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# Developmental Regulation With Progressive Vision Loss: Use of Control Strategies and Affective Well-Being

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The present study addresses older adults' developmental regulation when faced with progressive and irreversible vision loss. We used the motivational theory of life span development as a conceptual framework and examined changes in older adults' striving for control over everyday goal achievement, and their association with *affective* well-being, in a sample of 364 older adults diagnosed with age-related macular degeneration. Using longitudinal data from 5 occasions at 6-month intervals, we examined intraindividual change in control strategies, and how it was related to change in affective well-being, in terms of self-rated happiness and depressive symptoms. Mixed model analyses confirmed our hypotheses that (a) intraindividual change, particularly in selective primary control and in compensatory secondary control (CSC), predict change toward higher happiness ratings and lower depression; and (b) as functional abilities (instrumental activities of daily living) declined, CSC became increasingly predictive of better affective well-being. Overall, the findings suggest that CSC strategies are essential for maintaining affective well-being when physical functioning declines. Intensified selective primary control striving may be effective to achieve goals that have become difficult to reach but are not associated with affective well-being, possibly because struggling with difficulties undermines the experience of enjoyable mastery. In contrast, goal adjustments and self-protective thinking may help to find pleasure even from restricted daily activities.

*Keywords:* motivational theory of life span development, affective well-being, depressive symptoms, age-related macular degeneration, generalized linear mixed models



Across the adult life span—and particularly in late life—chronic health conditions that result in irreversible loss of basic physical functions are a crucial area of developmental regulation. Chronic reductions of physical functionality compromise the individual's behavioral repertoire and interfere with the fulfilment of basic needs and wants that individuals have become accustomed to over the course of their life. Such reductions elicit strong efforts to adapt one's expectations and self-regulate to maintain a sense of mastery and control of one's life. The motivational theory of life span development (MTD) proposed by Heckhausen and colleagues (Heckhausen & Schulz, 1995; Heckhausen, Wrosch, & Schulz, 2010) has gained considerable interest among developmental researchers as a core element of current psychological theory explaining such developmental regulation (Haase, Heckhausen, & Wrosch, 2013). Generally speaking, the MTD has established an understanding of developmental regulation processes as they are driven by the individual's striving for control in everyday goal achievement. In the present study, we utilize the conceptual framework of MTD and ask whether developmental regulation processes as suggested by the theory are related to the *affective* well-being of individuals confronted with crucial physical loss.

Developmental regulation as proposed by the MTD rests upon four kinds of control strategies (Heckhausen & Schulz, 1995). Selective primary control (SPC) strategies involve investing be-

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havioral resources of the individual, such as effort, time, and skills, in order to attain important goals. Compensatory primary control (CPC) strategies involve recruiting external resources (e.g., other people's help) in order to facilitate goal attainment. Selective secondary control (SSC) refers to metamotivational strategies (e.g., boost one's perception of control for goal attainment) directed at maximizing the motivational commitment toward desired goals. Compensatory secondary control (CSC) strategies include disengagement of no-longer-achievable goals, as well as engagement in self-protective thinking, such as downward social comparisons or self-serving attributions. Taken together, these strategies may be conceptualized as an adaptational toolbox of goal engagement (SPC, SSC, CPC) and goal disengagement (CSC disengagement, CSC self-protection) the individual can use to deal with major changes in control capacity, for better or worse. The MTD predicts that using control strategies should optimize physical functioning and prevent or minimize affective distress about those losses of functioning that are inevitable (Heckhausen, Wrosch, & Schulz, 2013; Wrosch, Dunne, Scheier, & Schulz, 2006; Wrosch, Schulz, & Heckhausen, 2004). Thus, focusing on the latter of these predictions, our basic research question in the present study is, does the use of strategies of goal engagement and disengagement as proposed by the MTD predict affective well-being when individuals have to adjust to irreversible degradations of their physical functionality?

To examine this question, we focus on chronic vision loss as an important scenario in which the decline in physical functioning generates needs of developmental regulation for many older adults. In particular, the case of vision loss caused by age-related macular degeneration (AMD; for a detailed description of the disease, see Fine, Berger, Maguire, & Ho, 2000) provides an excellent natural paradigm to study the self-regulatory dynamics of control strategies under conditions of irreversible and progressive loss of functioning for three reasons. First, AMD is characterized by progressive degeneration of the macula that results in a loss of central vision necessary for reading, face recognition, activities of daily living, and mobility safety. Thus, AMD-related visual impairment potentially interferes with the individual's routines of everyday goal attainment, meaning that coping with AMD requires constant goal adjustment, and possibly goal replacement, across rather short time periods such as several months. Second, although medical treatment options that can halt the progression of AMD have advanced over the past two decades, efficient treatment options are still limited for the majority of patients. Thus, AMD typically gives rise to a condition of irreversible and progressive loss of functioning. Those who have AMD undergo long time periods—typically, several years—in which they are forced to adapt again and again to vision losses (Coleman, Chan, Ferris, & Chew, 2008). Third, AMD is the leading cause of visual impairment, affecting about 20% of those between 65 and 74 years of age and one third of those aged 75 and older (Fine et al., 2000). Thus, AMD is a relatively frequent cause of loss of physical functionality that might trigger developmental regulation in old age. Therefore, we focus in this study on AMD to examine the self-regulatory dynamics of control strategies under irreversible and progressive loss of functioning.

## Applying the MTD to Individuals With Chronic Loss: Need for an Intraindividual View

Regarding a scenario of progressive decline in physical functioning, the MTD proposes that individuals first fight functional losses by using enhanced goal engagement strategies, including the recruitment of other people's help, and then as losses become unavoidable, individuals will increasingly use compensatory and secondary strategies of disengaging from and adjusting previous goals as well as self-protection against negative affective consequences of such losses (Heckhausen et al., 2013). At the empirical level, numerous studies have shown that this control-theoretical framework is useful for conceptualizing and understanding adaptation to loss of physical function (for an overview, see Heckhausen et al., 2010, 2013). Cross-sectional data suggest that individuals with multiple physical symptoms who use health engagement control strategies (i.e., health-specific SPC, CPC, and SSC strategies) report lower levels of depressed mood (Wrosch, Schulz, & Heckhausen, 2002; Wrosch, Schulz, Miller, Lupien, & Dunne, 2007). In addition, Wrosch et al. (2002) reported that higher use of health engagement strategies predicted fewer depressive symptoms after a 14-month interval. Moreover, Dunne, Wrosch, and Miller (2011) showed that disengagement from goals that are no longer or hardly attainable buffers increases of depressive symptoms associated with increasing functional disability in a sample of older adults. This adds to cross-sectional findings that show CSC strategies to be especially effective in adaptation to health constraints (Miller & Wrosch, 2007; Wrosch, Miller, Scheier, & de Pontet, 2007; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Regarding, in particular, the case of AMD, previous research has shown that across the progression of the disease, people indeed intensify the use of compensatory and/or selective strategies to adapt to the vision loss (e.g., Boerner, Brennan, Horowitz, & Reinhardt, 2010; Wahl, Becker, Burmedi, & Schilling, 2004; Wahl, Schilling, & Becker, 2007).

These findings support a view of adaptation to ongoing and accumulating health losses that unfolds as an intraindividual process, adjusted over time to the pace and pattern of loss in functioning. Heckhausen and colleagues (2013) proposed, in their lines-of-defense model of adaptation to chronic conditions, that the coping process reflects a swinging back and forth between engagement for attainable goals, disengagement from these goals as they become unattainable as a result of the ongoing disease progression, and reengaging with adjusted less ambitious but attainable goals. Whereas increasing investment of primary and/or selective strategies serves to reach everyday goals under physical functionality, CSC is particularly needed for adjustments of goals that become unattainable when physical functionality worsens—including disengagement from such goals as well as self-protective reappraisals of the importance and/or desired level of goal attainment.

Therefore, an *intra*individual view is critical for examining adaptation to chronic loss conditions by means of control strategy use. Intraindividual variation of control strategy use is expected to be predictive of physical and psychological outcomes, because changes in strategy use are only successful to the extent that they represent a fit with the individual's changing levels of functioning. Overall, longitudinal research addressing this intraindividual view with chronically impaired populations has remained scarce, whereas cross-sectional findings of *inter*individual associations between control strategy use and well-being provides only limited evidence on the respective intraindividual relationships. In the present study, we use a longitudinal sample of older adults with chronic vision loss to examine how the "ups and downs" in the use of vision-specific control strategies, and in affective well-being at 6-month intervals, are coupled within individual participants over the course of 2 years.

## Affective Well-Being in the Situation of Chronic Functional Loss: The Impact of Control Strategies

Affective well-being encompasses "a person's feelings or emotional states, typically measured with reference to a particular point in time" (OECD, 2013, p. 10), and is commonly defined in terms of the balance of pleasure and displeasure (e.g., Schimmack, Schupp, & Wagner, 2008). Thus, affective well-being could be considered as the degree of overall pleasantness that results from the positive and negative emotions and moods the person feels within the reporting period.[1] We analyze two outcomes that represent crucial facets of affective well-being—general sense of happiness and depressive symptoms. First, regarding the conceptual meaning of the construct "happiness," different views coincide in assuming that self-reported happiness involves an evaluation of hedonic experiences (see Gamble & Gärling, 2012, for an overview of different happiness concepts). Thus, happiness ratings are affect-driven, mirroring an appraisal of one's current state of positive versus negative affective experiences (Gamble & Gärling, 2012; Kahneman, 1999). Second, depressive symptoms are also a key indicator of affective well-being, signaling a person's failure to experience a positive balance of pleasure and displeasure. Theoretically, depressive symptomatology is viewed as composite of a negative affectivity factor and anhedonia in terms of low positive affect (Clark & Watson, 1991). Indeed, depressive symptoms have been found to be significantly elevated in older persons with AMD compared with the general aging population (Rovner & Casten, 2008).

How might the use of control strategies to reach everyday goals influence affective well-being? A chronic physical loss condition such as AMD could disrupt a person's balance between the pleasure and displeasure from both sides—stimulating negative affective reactions, as well as corrupting the individual's means to generate positive affect. Therefore, the impact of control strategy use could be considered twofold, namely, in terms of the prevention of emotional distress that might be caused by failure to reach one's goals, but also in terms of positive emotional reactions stimulated by the attainment of goals.

First, vision loss can be expected to elicit negative affective reactions. Negative affect has been proposed to serve the behavioral inhibition of activity that may result in unpleasant or harmful outcomes, by providing aversion against stimuli that cause or sustain adversities and threats (Gable, Reis, & Elliot, 2000; Watson, Wiese, Vaidya, & Tellegen, 1999). Thus, negative affect is driven by an "inward focused" alertness toward symptoms of physical, psychological, or social malfunctions and damages (Kunzmann, 2008). Failures to reach everyday goals because of vision loss will then elicit such negative affective reactions (e.g., painful or humiliating experiences). The use of control strategies may help visually impaired people to reach everyday goals and, by this means, avoid negative affect caused by experiences of failure. However, the experience of irreversible and progressing vision loss—as such signaling malfunction and damage—might also evoke feelings of fear and despair that are not prevented by everyday goal attainment. Hence, control strategy use may be only partially effective in preventing negative affect evoked by a chronic condition such as AMD.

