into later adulthood. Rather, our data suggest that most of these positive developments are to some extent reversed in late old age. Thus, this finding points toward a potential source of psychosocial vulnerability in later life, when older adults' adaptive capacity and cognitive resources might be challenged in unexpected ways (Baltes & Smith, 2003; Labouvie-Vief, Grünh, & Studer, 2010).

It also needs to be noted that the longitudinal trajectories of one coping strategy and one defense mechanism were inconsistent with a developmental growth and decline interpretation. Specifically, the coping mechanism of ego regression did not show age-related increases, but showed a linear age-related decrease. In addition, the trajectory of the defense mechanism of intellectualization failed to show age-related declines, but instead displayed a nonlinear association with age, with increases from adolescence until about age 45 and decrease after the age of 60. Although we cannot conclusively determine the reasons for the deviations of the data from conceptual expectations, it is noteworthy that these longitudinal trajectories were similar to the previously reported pattern of age differences (Diehl et al., 1996, Figure 2). Possible explanations for these counterintuitive change trajectories can be put forward when Haan's (1977) definitions of ego regression and intellectualization are examined more closely. For example, Haan (1977) describes individuals who score high on ego regression as willing to "... 'play' with ideas, feelings, and motoric expressions without being stifled by concerns over their practicality, reality allegiance, or appropriateness" (p. 304). On the other hand, adults who score high on intellectualization are described as individuals who, compared to individuals who use intellectuality, use words and

abstractions often inappropriately to the specific situation, suggesting a more rigid and defensive use of the intellect rather than an adaptive form of cognitive complexity. If one considers these definitions in the context of socialization and role theories of adult development, then the linear decline in ego regression and the nonlinear pattern for intellectualization may reflect that over the course of the adult life span individuals can become increasingly entrenched in social roles and institutions. Such entrenchment often limits cognitive playfulness, fosters conformity, and rewards rational and abstract thinking, even if it may result in pseudo-intellectuality (Kohn, 1995; Kohn & Schooler, 1983).

In summary, the reported findings are consistent with a *qualified version* of the growth and maturation hypothesis (McCrae, 1989; Vaillant, 1993). This qualified version suggests that across adulthood most individuals in this sample of European Americans showed increases in adaptive and decreases in maladaptive coping and defense mechanisms up to late middle age or early old age, with counter-directional changes occurring in late old age. Finally, it also needs to be noted that results from the present study are consistent with findings from the general literature on personality development across adulthood. In general, this literature has shown that (a) considerable mean level change in personality can be observed in the presence of moderate to high rank-order stability (Roberts & Mroczek, 2008); (b) many changes in personality characteristics tend to be nonlinear rather than linear across the adult life span (Helson et al., 2002); and (c) changes in adult personality tend to occur along the three broad dimensions of norm adherence, cognitive complexity (Labouvie-Vief & Diehl, 2000), and social vitality (Helson et al., 2002). In terms of the present study, the dimensions of norm adherence (i.e., understanding and complying with the norms and expectations of social roles) and cognitive complexity (i.e., reflecting about events and relationships in a complex and dialectical way) may be of particular importance. The dimension of cognitive complexity, in particular, may provide explanations for the documented age-related declines or increases of certain coping and defense mechanisms in late life when cognitive abilities tend to decline (Labouvie-Vief, Grünh, & Studer, 2010).

Covariates of Age-Related Change in Coping and Defense Strategies

The present study also extended previous research by examining time-invariant and time-varying covariates of age-related change in coping and defense mechanisms. Specifically, we examined whether participants' SES at the start of the study, a time-invariant covariate, and changes in ego level, verbal ability, and inductive reasoning (i.e., time-varying covariates) were associated with changes in coping and defense mechanisms. Overall, the objective of these analyses was to examine whether previously documented cross-sectional associations with these developmentally relevant variables (Cramer, 2009; Diehl et al., 1996; Labouvie-Vief et al., 1987) could be confirmed longitudinally. Such confirmation would provide further insights into developmental correlates, and potential developmental causes, of changes in coping and defense mechanisms.