Second, however, control strategies may play a crucial role for the maintenance of positive affectivity when progressive and irreversible loss of visual function decreases a person's behavioral repertoire needed for positive affective activation. Influential theories on positive affect concur that positive affect is directed toward the behavioral activation of experiences of pleasure and reward, to be gained by the individual from active interactions with its external world (e.g., Fredrickson, 2001; Gable et al., 2000; Watson et al., 1999). This means that the generation of positive affect can be constrained by forces that interfere with the person's behavioral repertoire needed for active engagements in the outside world. Therefore, loss of physical functionality may worsen the balance of pleasure and displeasure by complicating the attainment of everyday goals that imply hedonic rewards. Hence, vision loss may, for instance, interfere with the person's leisure activities suited to evoke positive affect. In this case, the use of control strategies could enable persons to reach or adjust everyday goals that can stimulate positive affective reactions, hence preventing or dampening anhedonia.

Following this rationale further, two of the four control strategies could be expected to be particularly relevant in enabling pleasurable experiences for chronically impaired persons, namely, SPC and CSC. With respect to primary and/or selective strategies, SPC is the control strategy most directly aimed at goal attainment, whereas SSC and CPC strategies provide additional support when individuals face difficulties to reach these goals with their usual selective primary means. Such difficulty, however, may interfere with the hedonic stimulation that could be provided by goal strivings, such that CPC and SSC strategies may not work well to maintain hedonic rewards gained from reaching everyday goals. For instance, some people may do the cooking not just for the purpose of nutrition, but rather as a fun hobby, gaining particular affective benefit from the elaborate preparation of meals. Even when worsening eyesight causes difficulties in preparation, they may still be able to enjoy it affectively, as long as it can be completed successfully simply by handling it slower and with more concentrated effort (i.e., SPC). However, if the cooking becomes so complex that one needs to employ external resources (such as aids or help from others; CPC) and/or has to convince oneself not to be discouraged by the extent of difficulty of that task (SSC), it may become a rather stressful and unpleasurable activity.

[1] Beedie and colleagues analyzed the manifold emotion–mood distinctions proposed in the research literature and compared these with nonacademic lay distinctions of both terms (Beedie, Terry, & Lane, 2005; Beedie, Terry, Lane, & Devonport, 2011). Noticing that these terms denote constructs that are closely related and frequently used interchangeably, they revealed no single clear-cut scientific emotion–mood distinction but a variety of criteria (such as duration and function of affective experiences) used by researchers to distinguish both constructs. However, regardless of the distinctive criteria used, the concept of affective well-being encompasses emotions and mood, both providing positive and negative affective experiences that sum up to degree of pleasantness felt at a given time point or period.

In that case, it may be more hedonically rewarding to adjust the cooking-related goals, for instance, by relaxing one's respective standards and finding pleasure in the preparation of less elaborate dishes (CSC).

Therefore, we assume that for those confronted with constraints of physical functionality such as severe vision impairment, SPC and CSC strategies are most effective in maintaining "prohedonic" outcomes from the attainment of everyday goals. Whenever a person engages in such goals that have become difficult, but are still attainable, more intense SPC investments should gain more hedonic affective benefit, whereas when current goals are no longer attainable, CSC strategies of goal disengagement and adjustment, as well as self-protection, are expected to optimize hedonic experience. In sum, across a variety of loss-related challenges, SPC and CSC are most likely to bolster overall affective well-being. This is not to say that the other strategies of SSC and CPC are not useful. They have their own function in terms of optimizing goal commitment (SSC) and recruiting external assistance to maintain primary control (CPC), but are less important for optimizing affective well-being.

### The Moderating Role of Everyday Functional Ability

Goal engagement and goal disengagement are not adaptive in and of themselves and under all possible circumstances. They should be congruent with actual control opportunities (Heckhausen et al., 2010). Previous research suggests that it is the congruence of control strategy use with actual functional abilities that is crucial for older adults adapting to chronic conditions (Boerner et al., 2010; Schilling et al., 2013; Wahl et al., 2007). In particular, among vision-loss patients, the loss of instrumental activities of daily living (IADL) leads to a differentiation of control strategy use, which can be expected, as IADL has been found to be more affected by visual impairments than the more basic, personal activities of daily living (Burmedi, Becker, Heyl, Wahl, & Himmelsbach, 2002; Wahl, Schilling, Oswald, & Heyl, 1999). Therefore, people might need to switch to CSC strategies in particular when they lose functional abilities in terms of IADL to the degree that they cannot reach their goals any longer with their usual means.

If so, use of CSC might be particularly effective in enhancing affective well-being at episodes of pronounced loss of IADL. In contrast, selective control strategies may be most efficient for keeping happiness high and depression low at times of relatively stable functional abilities, when the person has had time to adapt their means of everyday goal attainment to the functional level reached. Thus, we expect that the "reactivity" of happiness and depressive symptoms to CSC use increases with concurrent loss of IADL, and this increase may go along with some decreases in reactivity to the other strategies.

## The Current Study

Driven by the MTD and its explication of the critical role of control strategy use, we first examine the intraindividual effects of control strategy use predicting affective well-being—in terms of depressed mood and self-rated happiness—in older adults with chronic vision loss. We expect that among the four control strategies, SPC and CSC will show the highest within-person effects predicting both happiness and depression. Second, we predict that loss of functional ability moderates the effect of control strategy use (i.e., SPC, CSC) predicting affective well-being. Specifically, we expect that the effectiveness of CSC strategies to prevent depressive symptoms and promote happiness increases concurrently with increasing loss of IADL ability.

## Method

### Sample and Procedures

Older adults with AMD were recruited from a large vision rehabilitation agency in the Greater New York area. Data were collected by in-person interviews at baseline measurement (Time 1 [T1]; $N = 364$), 1-year (Time 3 [T3]; $n = 231$), and 2-year (Time 5 [T5]; $n = 186$) follow-ups, and by telephone interviews at 6 months (Time 2 [T2]; $n = 262$) and 18 months (Time 4 [T4]; $n = 207$). In addition to a diagnosis of AMD, eligibility criteria included age ≥ 65, best corrected acuity 20/60 or worse, first time applicant for vision rehabilitation services, and having received only low-vision clinical services (i.e., eye examination only, with or without the prescription of low-vision devices). Among the potential participants meeting inclusion criteria, the response rate was 50% at baseline. Participants did not differ with respect to gender or visual acuity, but were slightly younger ($p < .05$) than refusals. At baseline, the average age was 83 years (range = 65 to 98 years), 63% were women, 42% were married, 93% were White, 97% reported adequate incomes, and 87% had at least a high school education (see Boerner et al., 2010, for a more detailed sample description).

To analyze drop-out selectivity, we ran logistic regressions using basic sociodemographic characteristics, visual acuity, and the main study variables as predictors of the probability of missing at least one of the follow-up interviews ($n = 215$; 53%). Significant effects ($p < .05$; separate models for each predictor) indicated that the probability of drop-out increased with age, male gender, and the number of depressive symptoms at baseline, and decreased with the score of self-rated happiness at baseline. Despite statistical significance, all of these effects were minor (i.e., Nagelkerke's $R^2$ was .05 for age and .02 otherwise), indicating that these baseline characteristics were not substantially predictive of subsequent drop-out. Other sociodemographic characteristics (education, race/ethnicity, living arrangements, marital status, and income adequacy) did not predict drop-out, nor did visual acuity or IADL.

### Measures

**Control strategies.** A vision-specific version of the Optimization In Primary and Secondary Control Scale (Heckhausen, Schulz, & Wrosch, 1998) was used to assess control strategy use in response to vision-related challenges in daily life (VIS-OPS; Brennan-Ing, Boerner, Horowitz, & Reinhardt, 2013). The VIS-OPS includes four subscales representing SPC (six items), CPC (seven items), SSC (six items), and CSC (four items). A 4-point Likert scale was used, ranging from *not at all* to *most of the time*. Mean scores (range = 1 to 4) of SPC, CPC, SSC, and CPC were computed, with higher values indicating more control strategy use. Example items are "I do whatever I can to continue my everyday activities as I did before I had a vision problem" (SPC); "I often think how important it is to me to keep up my daily activities in spite of my vision problem" (SSC); "If there is something that I can no longer do because of my vision problem, I don't hesitate to ask others for help" (CPC); and "When I am not able to do something important because of my vision problem, I console myself by thinking about other things that I can still do well" (CSC). It should be noted that the CSC items address goal adjustments in terms of self-protective thinking, relaxing one's internal standards of goal achievement, rather than goal disengagements. Across the five measurement occasions, Cronbach's alpha ranged from .61 to .73, .71 to .77, .70 to .80, and .70 to .78 for SPC, CPC, SSC, and CSC, respectively (suggesting fairly acceptable levels of internal consistency; but see, e.g., Cho & Kim, 2015, for interpretational issues concerning alpha). Details of the VIS-OPS scale development have been reported by Brennan-Ing et al. (2013). Checking for measurement invariance across the five measurement occasions (e.g., Kline, 2013; Vandenberg & Lance, 2000) supported strong factorial invariance (equality of loadings and intercepts) for all subscales, and even strict factorial invariance (equality of factor loadings, intercepts, and error variances) fitted well. Hence, the VIS-OPS scores were suited for our longitudinal analyses.[2]

**Depressed mood and happiness.** The 20-item Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was used to assess depressive symptoms experienced in the past week. The items employ a 4-point Likert-type scale that ranges from *less than one day* to *5–7 times a week*. Higher values of the sum score (range = 0 to 60, alpha range = .85 to .88) indicate more depressed mood.

A single item was used as an indicator of happiness. Participants were asked to rate their overall happiness on an 11-point scale, ranging from (0) *not happy at all* to (10) *very happy*. Single item measures of happiness are widely used in research (Gamble & Gärling, 2012; Veenhoven & Hagerty, 2006). In particular, the 11-point single-item format has shown good psychometric properties (for analyses on reliability and validity, see, e.g., Abdel-Khalek, 2006; Fordyce, 1988; Larsen, Diener, & Emmons, 1985).

**Functional ability.** IADL competence was measured with a modified version of the OARS Multidimensional Functional Assessment Questionnaire (Center for the Study of Aging and Human Development, 1975), which includes seven IADL items. These are assessed on a 4-point rating scale ranging from *does task with no difficulty* to *needs help/cannot do task*; hence, the sum score of IADL (range = 7 to 28; α = .83, .78, .80 at T1, T3, T5, respectively) indicates *loss* of functional abilities.

## Statistical Modeling

Longitudinal mixed models were computed to model the relationships of depressed mood and happiness with the four control strategies (e.g., Verbeke & Molenberghs, 2000). In the first step of analyses, we examined the effects of control strategy use predicting the well-being outcomes. Within-person and between-person effects of each control strategy were separated by using as predictors the person-mean centered scores together with their respective person mean across the five measurement occasions (e.g., Hoffman & Stawski, 2009). These analyses were run twofold, modeling the effects of each of the four control strategies separately (i.e., one model per control strategy) as well as simultaneously within one model. With respect to our research questions, the effects of the simultaneous models are crucial, as these indicate the unique effects of each control strategy, controlled for the "co-use" of the other strategies. The separate models have been computed for comparative reasons. In addition, we controlled for age and gender in these models.

A second step of mixed model analyses was conducted to analyze the moderating effects of functional abilities, that is, whether within-person effects of the control strategies (CSC in particular) increased in periods of concurrent functional decline. To deal with the lack of IADL data at T2 and T4, we computed ΔIADL indicating concurrent change of IADL as follows: We coded the T3-T1 difference score of IADL as the value of ΔIADL at T2 and T3, and the T5-T3 difference score accordingly as the value of ΔIADL at T4 and T5. Thus, we followed the rationale that the 1-year differences reflect the concurrent change dynamics of IADL that might have been effective at the measurement occasion within the respective observation year (i.e., T2 or T4) as well as at the end of the year (T3 or T5). This seems reasonable given that functional abilities typically do not change abruptly within short time intervals (say, days or a few weeks), but slower and more continuously, such that ΔIADL might reflect changes of functional abilities that unfolded across a major part of—rather than at some time point within—that year.[3] As all IADL change covered by our observations occurred after the baseline measurement, ΔIADL was coded as missing at T1 (meaning T1 was dropped from these analyses).

The moderating effects of concurrent functional dynamics were examined by means of the interaction effects of ΔIADL with the intraindividual deviation scores of the four control strategies. We only ran simultaneous models containing all four control strategies, as our focus was on the impacts of concurrent dynamics of functional ability on the control strategies' *unique* effects in predicting the outcomes. In doing so, we had to consider an unexpected high rate of 1-year IADL differences indicating improvement of functional abilities (i.e., 33% of all difference scores in the first and second 1-year intervals). Our theoretical rationale with respect to IADL *loss* does not readily extend to the effect of IADL *gains*. Reasoning that CSC might get increasingly effective when

[2] We ran repeated-measures confirmatory factor analyses. For all models of strict measurement invariance, $\chi^2/df < 2$; the root mean square error of approximation was .041, .034, .041, and .051, and the standardized root mean square residual was .077, .075, .084, and .069, for SPC, SSC, CPC, and CSC, respectively. Strong factorial invariance was confirmed using the comparative fix index-based criteria recommended by Chen (2007; see also Cheung & Rensvold, 2002).

[3] We accepted a potential coarseness of ΔIADL implying that a given 1-year difference score represents the same amount of IADL change effective at both the half-year measurement in between and the measurement at the end of the respective year. For example, consider a positive difference T3-T1 followed by negative T5-T3: The first year increase of IADL difficulties could have occurred largely between T1 and T2, and the subsequent "recovery" may have started already before T3, such that the T3 measures were obtained within a period of gain, rather than loss, of IADL. Even if so, however, it seems reasonable that individuals need some time to adjust to functional declines, such that a drop of functional abilities early in the first observation year large enough to sum up to a larger value of ΔIADL (outnumbering any pre-T3 "recovery") may still promote adaptive reactions at T3.

functional decline aggravates attainment of important goals does not necessarily imply that CSC gets more and more ineffective—or even detrimental—for affective well-being the more one's functional abilities improve. Thus, we considered that the moderating effects of ΔIADL may not work linear across the entire continuum ranging from loss to gain. We dealt with such potential nonlinearity in a twofold way, modeling curvilinear effects of ΔIADL as well as piecewise linear effects of IADL loss and IADL gain. That is, for the curvilinear model, we used ΔIADL and ΔIADL-squared as predictors. A piecewise linear model was obtained by "splitting" ΔIADL into two predictors, namely *max*(0, ΔIADL) and *min*(0, ΔIADL), representing the linear effects of loss (positive values of ΔIADL) and gain (negative values of ΔIADL) of IADL, respectively.

Dropping the T1 measures from this mixed models meant a loss of sample size that might affect maximum likelihood estimation and the statistical power testing the within-person effects. To keep these models as parsimonious as possible, we left out the between-person effects of the control strategies, as well as age and gender. Note that these predictors account only for interindividual variation, such that deleting them from the models should increase the random intercept variances without affecting the estimates of the within-person effects of the control strategies. Also, we deleted all random slope effects of the control strategies that were not statistically significant in the first step of GLMM analyses, which seemed reasonable, as our analytical focus was on the respective fixed effects only.

We performed longitudinal generalized linear mixed models (GLMMs; Hedeker, 2005) by use of SAS PROC GLIMMIX (SAS Institute Inc., 2009), a method to fit mixed models to a wide range of response variable distributions. The data of both happiness and depressed mood showed considerable skewness, and in ad hoc checks of the response distribution, the gamma and beta distributions provided a better fit to the data as than did the normal distribution (see Figure 1). Thus, we ran all GLMM analyses threefold, specifying the normal, gamma, and beta distribution of the response variable. We report results obtained from the best-fitting solution, which is the beta-based GLMM (running the Laplace integral approximation method; see the GLIMMIX manual for computational details; SAS Institute Inc., 2009, pp. 2080–2430).

To evaluate the portion of intraindividual variance explained by the GLIMMIX estimates, we followed Xu's (2003) rationale to operationalize $R^2 = 1 - RSS/RSS_0$, where *RSS* and $RSS_0$ denote residual sum of squares of the model tested and the null model, respectively. To fit the beta distribution, the outcomes had to be rescaled to range within the 0 to 1 interval (i.e., [1 + CES-D]/61), and the happiness ratings were also reversed from left- to right-skewed to fit gamma (i.e., [11 – happiness]/12). The person mean scores of the four control strategies and age were grand-mean centered prior to the computations.

## Results

Descriptive information on study variables is given in Table 1. Statistics were computed prior to grand-mean centering, that is, the sample means refer to the original scales of the scores mentioned in the Results section. On average, the participants scored rather high in happiness and low in depressed mood at all measurement occasions. Also, all control strategies appear to be used quite frequently, with mean scores ranging closer to the upper than lower end of the 1-to-4 scale. Constraints of functional abilities appear moderate with the sample means below the midpoint of the IADL scale.

With respect to our key questions regarding affective outcomes depending on control strategy use, it is important to note dependencies among the latter: How much are individuals' overall levels of SPC, CPC, SSC, and CSC, as well as intraindividual changes in the use of control strategies, correlated? Table 2 shows the respective correlations among the control strategy predictors used in the GLMM analyses. As can be seen, all control strategies correlated positively between and within persons. Noticing the multiple cor-

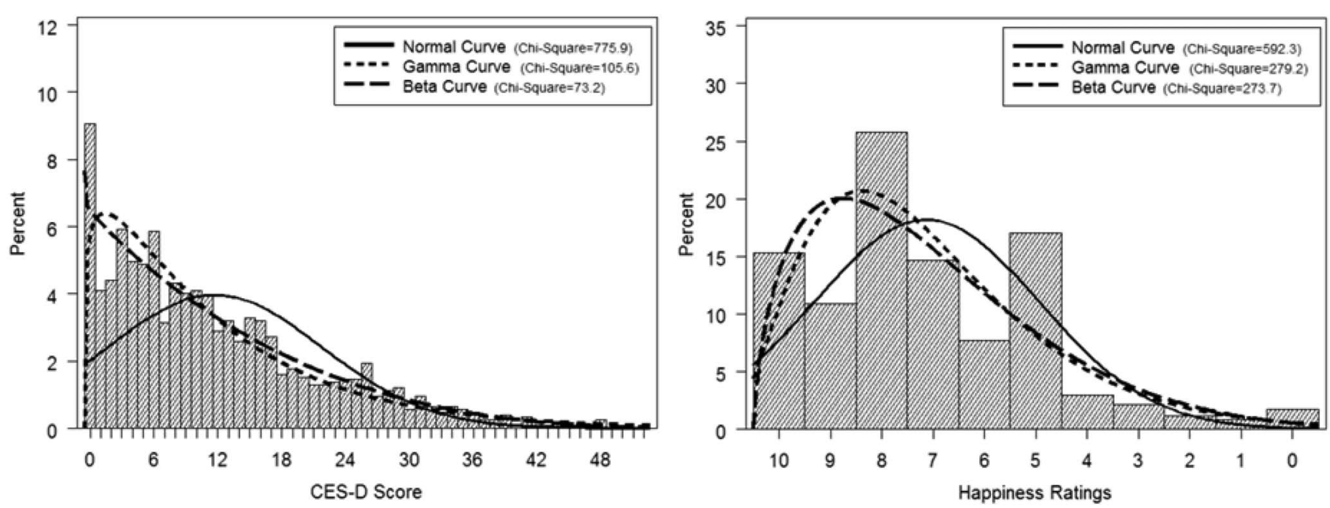


*Figure 1.* Distribution of depressive symptoms (CES-D scores) and the happiness ratings across all participants and measurement occasions, and curves of the normal, gamma, and beta distributions fitted to the data with SAS PROC CAPABILITY (SAS Institute Inc., 2014). CES-D = Center for Epidemiological Studies Depression Scale.

Table 1
*Sample Description of Study Variables*

| | Measurement occasion | | | | |
|---|---|---|---|---|---|
| Measure | T1 ($n$ = 364) *M* / *SD* / miss | T2 ($n$ = 262) *M* / *SD* / miss | T3 ($n$ = 231) *M* / *SD* / miss | T4 ($n$ = 207) *M* / *SD* / miss | T5 ($n$ = 186) *M* / *SD* / miss |
| Happiness | 7.0 / 2.3 / 1 | 6.9 / 2.3 / 3 | 7.2 / 2.3 / 4 | 7.3 / 2.1 / 5 | 7.4 / 1.9 / 3 |
| Depressed mood | 11.7 / 10.5 / 1 | 13.0 / 10.5 / 1 | 11.3 / 10.1 / 0 | 11.9 / 9.4 /0 | 10.6 / 9.3 / 0 |
| SPC | 3.5 / .5 / 1 | 3.6 / .6 / 0 | 3.6 / .5 / 0 | 3.6 / .5 / 3 | 3.6 / .5 / 1 |
| CPC | 2.9 / .7 / 0 | 3.0 / .7 / 1 | 3.1 / .7 / 0 | 3.0 / .7 / 0 | 3.1 / .7 / 1 |
| SSC | 3.2 / .7 / 4 | 3.2 / .8 / 2 | 3.2 / .7 / 1 | 3.3 / .8 / 4 | 3.2 / .7 / 1 |
| CSC | 3.2 / .8 / 2 | 3.3 / .8 / 2 | 3.2 / .8 / 0 | 3.3 / .8 / 4 | 3.3 / .8 / 0 |
| IADL | 13.8 / 5.1 / 0 | | 14.4 / 4.9 / 0 | | 14.3 / 5.1 / 3 |

*Note.* T = time; *M* = sample mean; *SD* = standard deviation; miss = number of missing values; SPC = selective primary control; CPC = compensatory primary control; SSC = selective secondary control; CSC = compensatory secondary control; IADL = instrumental activities of daily living (higher scores indicate worse functional abilities).



relations also shown in Table 2, in particular, CPC appears to be used most independently from other control investments, whereas both selective strategies showed the strongest relationships.