Findings from multilevel analyses provided partial support for our hypotheses. For example, higher SES at the beginning of the study was associated with greater use of sublimation and suppression, which are considered mature and adaptive coping mechanisms. However, level of SES was not significantly associated with changes in coping mechanisms across the 12-year period. In terms of defense mechanisms, individuals of higher SES reported less frequent use of isolation, rationalization, doubt, regression, and displacement compared to individuals of lower SES. Also, individuals of higher SES reported the use of intellectualization more frequently than individuals of lower SES. Again, level of SES was not significantly associated with longitudinal changes in defense mechanisms. Thus, although the findings about the associations of SES with *level* of coping and defense mechanism use were consistent with findings reported by other authors (Cramer, 2009), the finding that level of SES was not predictive of *longitudinal change* in coping and defense mechanisms was at odds with results reported by Cramer (2009) and more in line with findings reported by Vaillant (1993).

Although a number of reasons may underlie this inconsistency in findings, it is important to point out several things. First, it needs to be noted that Cramer (2009) documented the association between SES in childhood and change in defense mechanism use only for the defense mechanism of denial, but not for the mechanisms of projection or identification. Second, the predictive role of SES may lose some of its predictive relevance in adulthood, when individuals' social position is mostly established and room for

further social mobility might be limited (see Vaillant, 1993). Third, our study focused on development across the entire adult life span and it is possible that the influence of SES is easier to detect during the developmentally more sensitive period from pre-adolescence to young adulthood, compared to the adult years, when other influences (e.g., social roles, critical life events, etc.) might become more relevant.

The hypotheses regarding the effects of the time-varying covariates of ego level, verbal ability, and inductive reasoning were partially supported. In contrast to our hypotheses, ego level, verbal ability, and inductive reasoning showed no significant associations with changes in the use of coping mechanisms. This means that the observed changes in the coping mechanisms of sublimation, suppression, and ego regression were independent of changes in ego level or intellectual abilities. However, consistent with our hypotheses, change in ego level was significantly associated with increases in the defense mechanism of intellectualization and with decreases in the defense mechanisms of doubt and displacement. That means, increases in ego level over the 12-year period were significantly associated with increases in more mature defense mechanisms (i.e., the person tries to control affect by retreating to verbal expressions and abstractions), and with decreases in less mature defense mechanisms (i.e., the person doubts the validity of his or her own perceptions or redirects undesirable impulses toward objects or situations where greater tolerance exists). Taken together, this indicates that increases in ego level were associated with changes in defense mechanisms indicative of greater impulse control and greater self-reflection. In contrast, and consistent with findings reported by Vaillant (1993), verbal ability and inductive reasoning were not significantly associated with changes in any of the defense mechanisms.

Overall, these findings suggest that for European-American women and men changes in coping and defense mechanisms across the adult life span seem to be independent of changes in intellectual development, but are, to some extent, related to changes in ego level. This association is theoretically meaningful as Loevinger's measure of ego development is based on a conceptualization of the ego as a process that strives to master and integrate individuals' experiences, especially when these experiences are conflictual in nature (Loevinger, 1969). Moreover, these associations are meaningful in the context of Haan's (1977) theory which conceptualizes coping and defense mechanisms as distinct ego processes that

are activated by individuals to achieve optimal person-environment fit. Finally, these findings are in agreement with theoretical approaches that conceptualize successful personality development primarily as the development of ego control and ego resiliency (Block & Block, 2006). Individuals who can flexibly self-regulate their behavior (i.e., ego control) and can quickly adapt to the demands of different situations (i.e., ego resiliency) tend to be well-adjusted and mentally healthy individuals (Block & Block, 2006; Moffitt et al., 2011).