## Associations of Control Strategy Use With Happiness and Depressed Mood

Tables 3 and 4 show GLMM results obtained from the analyses on happiness and depressed mood, respectively, predicted by the control strategies (and controlled for age and gender).[4] With respect to the happiness ratings, the simultaneous model including all four control strategies, as well as in the separate models including only one control strategy at a time, revealed a significant within-person effect only of CSC (see Table 3). This effect indicates that intraindividual increases and decreases of CSC use were coupled with increases and decreases of one's happiness (note, with respect to the signs of the effects, that the happiness ratings were reversed prior to the computation). The within-person effect of SPC was only marginally significant in the simultaneous model and significant in the separate model. The between-person effects of SPC, CSC, and also SSC were significant in the simultaneous model. Thus, despite the large correlation between the individual mean scores of SPC and SSC, both had a unique effect, in that higher levels of use of these strategies, as well as of CSC, were related to higher individual levels of self-reported happiness.

About 35% of the intraindividual happiness variance was explained by the simultaneous happiness model, indicating that, altogether, the combined within-person effects of the four control strategies were quite strong—and were stronger in accounting for the intraindividual variation of happiness than of depressed mood (cf. Table 4). In the separate models, SPC revealed the highest $R^2$ among all control strategies, seemingly in contrast to its insignificant unique effect in the simultaneous model. It is evident from the correlations shown in Table 2 that SPC shares substantial parts of its intra- and interindividual variances with the other control strategies, meaning that the ups and downs in SPC tend to go along with ups and downs in control investments in general. Hence, the relatively large $R^2$ obtained from the SPC-only model, contrasted with the insignificant unique within-person effect of SPC in the simultaneous model, may, at first sight, appear to reflect the combined effectivity of all intraindividual changes of control investments rather than that of SPC in particular. Arguing against this explanation, one may notice from Table 2 that SSC correlated even slightly higher with the other control strategies, but revealed a much lower $R^2$ in the separate model than SPC. Therefore, the apparent inconsistency between the insignificant within-person SPC effect in the simultaneous model and its significant separate model counterpart, accounting for a high share of intraindividual happiness variation, may simply reflect an increase of the unique effect's standard error because of higher multicollinearity in the simultaneous model: Note in Table 3 that, in the simultaneous model, the $p$ value of the fixed SPC within-person effect just missed the significance threshold and was marginally significant at least, whereas the absolute values of the respective regression coefficient was not much lower than in the separate model and highest among all within-

Table 2
*Between-Person and Within-Person Correlations Between Selective Primary Control (SPC), Compensatory Primary Control (CPC), Selective Secondary Control (SSC), and Compensatory Secondary Control (CSC)*

| Measure | SPC | CPC | SSC | CSC | *R* |
|---|---|---|---|---|---|
| SPC | — | .35 | .69 | .48 | .72 |
| CPC | .26 | — | .26 | .29 | .38 |
| SSC | .40 | .23 | — | .63 | .77 |
| CSC | .30 | .13 | .37 | — | .64 |
| *R* | .48 | .30 | .50 | .41 | — |

*Note.* Above the diagonal: between-person correlations and multiple correlations *R* between individual average scores. Below the diagonal: within-person correlations and multiple correlations *R* between deviation scores from the individual average. All correlations significant with $p \leq .001$.

[4] Note that in the GLMM with beta response distribution, the values of the regression coefficients do not refer to the predicted value conditional on the predictors as in conventional linear regression analyses, but to the so-called linear predictor (for details, refer to the GLIMMIX manual, SAS Institute Inc., 2009, pp. 2080–2430). However, the signs of the effects and the significance tests can be interpreted as usual.

Table 3
*Generalized Linear Mixed Models of Happiness Regressed on Selective Primary Control (SPC), Compensatory Primary Control (CPC), Selective Secondary Control (SSC), and Compensatory Secondary Control (CSC)*

| Parameter | Simultaneous model | Separate models | | | |
|---|---|---|---|---|---|
| | | SPC | CPC | SSC | CSC |
| *Fixed effects* (*SE*) | | | | | |
| Intercept | −1.77 (.49)*** | −1.85 (.50)*** | −2.42 (.53)*** | −1.59 (.48)** | −2.43 (.48)*** |
| SPC within | −.141 (.077)+ | −.186 (.072)* | | | |
| CPC within | .006 (.045) | | −.040 (.044) | | |
| SSC within | −.002 (.050) | | | −.091 (.047)+ | |
| CSC within | −.135 (.048)** | | | | −.154 (.046)*** |
| SPC between | −.214 (.119)+ | −.719 (.088)*** | | | |
| CPC between | .000 (.067) | | −.226 (.070)** | | |
| SSC between | −.302 (.087)** | | | −.565 (.057)*** | |
| CSC between | −.224 (.065)** | | | | −.449 (.051)*** |
| Age | .012 (.006)* | .014 (.006)* | .021 (.006)** | .011 (.006)+ | .021 (.006)*** |
| Sex (female) | −.073 (.073) | −.089 (.078) | −.063 (.082) | −.062 (.074) | −.075 (.076) |
| *Random variances* (*SE*) | | | | | |
| Intercept | .352 (.035)*** | .397 (.039)*** | .452 (.044)*** | .345 (.036)*** | .367 (.037)*** |
| SPC within | .303 (.104)** | .338 (.100)*** | | | |
| CPC within | .020 (.036) | | .036 (.037) | | |
| SSC within | .040 (.037) | | | .081 (.038)*** | |
| CSC within | .061 (.034) | | | | .082 (.032)*** |
| Residual | 18.5 (1.29)*** | 16.6 (.89)*** | 14.6 (.77)*** | 15.1 (.80)*** | 15.7 (.81)*** |
| $R^2$ | .346 | .210 | .049 | .099 | .133 |

*Note.* "Within" effects refer to person-mean centered deviation scores; "between" effects refer to person-mean scores. Models estimated with SAS PROC GLIMMIX by use of the beta distribution link function (SAS Institute Inc., 2009). *SE* = standard error.
+ $p \leq .07$. * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

person effects (as all control strategy measures use the same 0-to-4 scale, these coefficients may be compared at least tentatively). Thus, comparing, again, the separate models' $R^2$s, it could be concluded that, among the four strategies, SPC is most effective in accounting for intraindividual variation of happiness, whereas CSC ranks second, also driving some substantial intraindividual variation of the happiness ratings.

Regarding depressed mood, the fixed within-person effects of SPC and CSC were significant, both indicating that the more the individuals rose above or below their average level of use of these control strategies, the lower or the higher depressed mood, respectively, they reported (see Table 4). These effects held in the simultaneous model as well as in the separate models. Also, in the separate model, SSC showed a significant within-person effect, yet this effect becomes insignificant in the simultaneous model. Thus, when the covariation among the control strategies was controlled, the unique effect of SSC appeared not substantial. The same pattern of significance as for the within-person effects appeared for the between-person effects, indicating that higher levels of individual SPC and CSC use are related to lower levels of depressed mood. The simultaneous model ad hoc $R^2$ suggests that about 22% of the intraindividual variance is explained by the within-person effects of the four control strategies together (noticing that the $R^2$s obtained from only the fixed effects of age and gender were virtually zero, whereas modeling random age effects failed to produce a valid objective function). Comparison of the $R^2$s obtained from the separate models suggests that, among the four strategies, CSC is most effective in accounting for intraindividual variation of depressed mood.

## Functional Ability as Moderator of the Effects of Control Strategy Use

As explained in the Method section, we used ΔIADL, that is, the 1-year change in IADL, as the indicator of concurrent IADL change at T2-T5 and ran a second step of GLMM analyses modeling the curvilinear and piecewise linear effects of ΔIADL interacting with the effects of the control strategies. The results are shown in Table 5. In particular, the interactions are key to our research question concerning changes of the effectivity of control strategies for keeping happiness high and depression low in periods of worsening compared with periods of relatively stable functional competence. As expected, we found such moderating effects for CSC use. Predicting happiness, the linear term of the curvilinear ΔIADL model interacted significantly with the within-person CSC, and in the piecewise linear model, a significant interaction of ΔIADL loss with CSC was revealed. Regarding depressed mood, the quadratic term of ΔIADL interacted significantly with within-person CSC, but the piecewise linear effects of ΔIADL loss and ΔIADL gain revealed only marginal significance.

We illustrated these interaction effects in Figure 2, which shows the respective curves of the within-person CSC effects conditional on ΔIADL. Note that we plotted the curves over the ΔIADL-axis range from −4 to 7, which were the 5th and 95th percentiles of ΔIADL (total range was from −11 to 16; hence, enlarging the curves up to these endpoints might depict exaggeratedly enlarged CSC effects). The curves representing the moderating effects of ΔIADL for the CSC effects predicting happiness are largely in line with our theoretical expectation, showing clear-cut negative trends with increasing levels of concurrent ΔIADL loss (note, again, that

Table 4
*Generalized Linear Mixed Models of Depressed Mood Regressed on Selective Primary Control (SPC), Compensatory Primary Control (CPC), Selective Secondary Control (SSC), and Compensatory Secondary Control (CSC)*

| Parameter | Simultaneous model | Separate models | | | |
|---|---|---|---|---|---|
| | | SPC | CPC | SSC | CSC |
| *Fixed effects* (*SE*) | | | | | |
| Intercept | −1.17 (.791) | −1.03 (.784) | −3.64 (.721)*** | −1.88 (.692)** | −2.67 (.639)*** |
| SPC within | −.187 (.063)** | −.217 (.060)*** | | | |
| CPC within | .045 (.048) | | −.012 (.048) | | |
| SSC within | −.002 (.049) | | | −.090 (.045)* | |
| CSC within | −.137 (.050)** | | | | −.171 (.047)*** |
| SPC between | −.401 (.148)** | −.670 (.107)*** | | | |
| CPC between | .097 (.084) | | −.137 (.084) | | |
| SSC between | −.114 (.109) | | | −.461 (.071)*** | |
| CSC between | −.266 (.081)** | | | | −.422 (.062)*** |
| Age | .026 (.007)** | .024 (.007)** | .032 (.008)*** | .032 (.007)** | .032 (.007)*** |
| Sex (female) | −.215 (.093)* | −.213 (.094)* | −.186 (.099)+ | −.190 (.093)* | −.203 (.094)* |
| *Random variances* (*SE*) | | | | | |
| Intercept | .583 (.055)*** | .608 (.057)*** | .682 (.063)*** | .592 (.056)*** | .600 (.056)*** |
| SPC within | .000 (.000) | .071 (.054) | | | |
| CPC within | .045 (.042) | | .075 (.053) | | |
| SSC within | .007 (.029) | | | .024 (.027) | |
| CSC within | .079 (.035)* | | | | .086 (.032)* |
| Residual | 19.6 (1.19)*** | 17.9 (.93)*** | 17.9 (1.03)*** | 17.3 (.89)*** | 18.8 (.98)*** |
| $R^2$ | .223 | .084 | .091 | .034 | .156 |

*Note.* "Within" effects refer to person-mean centered deviation scores; "between" effects refer to person-mean scores. Models estimated with SAS PROC GLIMMIX by use of the beta distribution link function (SAS Institute Inc., 2009). *SE* = standard error.
$^{+}$ $p \leq .07$. $^{*}$ $p \leq .05$. $^{**}$ $p \leq .01$. $^{***}$ $p \leq .001$.

positive values of ΔIADL mean increase of IADL difficulties). Thus, under increasing levels of concurrent functional loss, intraindividual increases of CSC are more strongly related to increases in happiness. With regard to the left-hand side of the display, it seems that the moderating effect extends to reversed effects of happiness to CSC, in that these curves suggest positively signed CSC effects. That is, under high levels of ΔIADL gain, increased CSC goes with reduced happiness. However, this impression should not be overstated, as across the negative ΔIADL range, both curves run quite close to the zero level of CSC effects, and only in the piecewise model, the left-hand slope would extend to larger positive values if the curve would be prolonged up to the IADL minimum of −11. However, this slope of ΔIADL gain was not significant at all.

Concerning the moderating effects of ΔIADL for the CSC effects predicting depressive symptoms, the curves depicted in Figure 2 run partly according to our theoretical expectation but also point to some unexpected relation. The negative trend of the curvilinear as well as the piecewise linear curve toward the right-hand side indicates increasing effectivity of CSC to dampen depressed mood under increasing levels of concurrent ΔIADL loss. However, both curves also show such a trend toward the left-hand side, suggesting also that larger gains or recovery of functional abilities might be predictive of increased effectivity of CSC use. As both linear slopes of the piecewise linear model were only marginally significant, these should be interpreted with some caution. Note also that the "turnaround" of the quadratic curve is located right of zero ΔIADL (exactly at ΔIADL = 1.07), suggesting that the CSC × ΔIADL-loss effect of the piecewise model with change point zero might underestimate the right-hand-side trend.

All interaction effects involving SPC were statistically insignificant and comparatively low. Thus, the results provided no evidence of concurrent IADL dynamics impacting on the effectivity of SPC use. All ΔIADL interaction effects involving CPC were not significant and comparatively low in size. Only a marginally significant interaction between ΔIADL gain and CPC predicting depressed mood was revealed, suggesting some tendency similar to (though weaker than) the effect found for CSC.

However, there were significant interactions between ΔIADL and within-person SSC in all models run. That is, predicting happiness, the linear ΔIADL term of the curvilinear model and the ΔIADL-gain component of the piecewise linear model interacted significantly with SSC. Predicting depressed mood with the curvilinear model, the quadratic term of ΔIADL interacted significantly with SSC, whereas the piecewise linear model revealed significant interactions with both components of ΔIADL, loss and gain. In Figure 3, we depicted the respective curves of the within-person SSC effects for mood conditional on ΔIADL. In particular, the curves regarding the SSC effects for depressed mood suggest a trend inverse to the CSC effects, in that a positive trend of the curvilinear and the piecewise linear curve toward the right- and left-hand side indicates that depressed mood is ameliorated by SSC only when functional abilities do not change. Concerning the moderating effects of ΔIADL for the SSC effects predicting happiness, it should be noted that the curves depicted in Figure 3 largely run rather close to the zero SSC effect level, except for the clear-cut increase toward higher positive effect values on the "gain side" of ΔIADL, which mirrors the significant interaction effect in the piecewise linear model. Thus, under increasing levels of ΔIADL gain, the use of SSC strategies predicts reduced happiness. However, this prediction should be treated here with caution, noticing that most cases contributing to this left-hand slope were in the −3 to −1 range of ΔIADL (i.e., 34% had negative values and 10% had values of −4 or less): The linear left-hand slope might

Table 5
*Generalized Linear Mixed Models of Reactivity of Happiness and Depressed Mood (CES-D) to the Four Control Strategies, Moderated by Concurrent Change of Functional Abilities*

| Curvilinear ΔIADL model | | | Piecewise linear ΔIADL model | | |
|---|---|---|---|---|---|
| Parameter | Happiness *Estimate* (*SE*) | CES-D *Estimate* (*SE*) | Parameter | Happiness *Estimate* (*SE*) | CES-D *Estimate* (*SE*) |
| Intercept | −.796 (.055)*** | −1.51 (.064)*** | Intercept | −.767 (.063)*** | −1.48 (.072)*** |
| SPC | −.158 (.124) | −.276 (.109)* | SPC | −.076 (.158) | −.273 (.143)+ |
| CPC | −.007 (.064) | .075 (.070) | CPC | .030 (.081) | .096 (.088) |
| SSC | −.017 (.074) | −.141 (.079)+ | SSC | −.096 (.091) | −.253 (.100)* |
| CSC | −.072 (.064) | −.073 (.081) | CSC | −.054 (.083) | .001 (.103) |
| ΔIADL linear | .020 (.008)** | .013 (.008) | ΔIADL-loss | −.001 (.014) | −.001 (.015) |
| ΔIADL quadratic | −.002 (.002) | −.001 (.002) | ΔIADL-gain | .039 (.017)* | .027 (.019) |
| ΔIADL Lin × SPC | −.007 (.027) | −.025 (.025) | ΔIADL-Loss × SPC | −.012 (.040) | −.018 (.035) |
| ΔIADL Quad × SPC | .003 (.005) | .002 (.004) | ΔIADL-Gain × SPC | .017 (.058) | −.027 (.055) |
| ΔIADL Lin × CPC | −.002 (.019) | −.029 (.020) | ΔIADL-Loss × CPC | −.031 (.025) | −.044 (.026)+ |
| ΔIADL Quad × CPC | −.003 (.003) | −.002 (.003) | ΔIADL-Gain × CPC | .031 (.037) | −.010 (.040) |
| ΔIADL Lin × SSC | −.026 (.019)* | −.026 (.020) | ΔIADL-Loss × SSC | .012 (.029) | .058 (.029)* |
| ΔIADL Quad × SSC | .003 (.003) | .009 (.003)** | ΔIADL-Gain × SSC | −.077 (.037)* | −.112 (.040)** |
| ΔIADL Lin × CSC | −.056 (.020)** | .019 (.022) | ΔIADL-Loss × CSC | −.084 (.028)** | −.053 (.032)+ |
| ΔIADL Quad × CSC | −.004 (.003) | −.009 (.004)* | ΔIADL-Gain × CSC | −.035 (.039) | .082 (.044)+ |
| $R^2$ | .360 | .327 | | .362 | .324 |

*Note.* In all models, random intercept variance was significant ($p \leq .001$); in the happiness models, only the SPC random slope was modeled and significant ($p \leq .01$); in the CES-D models, only the CSC random slope was modeled and significant ($p \leq .05$). Models estimated with SAS PROC GLIMMIX by use of the beta distribution link function (SAS Institute Inc., 2009). *SE* = standard error; CES-D = Center for Epidemiological Studies Depression Scale; SPC, CPC, SSC, CSC = within-person deviation scores of selective primary, compensatory primary, selective secondary, compensatory secondary control, respectively; ΔIADL = concurrent 1-year difference score of instrumental activities of daily living (see Method section, positive scores indicate loss of functional abilities); ΔIADL-Loss = *max*(0, ΔIADL); ΔIADL-Gain = *min*(0, ΔIADL).
$^{+}p \leq .10$. $^{*}p \leq .05$. $^{**}p \leq .01$. $^{***}p \leq .001$.

mirror, rather, a "small" trend toward the ineffectiveness of SSC under mild gains of IADL than a trend toward more substantial SSC-related reduction of happiness under larger gains of IADL. In contrast, the curvilinear happiness curves seem to indicate constantly low reactivity under ΔIADL gain, but more effectivity of SSC under increasing levels of ΔIADL loss. However, this impression should again not be overstated, as the downward curvature toward the right is produced by the quadratic effect, which was not statistically significant. Overall, the changes of the SSC effect predicting happiness under varying levels of ΔIADL appear

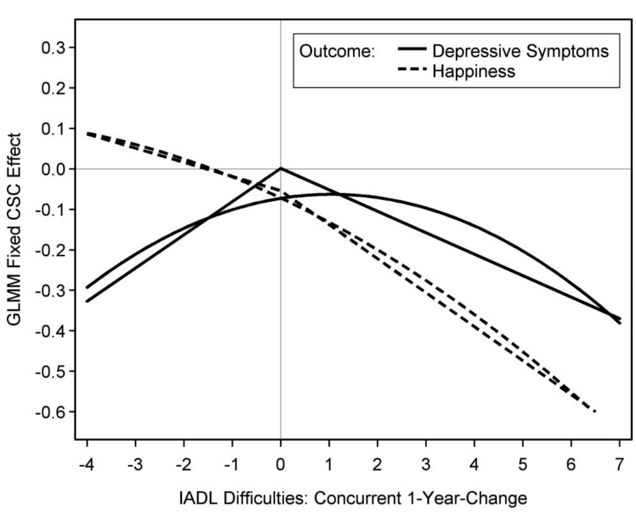


*Figure 2.* Generalized linear mixed model regression curves of the within-person compensatory secondary control (CSC) fixed effects on depressed mood and happiness, conditional on the concurrent 1-year change of IADL difficulties (ΔIADL, axis range from −4 to 7 represents 5th and 95th percentiles; total range = −11 to 16). IADL = instrumental activities of daily living.

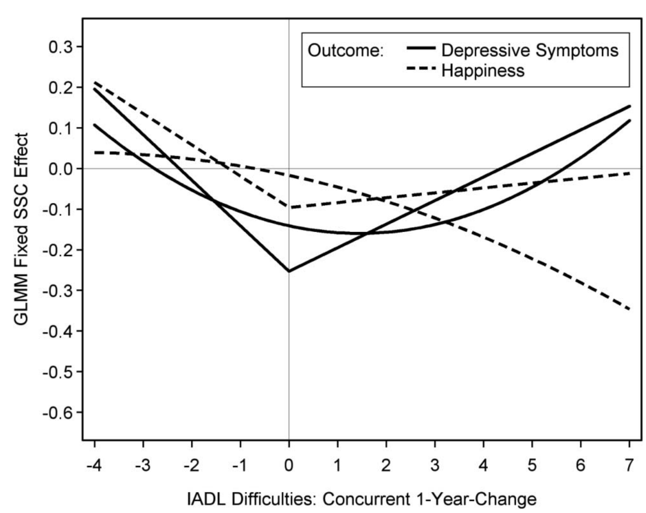


*Figure 3.* Generalized linear mixed model regression curves of the within-person selective secondary control (SSC) fixed effects on depressed mood and happiness conditional on the concurrent 1-year change of IADL difficulties (ΔIADL, axis range from −4 to 7 represents 5th and 95th percentiles; total range = −11 to 16). IADL = instrumental activities of daily living.

less pronounced compared with those on depressed mood (and the changes of the CSC effects).

## Discussion

Overall, the results presented provide an answer to the basic question posed at the beginning of this article: Indeed, strategies of goal attainment as proposed by the MTD predict *affective* well-being when individuals have to adjust to irreversible degradations of physical functionality. Moreover, this study aimed to contribute an innovative longitudinal analysis that adds to an already sizable body of literature providing support of the MTD framework explaining developmental regulation of health-related loss (for other challenges to individual goal attainment, see Heckhausen et al., 2010, 2013; Wrosch et al., 2006). That is, we analyzed the intraindividual effects of control strategy use predicting happiness and depressed moods, which, to our knowledge, has not been done in previous research on the MTD.