Gender Differences in Coping and Defense Mechanisms

Finally, analyses examining the effect of gender showed that men and women differed in their use of several coping and defense mechanisms. Specifically, across the adult life span and compared to men, women reported more use of the coping mechanisms of sublimation and suppression and the defense mechanisms of rationalization and doubt, but less use of the defense mechanism of intellectualization. These findings are consistent with previously reported cross-sectional data (Diehl et al., 1996; Labouvie-Vief et al., 1987) and with the general notion that women tend to use more internalizing coping and defense mechanisms compared to men. However, across adulthood and in this sample of European-American individuals, women and men *changed* in very similar ways in their coping and defense mechanisms. This latter finding is consistent with the gender similarity hypothesis, suggesting that men and women tend to be more similar than different, and that the effect sizes of gender differences usually tend to be small (Hyde, 2005).

Limitations

As with any research, it is important to acknowledge several limitations of the present study. First, it needs to be acknowledged that the reported findings are limited because they were derived from a racially homogeneous sample of mostly European-American adults. Thus, the findings from the current study cannot be generalized to other ethnic groups, such as African Americans, Hispanic Americans, or Asian Americans. Furthermore, it cannot be ruled out that some coping and defense mechanisms that are evaluated as being maladaptive or less mature in European-Americans adults might be evaluated as being adaptive or mature in a different cultural and ethnic context.

Second, our attrition analyses showed that over the course of the study, individuals with lower levels of education, lower performance on two intellectual abilities, and higher scores on the defense mechanism of projection were more likely to drop out of the study. Overall, this pattern of attrition resulted in an educationally and intellectually more advantaged sample. More importantly, however, this pattern of attrition also resulted in an underrepresentation of individuals who were more inclined to rely on maladaptive coping and defense mechanisms in their daily lives. In turn, this underrepresentation very likely affected our findings in a way that changes in adaptive coping and defense mechanisms might be overestimated, whereas changes in maladaptive coping and defense mechanisms might be underestimated. Thus, these biases due to selective attrition need to be taken into account when interpreting the study's findings.

Third, although we examined the change trajectories of a large number of conceptually derived coping and defense mechanisms, it needs to be noted that the exclusive reliance on self-report and context-free measures to assess these mechanisms is another limitation. Although the overall convergence between the pattern of age differences and the longitudinal change trajectories is very reassuring regarding the validity of our findings, it would have been desirable to have other cross-validating information available.

Fourth, our study is also limited in that it cannot speak to the issue to what extent coping and defense mechanisms are applied in a context-specific fashion or to what extent individuals apply multiple coping strategies simultaneously (Watson & Blanchard-Fields, 1998). Several studies have shown that adults use different coping strategies in different behavioral domains to meet their personal goals (Blanchard-Fields et al, 2007; Hoppmann, Coats, & Blanchard-Fields, 2008; Sorkin & Rook, 2006). Moreover, research with adolescents and young adults has provided evidence that a large percentage of the variation in individuals' coping strategies is attributable to the context in which stressful events occur (Seiffge-Krenke, Aunola, & Nurmi, 2009).

Fifth, we acknowledge that the distinction between adaptive vs. maladaptive coping and defense mechanisms is in need of further elaboration and critical reflection. In the present study, we adopted the

nomenclatures of established authors (e.g., Haan, 1977; Vaillant, 1993) and examined the longitudinal change in well-described coping and defense mechanisms. We are, however, aware that the adaptive nature of any coping and defense strategy can be quite context dependent and can be determined by a number of different variables (see also Cramer, 2008). One way to examine the adaptive value of coping and defense mechanisms would be to examine their association with developmental outcomes (see Vaillant, 1993). Examining the connection of the coping and defense mechanisms with developmental outcomes, or examining the role of other developmental covariates (i.e., exposure to critical life events) was, however, beyond the scope of the present study.

Conclusion

The main conclusion from the present study with European Americans is that most of the age-related change trajectories in adults' coping and defense mechanisms were nonlinear across the adult life span. This finding converges with results from the literature on personality trait change across the adult life span (Helson et al., 2002; Roberts & Mroczek, 2008) and suggests that the use of coping and defense mechanisms in this population does not follow a straightforward path of increased efficiency and adaptation. Although several coping and defense mechanisms showed positive changes into late middle age and early old age, during later adulthood we also observed reversals in several of these change trajectories. Thus, later adulthood and associated life circumstances in terms of waning social and cognitive resources (e.g., shrinking social network; cognitive decline) may challenge adults' cognitive-emotional complexity and their coping and defense strategies in unique ways (Baltes & Smith, 2003; Labouvie-Vief et al. 2010).