### SPC and CSC Strategies Facilitate Pleasurable Goal Attainment

Regarding our results on the overall effectivity of the four control strategies, two aspects seem particularly relevant. First, the within-person (person-centered) scores of the four control strategies accounted for quite substantial shares of intraindividual variation in happiness and depressive symptoms. Thus, our findings suggest that linkages between control strategy use and affective processes work rather "promptly," within time lags below the half-year intervals of our study. In contrast, associations between interindividual differences in control strategy use and affective well-being that have become evident in our models' between-person effects and in other research (Miller & Wrosch, 2007; Wrosch, Miller, et al., 2007; Wrosch et al., 2003; Wrosch et al., 2002; Wrosch, Schulz, et al., 2007) might not necessarily emerge from processes that are effective within short time frames. Interindividual associations could also mirror causal linkages that worked in the long run prior to the respective study's observation (e.g., stable personality characteristics that may have impacted on both, the individuals' levels of goal engagements and affective well-being). Therefore, the substantial mixed model within-person effects confirm a more direct linkage, in that the "modulation" in using the respective strategies more or less than usual predicts the person's actual state of affective well-being.

Second, the persons' current affective well-being appeared particularly closely related to SPC and CSC, in that lower depression and higher happiness was coupled with higher use of SPC and CSC, whereas the unique within-person associations with CPC and SSC were minor. Notably, this does not mean that CPC and SSC strategies are not relevant in coping with chronic loss conditions: These strategies play an important role in reaching goals that have become difficult to attain. However, such difficulty in reaching a goal may impede hedonic rewards of goal attainment, dampening pleasure and affective benefits gained from the respective activity. Hence, this result converges with our assumption that SPC and CSC strategies in particular predict affective well-being via the "positive pathway," in that these strategies particularly facilitate "pleasurable" goal attainment, suited to stimulate positive affect.

Though supporting this latter interpretation, our data cannot provide definite proof, particularly in regard to a possible negative pathway that might have worked as well. That is, control strategy use might prevent failures in goal attainment that would evoke negative affect. However, it would be difficult to explain why only SPC and CSC, but not CPC and SSC, strategies work over such a negative pathway. Considering that obstacles to goal engagement would enhance negative affect, any means to overcome these obstacles, enabling successful goal attainment, might prevent this negative enhancement. CPC and SSC are put into play when regular goal engagement runs into obstacles and regular SPC is insufficient to persist in goal pursuit. Hence, CPC and SSC strategies might also prevent negative affect that would be caused by failures to reach one's everyday goals.

Overall, we conclude that our findings indicate that the use of SPC and CSC strategies promotes affective well-being primarily by facilitating the generation of positive affect, rather than preventing negative affective reactions in one's everyday goal pursuit. This conclusion holds some promises for further insights in how goal-related control investments might be successful in protecting affective well-being under chronic loss conditions. In particular, if a person has to adjust or disengage from goals, the use of CSC strategies to do so may protect affective well-being only to the degree that the goal adjustments or reengagements provide ways to "have fun" and gain affective benefits in everyday life conduct. If, again, for example, persons that used to find pleasure in cooking become visually impaired to a degree that they can no longer do that cooking, they might find other ways to get catered with tasty meals—but will they also find a "replacement" for the pleasure gained from the cooking? This might depend on personal characteristics, such as knowledge and motivation driving one's pleasure-seeking activities. Thus, though this argument is made only speculatively here, it seems promising for future research to connect the MTD view of developmental regulation with personal characteristics that could moderate the effectivity of goal adjustments in protecting affective well-being under chronic functional loss. For instance, wisdom-related knowledge and insights about the pragmatics of life (e.g., Baltes & Staudinger, 2000; Pasupathi, Staudinger, & Baltes, 2001) might guide persons to adjust or change their activities in the best "pleasure-protecting" way. In contrast, the experience of chronic loss conditions over larger periods of one's life span could fuel negative thinking dynamics, such as ruminative response styles (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Soo, Burney, & Basten, 2009) or learned helplessness (e.g., Peterson, Maier, & Seligman, 1993). These dynamics may lead to overly pessimistic expectations about the controllability and hedonic rewards of goal attainment, hence leading individuals to make "fatalistic" goal adjustments or disengagements, giving up the search for hedonic rewards.

### Moderating Effects of Changes in Functional Ability

Considering that across the course of AMD, episodes of IADL loss may occur frequently, demanding persons to adjust goals that have become difficult to reach and to use self-protective comparisons to accept such adjustments, we expected the effectivity of CSC strategies to maintain positive well-being to increase under such pronounced functional decline. Modeling concurrent change of IADL as moderator confirmed that expectation, in that under increasing loss of IADL, the use of CSC strategies was more strongly associated with higher happiness and lower depressed mood. Overall, this underscores the MTD rationale to view the functional component as a basic driver of developmental regulation, in that persons use control strategies to adapt to functional constraints and to maintain control over goal attainment: At times when chronic impairments of physical functionality have accumulated to the extent that a person's behavioral competencies for everyday life activities get substantially restricted, this will create challenges to everyday functioning and, ultimately, problems in attainment of everyday goals, which were possible prior to loss of functionality. Using, again, the cooking example, it might be *in such a period* when vision loss has progressed to a degree worsening the functional abilities that the person burns the roast or spoils the soup for the first time. Instead of struggling with such increased complexity, it might then be easier to have pleasure from preparation of meals that need less visual capabilities—or shift attention and/or engagements toward other activities that still provide pleasure without problems.

Unexpectedly, the effects of CSC predicting depressed mood also seemed boosted by *gains* of IADL. Though not contradictory to our expectations, this finding may stimulate further theoretical considerations, asking what it could mean that persons under a chronic condition such as AMD *increased* their everyday functional abilities. Such gain (e.g., by using help or technical aids, i.e., employing CPC strategies) might be considered in terms of restoration or recovery of functional abilities that had been lost before. Thus, IADL increases may mark the final stage of a successful process of adaptation to prior functional declines, and the increased effectivity of CSC to dampen depressed moods, triggered initially by IADL loss, may be retained through that entire process. An alternative—or complementary—explanation might be that struggling to regain functional abilities also provides stressful experiences, and the self-protective CSC strategies may work adaptively in coping with that increased stress. This latter explanation would also explain why this effect was only found with respect to depressive symptoms, considering that these could be more strongly driven by negative affect than happiness ratings and that negative affect has been found particularly reactive to daily stressors (e.g., Schilling & Diehl, 2014; Stawski, Sliwinski, Almeida, & Smyth, 2008). However, ad hoc interpretations concerning IADL gains are admittedly speculative here and—given that no such effect was found for the happiness ratings—should be noted with caution.

No moderating effects of concurrent functional changes were revealed involving SPC and CPC. SPC investments seem to pay off for affective well-being generally, not affected by concurrent dynamics of functional abilities.[5] However, our model estimates indicated that ΔIADL moderated SSC effects predicting depressed mood in a way inverse to the CSC effects. Thus, SSC appeared coupled with lower depression under stable IADL, but this association attenuated under increasing concurrent change of IADL, whether loss or gain. The decrease of effectivity related to functional loss appears in line with our theoretical expectations: If SPC (and CPC) strategies are not sufficient to reach desired goals, increasing motivational commitments seems an alternative to goal adjustments that might make goal attainment a more stressful, rather than pleasurable, experience. Hence, the rationale of expecting the effectivity of CSC to increase with concurrent loss of IADL also implies, in a way, some decrease of SSC effectivity. In the same way, weakening SSC effectivity under increasing *gain* of IADL might be explained along the lines of our ad hoc interpretations of the respective increase of CSC effectivity. In particular, it seems reasonable to speculate that increasing motivational commitments also boosts the intensity of stress perceived in struggling to restore IALD competencies. Furthermore, we also found some effects of concurrent IADL change moderating the SSC effects for happiness, yet these appeared relatively insubstantial, largely predicting mild variations of an overall low SSC effect. At most, these results pointed at a potential detrimental impact of SSC on the happiness ratings under increasing gain of IADL, which should, however, be noted only with caution, as explained in the Results section.

## Use of Control Strategies and Affective Well-Being: Driver or Driven?

In modeling within-person regression effects of control strategy use, we took the within-person covariances as indicative of how the use of control strategies impacted the individual's affective well-being at the time of measurement. However, this interpretation of our findings should be made with caution, as the reversed causal direction also deserves some consideration: Fluctuations of the person's well-being may also promote changes in the person's control strategy use. In particular, the positive affect component inherent in the measures of happiness and depressive symptoms might also stimulate self-regulation of one's goal engagements. Frederickson (2001) proposed that positive affective experiences broaden the individual's momentary thought–action repertoire. Such a broadening may then enhance people's flexibility in striving for everyday goals, facilitating goal adjustments or goal disengagements. Moreover, affective distress may demotivate a person's general investment in goal attainment. For instance, the progressive and irreversible nature of chronic functional loss could facilitate perceptions of uncontrollability and aggravate maladaptive styles of affect regulation, promoting ruminative responses that, in return, interfere with the person's motivational commitment and striving toward desired goals (Nolen-Hoeksema et al., 2008; Watkins & Nolen-Hoeksema, 2014). Overall, such potential impacts of affective experiences might also have contributed to the intraindividual relationships of SPC and CSC with happiness and depressive symptoms, though there is no obvious reason why they should not have done so for CPC and SSC strategies as well.

The consideration of such different causalities is further complicated with respect to the "timing" of such effects. For instance, loss of physical functionality could promote an immediate worsening of well-being, which, however, might be "repaired" by adaptation processes (Schilling & Wahl, 2006; Schilling, Wahl, Horowitz, Reinhardt, & Boerner, 2011), the latter employing control strategy changes (Schilling et al., 2013). With respect to the

[5] This conclusion may be doubted, considering that the fixed main effect of within-person SPC predicting happiness did not even keep its marginal significance in the models containing the moderating effects of ΔIADL. However, noticing that the inclusion of any interaction effect (significant or not) "cuts off" some of the predictor's unique covariance with the outcome from the main effect, testing this main effect should not be overstated as a test of general SPC effectivity. Note also, again, that the conclusion of substantial SPC effects predicting happiness was based on the $R^2$, rather than on the tentative significance obtained with the model shown in Table 4.

"direct" impacts of control strategy use on well-being outcomes, one may question whether a change in control strategy use prompts immediate changes in well-being, observable within short terms, or whether these effects work in the long run, in that a persistent shift in the preference for certain control strategies causes the amount of goal attainment crucial to enhance well-being.

Overall, control strategies may be related to aspects of well-being because of multiple complex causal pathways, effective at variable temporal extension. The methodological demands of disentangling such complex causalities are hardly met and are beyond the scope of this study. Everyday goal attainment and the formation of subjective well-being denote psychological processes responsive to the multifaceted contexts of real life. Thus, randomized experimental studies of the respective causal effects may imply operationalizations that hardly meet the ecological validity needed to generalize the results to people's goal attainment and well-being in real life situations. In addition, longitudinal studies designed to disentangle both causal directions by means of the temporal sequence of cause and effect (i.e., modeling the unique statistical associations between antecedent causes and follow-up effects by means of cross-lagged panel analyses) are limited with respect to the study's measurement intervals (Rogosa, 1980; Voelkle, Oud, Davidov, & Schmidt, 2012). Cross-lagged effects indicate how predictive the status of the causative variable reached at a given measurement occasion is for the change in the effect variable over the subsequent measurement interval. If, for instance, changes of the causative variable within the measurement interval also promote fast changes in the outcome observable at the subsequent measurement occasion, these would not contribute to the estimate of the causal effect, but to the outcome's unexplained change variance (hence leading to an underestimation of the causal effect). Overall, if the "speed" and/or temporal extension of the causal effects falls sizably below or above the measurement intervals, these may not be detected by means of cross-lagged effects. Given these difficulties in modeling the causality, the operationalization used in this study seems reasonable, considering, in particular, that the ups and downs of both control strategy use and well-being might unfold a rapid temporal sequence of "triggering" and "reactive" changes, which cannot be sufficiently be disentangled with our study's half-year follow-up intervals. In that regard, future research providing longitudinal measures with shorter intervals is needed to gain further insight in the causalities underlying the intraindividual association between control strategy investments and well-being.

## Broadening the View: Recent Approaches to Goals and Motivational Behavior

Advances in motivational psychology point to the distinction between implicit and explicit motives (McClelland, Koestner, & Weinberger, 1989; see review in Brunstein, 2008) and between unconscious and conscious motives (e.g., Huang & Bargh, 2014; Kenrick, Griskevicius, Neuberg, & Schaller, 2010; Kruglanski et al., 2002). Basically, these approaches converge in conceptualizing multiple conscious and nonconscious motives and goals coexisting simultaneously within the individual and driving affective experiences (including anticipation), cognition, and behavior (see also a precursor of some of these ideas in the dynamics of action model of Atkinson & Birch, 1970). These approaches have stimulated research on the developmental origin and transformation of motives and goals across the life span. Moreover, recent theoretical proposals considered the evolutionary formation of the goal-generating motivational system to explain goal formation and selection over the life span. For instance, Kenrick and colleagues (2010) utilized life history theory from the biological sciences to trace back goals to fundamental human motives that trigger behavior needed at certain phases of the life span to facilitate reproductive success. The MTD fits into this larger conceptual framework by, first, facilitating our understanding of *how* individuals strive for the explicit goals they had selected (addressing the adaptive strategies that might lead to goal attainment); second, providing a model of motivated behavior for the *developmental regulation of losses* of resources across the life span[6]; and third, offering a hypothesis-generating model to search for nonconscious effects of goal engagement and goal disengagement on affect and cognition (see, e.g., incidental memory effects of child-wish goals; Heckhausen, Wrosch, & Fleeson, 2001).

Moreover, whereas evolutionary approaches provide an understanding of general motivational principles underlying the formation and selection of goals (see also Conroy-Beam & Buss, 2014; Neuberg & Schaller, 2014), they do not include a specification of the formative and selective psychological processes at the level of specific goals pursued in everyday life contexts. Thus, questions regarding, in particular, the specification of goal-selective processes (e.g., Ainslie, 2014; Bliss-Moreau & Williams, 2014) might complete these theoretical proposals. The research we presented highlights the major role of affect in goal formation and goal selection (e.g., Bliss-Moreau & Williams, 2014; Huang & Bargh, 2014). In particular, positive affect serves to incentivize goals, in that "affect 'tags' existing goals, allowing for the resolution of goal competition (i.e., goal selection)" (Bliss-Moreau & Williams, 2014, p. 138). If so, selective primary goal engagements should be associated with affective well-being, and, also, adjustments in goal formation and selection—as implied by compensatory secondary strategies—should enhance affective well-being when the individual has to deal with losses of behavioral resources relevant for goal attainments. Thus, in particular, our conclusion that SPC and CSC strategies promote affective well-being primarily via the generation of positive affect might be taken as support of the assumption that positive affect "in return" works as incentive channeling the individual's selection of goals.

## Study Limitations

A limitation to our analyses is the lack of IADL measures at the "in-between" measurement occasions (i.e., T1 and T3). To model

[6] Though life history theory implies a life span developmental model in terms of a sequential order of prioritized goals, following basic motives that serve reproductive success, this model seems theoretically limited in addressing the motivational basis of regulation of loss in the postreproductive phase of the human life span. Considering, for example, the hierarchy of fundamental goals suggested by Kenrick et al. (2010), people adapting to chronic loss in old age may follow the basic self-protective motives. However, as "reproductive success, not survival, is the currency of natural selection" (von Hippel & von Hippel, 2014, p. 157), the evolutionary basis of the motives that drive regulation of the age-related losses that occur in middle and old age seems not strongly substantiated: It seems questionable, apart from parent and grandparental kin care motives, how motivated behavior in old age can be relevant for reproductive success.

the moderating effects of concurrent changes of functional ability, we accepted twofold coarseness of ΔIADL, namely, the exclusion of the baseline measures from the respective analyses and the use of the 1-year change of IADL as an indicator of concurrent IADL dynamics at the midpoint, as well as at the endpoint, of the respective time interval. The potential shortcomings of this strategy, as well as our reasons to accept these, have already been explained in the Method section and should be noted here as another study limitation. Again, future research on the topic should implement shorter measurement intervals, also including measures of functional ability.

Further, generalizability of our results to progressive loss conditions other than visual impairment caused by AMD may be of concern. Vision loss may cause specific psychological burdens aside from the functional losses threatening the individual's goal attainment. For instance, the rate of AMD progression typically varies between and within individuals, which may nurture fears of further vision loss even for those in periods of stable vision and/or slow progression of the disease, which cannot be regulated adaptively by means of control strategies. Thus, more research is needed to address the generalizability of the results found in this study to other chronic conditions.

Finally, as we were not able to compare our results with a control sample not affected by any loss of physical functionality, it may be asked whether our data are sufficient to draw conclusions on developmental regulation of chronic functional losses. This study was based on the MTD rationale that people use control strategies to adapt to *some kind of loss*, and our basic research question was whether persons benefit affectively when they do so. Our intraindividual design is suited to address this latter question, by analyzing how a person's changes of control strategies are associated with changes in affective-well-being. Lacking a respective control group, we cannot strictly rule out that people who do not suffer from any functional loss might also employ the control strategies (say, for convenience) and that this control strategy use might then be associated with affective well-being in similar ways. However, our analyses of moderating effects of concurrent changes in functional abilities strengthen the argument that the intraindividual associations reflect adaptation to functional loss.

## Conclusion

This study addressed the adaptive effects of the control strategies proposed by the life span theory of control (Heckhausen & Schulz, 1995; Heckhausen et al., 2010) on affective well-being under conditions of chronic vision loss. Analyzing intraindividual change in self-rated happiness and depressed mood, our analyses confirmed, to a large extent, the general pattern of affective "reactivity" that we expected theoretically, in that both outcomes appeared particularly associated with the intraindividual ups and downs in the use of SPC and CSC strategies, and that the effect of CSC increased at periods of concurrent decline of functional abilities. Building on these findings, future longitudinal research implementing shorter measurement intervals seems promising to examine the processes of mutually associated short-term changes in control strategy use and well-being more "timely" and in-depth.



## References


Abdel-Khalek, A. M. (2006). Measuring happiness with a single-item scale. *Social Behavior and Personality, 34,* 139–150. http://dx.doi.org/10.2224/sbp.2006.34.2.139

Ainslie, G. (2014). Selfish goals must compete for the common currency of reward. *Behavioral and Brain Sciences, 37,* 135–136. http://dx.doi.org/10.1017/S0140525X13001933

Atkinson, J. W., & Birch, D. A. (1970). *The dynamics of action*. New York, NY: Wiley.

Baltes, P. B., & Staudinger, U. M. (2000). Wisdom: A metaheuristic (pragmatic) to orchestrate mind and virtue toward excellence. *American Psychologist, 55,* 122–136. http://dx.doi.org/10.1037/0003-066X.55.1.122

Beedie, C. J., Terry, P. C., & Lane, A. M. (2005). Distinctions between emotion and mood. *Cognition and Emotion, 19,* 847–878. http://dx.doi.org/10.1080/02699930541000057

Beedie, C. J., Terry, P. C., Lane, A. M., & Devonport, T. J. (2011). Differential assessment of emotions and moods: Development and validation of the Emotion and Mood Components of Anxiety Questionnaire. *Personality and Individual Differences, 50,* 228–233. http://dx.doi.org/10.1016/j.paid.2010.09.034

Bliss-Moreau, E., & Williams, L. A. (2014). Tag, you're it: Affect tagging promotes goal formation and selection. *Behavioral and Brain Sciences, 37,* 138–139. http://dx.doi.org/10.1017/S0140525X13001969

Boerner, K., Brennan, M., Horowitz, A., & Reinhardt, J. P. (2010). Tackling vision-related disability in old age: An application of the life-span theory of control to narrative data. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 65B,* 22–31. http://dx.doi.org/10.1093/geronb/gbp098

Brennan-Ing, M., Boerner, K., Horowitz, A., & Reinhardt, J. (2013). The vision-specific optimization in primary and secondary control (OPS) scale. *European Journal of Ageing, 10,* 345–352. http://dx.doi.org/10.1007/s10433-013-0278-4

Brunstein, J. C. (2008). Implicit and explicit motives. In J. Heckhausen & H. Heckhausen (Eds.), *Motivation and action* (2nd ed., pp. 227–246). New York, NY: Cambridge University Press. http://dx.doi.org/10.1017/CBO9780511499821.010

Burmedi, D., Becker, S., Heyl, V., Wahl, H.-W., & Himmelsbach, I. (2002). Behavioral consequences of age-related low vision: A narrative review. *Visual Impairment Research, 4,* 15–45. http://dx.doi.org/10.1076/vimr.4.1.15.15633

Center for the Study of Aging and Human Development. (1975). *Multidimensional functional assessment: The OARS methodology*. Durham, NC: Center for the Study of Aging and Human Development, Duke University.