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Footnotes

¹We acknowledge that there is an ongoing discussion about whether both defense and coping mechanisms can be adaptive or maladaptive. Whether a coping or defense mechanism is adaptive or maladaptive often depends on situational circumstances, such as social/cultural context, type of stressful event, or timing and duration of use (Lazarus & Folkman, 1984; Blanchard-Fields et al., 2007). Within the theoretical framework adopted in this study (Haan, 1977), coping mechanisms are, by definition, viewed as the adaptive form of ego processes, whereas defense mechanisms are seen as the maladaptive form. However, we are aware that this theoretical distinction does not rule out that in everyday life a coping mechanism may become maladaptive and a defense mechanism may be quite adaptive, depending on the circumstances.

²To examine the possibility of age-related change in coping and defense mechanisms for which no age-related differences had been documented previously, we started our analyses by examining all 20 coping and defense mechanisms. These analyses also showed significant nonlinear age-related changes for the coping mechanisms of objectivity, intellectuality, logical analysis, concentration, and substitution, and for the defense mechanisms of projection, reaction formation, and repression. Significant linear change was found for the coping mechanism of tolerance of ambiguity and the defense mechanism of denial. The change trajectories were very similar to the ones reported for the featured coping and defense mechanisms and do not change the overall conclusions of the study. Tables and figures showing the findings from these additional analyses are available on request from the first author.

³If a participant was too young in the first or second wave to receive the CPI, than he or she could still contribute data in later waves. Multilevel modeling can handle cases for which no complete data are available and, thus, we were able to include these participants' data in a meaningful way in the reported analyses.

Table 1

Defense and Coping Mechanisms Measured by the California Psychological Inventory (CPI)

Coping mechanism	Description	Defense mechanism	Description
Objectivity	Person separates ideas from feelings and ideas from each other so that objective evaluations may be achieved.	Isolation*	Person's affect seems unrelated to his or her ideas, and he or she seems unable to put ideas together.
Intellectuality	Person is able to detach him- or herself from restrictions of the environment and the self to engage in impartial analysis of a situation. Articulates and symbolizes feelings so that they can contribute to the cognitive processes.	Intellectualization*	Person retreats from affect to using words and abstractions that are often inappropriate to the specific situation. Uses jargon and is pseudointellectual.
Logical analysis	Person thoughtfully and carefully analyzes causal aspects of a situation, whether personal or not.	Rationalization*	A person arrives at superficially plausible reasons to explain his or her behavior or intent by omitting crucial aspects of a situation.
Tolerance of ambiguity	Person can cope with cognitive and affective complexity or dissonance. "Gray areas" are tolerable as not everything needs to be black and white.	Doubt*	Person doubts the validity of his or her own perceptions and has trouble making decisions. Person cannot tolerate ambiguity.
Empathy	Person is able to understand and take into consideration others' feelings and ideas.	Projection	Person attributes undesirable tendencies (often involving power or accusation) to another person.
Ego regression*	Person uses preconscious elements, which may be unrelated to a particular situation, in a rich and flexible way.	Regression*	Person exhibits inappropriate behavior and fantasy in order to avoid responsibility and aggression from others and self.
Concentration	Person successfully disregards (positive or negative) affects so that he or she may concentrate on a particular task.	Denial	The person ignores past or present facts that would be unpleasant to acknowledge and instead focuses on the benign.
Sublimation*	Person finds self-satisfying and socially acceptable means for satisfying generally intolerable affects or urges.	Displacement*	Person attempts to control undesirable impulses toward objects or situations by expressing them where there is greater tolerance.
Substitution	Also called "good reaction formation"	Reaction formation	Person transforms unpleasant impulses

Suppression*	(Rapaport 1954), substitution involves a tampering of feelings, which is more flexible and appropriate. Person withholds inappropriate feelings from being expressed until a more appropriate setting and object is available.	Repression	into their opposite, expressing an attitude that contradicts underlying values or inclinations. Person unconsciously or purposefully forgets. Gaps in memory are manifestations of a naïve, unthinking attitude.
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Note. Coping and defense mechanisms that align horizontally are thought to involve similar mental processes (e.g., objectivity and isolation). From *Coping and defending: Processes of self-environment organization* (pp. 35, 299-307) by N. Haan, 1977, New York, NY: Academic Press. Copyright 1977 by Academic Press. Adapted by permission.

Table 2

Rank-Order Stabilities for Consecutive Waves of Testing and the Entire Study Period and Intraclass Correlations

	1992-94 <i>n</i> = 296-298	1994-98 <i>n</i> = 235	1998-2004 <i>n</i> = 138-139	1992-2004 <i>n</i> = 127-129	Intraclass correlation
Coping mechanism					
Ego Regression	.58	.66	.60	.50	.59
Sublimation	.47	.58	.56	.52	.51
Suppression	.49	.51	.57	.38	.53
Defense mechanism					
Isolation	.50	.41	.41	.45	.47
Intellectualization	.78	.77	.82	.84	.77
Rationalization	.56	.61	.69	.52	.56
Doubt	.81	.79	.79	.72	.77
Regression	.65	.63	.64	.53	.63
Displacement	.66	.68	.71	.53	.68

Note. All stability coefficients are statistically significant at $p < .001$.

Table 3

Fixed-Effects and Variance-Covariance Estimates for Models of the Predictors of the Coping Mechanisms Ego Regression, Sublimation, and Suppression

	Ego regression		Sublimation		Suppression	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
	Fixed effects					
Intercept	12.74 (.17)***	13.71 (.69)***	19.55 (.16)***	16.38 (.62)***	18.63 (.14)***	16.15 (.57)***
Level 1						
Age	-.06 (.01)***	-.02 (.03)	.02 (.01)***	.05 (.03)	.05 (.01)***	.09 (.03)***
Age ²	.0005 (.0003)	--	-.001 (.0003)**	-.001 (.0003)***	-.001 (.0003)***	-.001 (.0003)***
Ego level	--	-.02 (.24)	--	.10 (.23)	--	.03 (.21)
Verbal ability	--	.03 (.05)	--	.03 (.05)	--	.08 (.05)
Inductive reasoning	--	-.001 (.04)	--	.0001 (.04)	--	.02 (.03)
Level 2						
Gender	--	-.34 (.29)	--	1.02 (.25)***	--	.84 (.23)***
Age x Gender	--	-.02 (.01)	--	.001 (.01)	--	-.002 (.01)
SES	--	-.02 (.04)	--	.16 (.04)***	--	.11 (.03)**
Age x SES	--	-.001 (.002)	--	-.001 (.002)	--	-.002 (.002)
	Random effects					
Level 1						
Within-person σ_{ϵ}^2	3.67 (.20)***	3.68 (.22)***	3.66 (.20)***	3.51 (.21)***	3.30 (.18)***	3.12 (.19)***
Level 2						
In intercept σ_0^2	5.00 (.62)***	5.16 (.51)***	3.86 (.50)***	3.43 (.53)***	2.93 (.45)***	2.59 (.44)***
Covariance σ_{01}	-.02 (.01)	-.01 (.01)	-.03 (.01)*	-.02 (.01)	-.03 (.01)**	-.03 (.01)**
In age σ_1^2	.0004 (.001)	.0001 (.001)	.0002 (.001)	.001 (.001)	.001 (.001)	.001 (.001)
Goodness-of-fit						
-2*log likelihood	5067.3	4289.4	4988.2	4165.4	4856.3	4023.4
AIC	5081.3	4315.4	5002.2	4193.4	4870.3	4051.4
BIC	5109.1	4365.8	5030.0	4247.6	4898.0	4105.6

Note. Standard errors are in parenthesis. SES = Socioeconomic status at Time 1.

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

Table 4

Fixed-Effects and Variance-Covariance Estimates for Models of the Predictors of the Defense Mechanisms Isolation, Intellectualization, and Rationalization

	Isolation		Intellectualization		Rationalization	
	Model 4a	Model 4b	Model 5a	Model 5b	Model 6a	Model 6b
	Fixed effects					
Intercept	13.57 (.14)***	12.78 (.53)***	15.92 (.23)***	14.38 (.91)***	11.81 (.16)***	12.92 (.64)***
Level 1						
Age	-.03 (.005)***	-.02 (.02)	-.02 (.01)*	-.01 (.04)	-.03 (.01)***	-.04 (.03)**
Age ²	-.001 (.0003)	--	-.001(.0003)***	-.001 (.0004)*	.0005(.0003)	--
Ego level	--	.03 (.22)	--	.79 (.24)**	--	-.10 (.23)
Verbal ability	--	-.02 (.05)	--	-.003 (.06)	--	-.02 (.05)
Inductive reasoning	--	-.02 (.04)	--	-.02 (.04)	--	-.03 (.04)
Level 2						
Gender	--	-.16 (.22)	--	-1.04 (.38)**	--	.73 (.27)**
Age*Gender	--	-.01 (.01)	--	-.02 (.02)	--	.002 (.01)
SES	--	-.09 (.03)**	--	.29 (.05)***	--	-.19 (.04)***
Age*SES	--	.001 (.001)	--	.004 (.002)	--	-.001 (.002)
	Random effects					
Level 1						
Within-person σ_{ϵ}^2	3.32 (.18)***	3.32 (.20)***	3.65 (.20)***	3.48 (.21)***	3.75 (.20)***	3.51 (.21)***
Level 2						
In intercept σ_0^2	2.62 (.40)***	2.27 (.42)***	11.89 (.96)***	10.48 (.90)***	4.48 (.54)***	3.98 (.54)***
Covariance σ_{01}	.004 (.01)	.004 (.01)	--	--	-.02 (.01)	-.02 (.01)
In age σ_1^2	.0002 (.001)	.001 (.001)	--	--	.001 (.001)	.001 (.001)
Goodness-of-fit						
-2*log likelihood	4819.0	4055.7	5335.8	4458.9	5054.4	4197.3
AIC	4833.0	4081.7	5345.8	4482.9	5068.4	4223.3
BIC	4860.7	4132.0	5365.7	4529.4	5096.2	4273.7

Note. Standard errors are in parenthesis. The random effects of age for intellectualization were not estimated because of a non-positive definite matrix. SES = Socioeconomic status at Time 1. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5

Fixed-Effects and Variance-Covariance Estimates for Models of the Predictors of the Defense Mechanisms Doubt, Regression, and Displacement

	Doubt		Regression		Displacement	
	Model 7a	Model 7b	Model 8a	Model 8b	Model 9a	Model 9b
	Fixed effects					
Intercept	9.02 (.27)***	10.25 (1.11)***	9.64 (.19)***	12.08 (.78)***	10.72 (.22)***	13.70 (.89)***
Level 1						
Age	-.08 (.01)***	-.10 (.05)	-.08 (.01)***	-.08 (.03)*	-.09 (.01)***	-.09 (.04)*
Age ²	.002 (.0004)***	.002 (.001)***	.002 (.0003)***	.002 (.0004)***	.002 (.0004)***	.002 (.00)***
Ego level	--	-.76 (.29)**	--	-.46 (.25)	--	-.63 (.28)*
Verbal ability	--	.01 (.07)	--	-.01 (.06)	--	.04 (.07)
Inductive reasoning	--	-.01 (.05)	--	.02 (.04)	--	-.003 (.05)
Level 2						
Gender	--	1.67 (.46)***	--	-.54 (.32)	--	-.32 (.36)
Age*Gender	--	.01 (.02)	--	-.02 (.01)	--	-.02 (.02)
SES	--	-.35 (.06)***	--	-.15 (.05)**	--	-.23 (.05)***
Age*SES	--	-.001 (.003)	--	.001 (.002)	--	.002 (.002)
	Random effects					
Level 1						
Within-person σ_{ϵ}^2	5.11 (.29)***	4.89 (.30)***	4.26 (.23)***	4.06 (.25)***	4.89 (.27)***	4.86 (.30)***
Level 2						
In intercept σ_0^2	16.53 (1.63)***	13.63 (1.52)***	6.50 (.74)***	6.19 (.80)***	8.82 (1.01)***	8.00 (1.01)***
Covariance σ_{01}	-.05 (.04)	-.07 (.04)	-.04 (.02)*	-.04 (.02)*	-.03 (.02)	-.04 (.03)
In age σ_1^2	.003 (.003)	.01 (.00)*	.0004 (.001)	.001 (.002)	.002 (.002)	.002 (.002)
Goodness-of-fit						
-2*log likelihood	5737.8	4791.7	5268.7	4404.3	5493.2	4610.6
AIC	5751.8	4819.7	5282.7	4432.3	5507.2	4638.6
BIC	5779.6	4873.9	5310.5	4486.5	5535.0	4692.8

Note. Standard errors are in parenthesis. SES = Socioeconomic status at Time 1.

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

Figure 1. Age-Related Changes in Coping Mechanisms

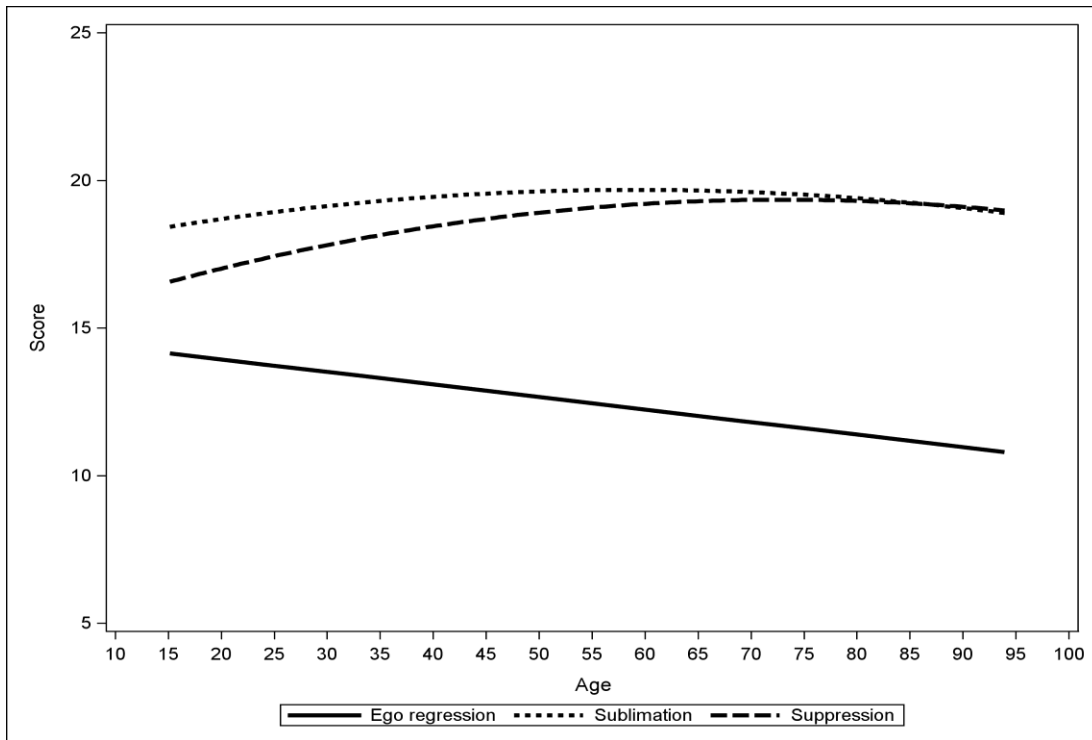


Figure 2. Age-Related Changes in Defense Mechanisms