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14,* 464–504. http://dx.doi.org/10.1080/10705510701301834

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9,* 233–255. http://dx.doi.org/10.1207/S15328007SEM0902_5

Cho, E., & Kim, S. (2015). Cronbach's coefficient alpha: Well known but poorly understood. *Organizational Research Methods, 18,* 207–230. http://dx.doi.org/10.1177/1094428114555994

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 100,* 316–336. http://dx.doi.org/10.1037/0021-843X.100.3.316

Coleman, H. R., Chan, C. C., Ferris, F. L., III, & Chew, E. Y. (2008). Age-related macular degeneration. *The Lancet, 372,* 1835–1845. http://dx.doi.org/10.1016/S0140-6736(08)61759-6

Conroy-Beam, D., & Buss, D. M. (2014). A deeper integration of selfish goal theory and modern evolutionary psychology. *Behavioral and Brain Sciences, 37,* 140–141. http://dx.doi.org/10.1017/S0140525X13001982

Dunne, E., Wrosch, C., & Miller, G. E. (2011). Goal disengagement, functional disability, and depressive symptoms in old age. *Health Psychology, 30,* 763–770. http://dx.doi.org/10.1037/a0024019

Fine, S. L., Berger, J. W., Maguire, M. G., & Ho, A. C. (2000). Age-related macular degeneration. *The New England Journal of Medicine, 342,* 483–492. http://dx.doi.org/10.1056/NEJM200002173420707

Fordyce, M. W. (1988). A review of research on the happiness measures: A sixty second index of happiness and mental health. *Social Indicators Research, 20,* 355–381. http://dx.doi.org/10.1007/BF00302333

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56,* 218–226. http://dx.doi.org/10.1037/0003-066X.56.3.218

Gable, S. L., Reis, H. T., & Elliot, A. J. (2000). Behavioral activation and inhibition in everyday life. *Journal of Personality and Social Psychology, 78,* 1135–1149. http://dx.doi.org/10.1037/0022-3514.78.6.1135

Gamble, A., & Gärling, T. (2012). The relationships between life satisfaction, happiness, and current mood. *Journal of Happiness Studies, 13,* 31–45. http://dx.doi.org/10.1007/s10902-011-9248-8

Haase, C. M., Heckhausen, J., & Wrosch, C. (2013). Developmental regulation across the life span: Toward a new synthesis. *Developmental Psychology, 49,* 964–972. http://dx.doi.org/10.1037/a0029231

Heckhausen, J., & Schulz, R. (1995). A life-span theory of control. *Psychological Review, 102,* 284–304. http://dx.doi.org/10.1037/0033-295X.102.2.284

Heckhausen, J., Schulz, R., & Wrosch, C. (1998). *Developmental regulation in adulthood: Optimization in Primary and Secondary Control – A multiscale questionnaire (OPS-Scales). Technical report*. Berlin, Germany: Max Planck Institute for Human Development. http://dx.doi.org/10.1017/CBO9780511527852

Heckhausen, J., Wrosch, C., & Fleeson, W. (2001). Developmental regulation before and after a developmental deadline: The sample case of "biological clock" for childbearing. *Psychology and Aging, 16,* 400–413. http://dx.doi.org/10.1037/0882-7974.16.3.400

Heckhausen, J., Wrosch, C., & Schulz, R. (2010). A motivational theory of life-span development. *Psychological Review, 117,* 32–60. http://dx.doi.org/10.1037/a0017668

Heckhausen, J., Wrosch, C., & Schulz, R. (2013). A lines-of-defense model for managing health threats: A review. *Gerontology, 59,* 438–447. http://dx.doi.org/10.1159/000351269

Hedeker, D. (2005). Generalized linear mixed models. In B. S. Everitt & D. C. Howell (Eds.), *Encyclopedia of statistics in behavioral science* (pp. 729–738). New York, NY: Wiley. http://dx.doi.org/10.1002/0470013192.bsa251

Hoffman, L., & Stawski, R. S. (2009). Persons as contexts: Evaluating between-person and within-person effects in longitudinal analysis. *Research in Human Development, 6,* 97–120. http://dx.doi.org/10.1080/15427600902911189

Huang, J. Y., & Bargh, J. A. (2014). The selfish goal: Autonomously operating motivational structures as the proximate cause of human judgment and behavior. *Behavioral and Brain Sciences, 37,* 121–135. http://dx.doi.org/10.1017/S0140525X13000290

Kahneman, D. (1999). Objective happiness. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: The foundations of hedonic psychology* (pp. 3–25). New York, NY: Russell Sage Foundation.

Kenrick, D. T., Griskevicius, V., Neuberg, S. L., & Schaller, M. (2010). Renovating the pyramid of needs: Contemporary extensions built upon ancient foundations. *Perspectives on Psychological Science, 5,* 292–314. http://dx.doi.org/10.1177/1745691610369469

Kline, R. B. (2013). Assessing statistical aspects of test fairness with structural equation modelling. *Educational Research and Evaluation, 19,* 204–222. http://dx.doi.org/10.1080/13803611.2013.767624

Kruglanski, A. W., Shah, J. Y., Fishbach, A., Friedman, R., Chun, W. Y., & Sleeth-Keppler, D. (2002). A theory of goal systems. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 34, pp. 331–378). San Diego, CA: Academic Press.

Kunzmann, U. (2008). Differential age trajectories of positive and negative affect: Further evidence from the Berlin Aging Study. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 63,* P261–P270. http://dx.doi.org/10.1093/geronb/63.5.P261

Larsen, R. J., Diener, E., & Emmons, R. A. (1985). An evaluation of subjective well-being measures. *Social Indicators Research, 17,* 1–17. http://dx.doi.org/10.1007/BF00354108

McClelland, D. C., Koestner, R., & Weinberger, J. (1989). How do self-attributed and implicit motives differ? *Psychological Review, 96,* 690–702. http://dx.doi.org/10.1037/0033-295X.96.4.690

Miller, G. E., & Wrosch, C. (2007). You've gotta know when to fold 'em: Goal disengagement and systemic inflammation in adolescence. *Psychological Science, 18,* 773–777. http://dx.doi.org/10.1111/j.1467-9280.2007.01977.x

Neuberg, S. L., & Schaller, M. (2014). The selfish goal meets the selfish gene. *Behavioral and Brain Sciences, 37,* 153–154. http://dx.doi.org/10.1017/S0140525X13002136

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking Rumination. *Perspectives on Psychological Science, 3,* 400–424. http://dx.doi.org/10.1111/j.1745-6924.2008.00088.x

OECD. (2013). *OECD guidelines on measuring subjective well-being*. Retrieved from http://dx.doi.org/10.1787/9789264191655-en

Pasupathi, M., Staudinger, U. M., & Baltes, P. B. (2001). Seeds of wisdom: Adolescents' knowledge and judgment about difficult life problems. *Developmental Psychology, 37,* 351–361.

Peterson, C., Maier, S. F., & Seligman, M. P. (1993). *Learned helplessness: A theory for the age of personal control*. New York, NY: Oxford University Press.

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1,* 385–401. http://dx.doi.org/10.1177/014662167700100306

Rogosa, D. R. (1980). A critique of cross-lagged correlation. *Psychological Bulletin, 88,* 245–258. http://dx.doi.org/10.1037/0033-2909.88.2.245

Rovner, B. W., & Casten, R. J. (2008). Preventing late-life depression in age-related macular degeneration. *The American Journal of Geriatric Psychiatry, 16,* 454–459. http://dx.doi.org/10.1097/JGP.0b013e31816b7342

SAS Institute Inc. (2009). *SAS/STAT 9.2 User's guide* (2nd ed.). Cary, NC: Author.

SAS Institute Inc. (2014). *SAS/QC®13.2 User's guide*. Cary, NC: Author.

Schilling, O. K., & Diehl, M. (2014). Reactivity to stressor pile-up in adulthood: Effects on daily negative and positive affect. *Psychology and Aging, 29,* 72–83. http://dx.doi.org/10.1037/a0035500

Schilling, O. K., & Wahl, H.-W. (2006). Modeling late-life adaptation in affective well-being under a severe chronic health condition: The case of age-related macular degeneration. *Psychology and Aging, 21,* 703–714. http://dx.doi.org/10.1037/0882-7974.21.4.703

Schilling, O. K., Wahl, H.-W., Boerner, K., Reinhardt, J. P., Brennan-Ing, M., & Horowitz, A. (2013). Change in psychological control in visually impaired older adults over 2 years: Role of functional ability and depressed mood. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 68,* 750–761. http://dx.doi.org/10.1093/geronb/gbs118

Schilling, O. K., Wahl, H.-W., Horowitz, A., Reinhardt, J. P., & Boerner, K. (2011). The adaptation dynamics of chronic functional impairment: What we can learn from older adults with vision loss. *Psychology and Aging, 26,* 203–213. http://dx.doi.org/10.1037/a0021127

Schimmack, U., Schupp, J., & Wagner, G. G. (2008). The influence of environment and personality on the affective and cognitive component of subjective well-being. *Social Indicators Research, 89,* 41–60. http://dx.doi.org/10.1007/s11205-007-9230-3

Soo, H., Burney, S., & Basten, C. (2009). The role of rumination in affective distress in people with a chronic physical illness: A review of the literature and theoretical formulation. *Journal of Health Psychology, 14,* 956–966. http://dx.doi.org/10.1177/1359105309341204

Stawski, R. S., Sliwinski, M. J., Almeida, D. M., & Smyth, J. M. (2008). Reported exposure and emotional reactivity to daily stressors: The roles of adult age and global perceived stress. *Psychology and Aging, 23,* 52–61. http://dx.doi.org/10.1037/0882-7974.23.1.52

Vandenberg, R. J., & Lance, C. E. (2000). A Review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3,* 4–70. http://dx.doi.org/10.1177/109442810031002

Veenhoven, R., & Hagerty, M. (2006). Rising happiness in nations 1946–2004: A reply to Easterlin. *Social Indicators Research, 79,* 421–436. http://dx.doi.org/10.1007/s11205-005-5074-x

Verbeke, G., & Molenberghs, G. (2000). *Linear mixed models for longitudinal data*. New York, NY: Springer.

Voelkle, M. C., Oud, J. H. L., Davidov, E., & Schmidt, P. (2012). An SEM approach to continuous time modeling of panel data: Relating authoritarianism and anomia. *Psychological Methods, 17,* 176–192. http://dx.doi.org/10.1037/a0027543

von Hippel, W., & von Hippel, F. A. (2014). Goals are not selfish. *Behavioral and Brain Sciences, 37,* 157–158. http://dx.doi.org/10.1017/S0140525X13002173

Wahl, H.-W., Becker, S., Burmedi, D., & Schilling, O. (2004). The role of primary and secondary control in adaptation to age-related vision loss: A study of older adults with macular degeneration. *Psychology and Aging, 19,* 235–239. http://dx.doi.org/10.1037/0882-7974.19.1.235

Wahl, H.-W., Schilling, O., & Becker, S. (2007). Age-related macular degeneration and change in psychological control: Role of time since diagnosis and functional ability. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 62,* P90–P97. http://dx.doi.org/10.1093/geronb/62.2.P90

Wahl, H.-W., Schilling, O., Oswald, F., & Heyl, V. (1999). Psychosocial consequences of age-related visual impairment: Comparison with mobility-impaired older adults and long-term outcome. *Journal of Gerontology: Psychological Sciences, 54B,* P304–P316. http://dx.doi.org/10.1093/geronb/54B.5.P304

Watkins, E. R., & Nolen-Hoeksema, S. (2014). A habit-goal framework of depressive rumination. *Journal of Abnormal Psychology, 123,* 24–34. http://dx.doi.org/10.1037/a0035540

Watson, D., Wiese, D. W., Vaidya, J., & Tellegen, A. (1999). Two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology, 76,* 820–838. http://dx.doi.org/10.1037/0022-3514.76.5.820

Wrosch, C., Dunne, E., Scheier, M. F., & Schulz, R. (2006). Self-regulation of common age-related challenges: Benefits for older adults' psychological and physical health. *Journal of Behavioral Medicine, 29,* 299–306. http://dx.doi.org/10.1007/s10865-006-9051-x

Wrosch, C., Miller, G. E., Scheier, M. F., & de Pontet, S. B. (2007). Giving up on unattainable goals: Benefits for health? *Personality and Social Psychology Bulletin, 33,* 251–265. http://dx.doi.org/10.1177/0146167206294905

Wrosch, C., Scheier, M. F., Miller, G. E., Schulz, R., & Carver, C. S. (2003). Adaptive self-regulation of unattainable goals: Goal disengagement, goal reengagement, and subjective well-being. *Personality and Social Psychology Bulletin, 29,* 1494–1508. http://dx.doi.org/10.1177/0146167203256921

Wrosch, C., Schulz, R., & Heckhausen, J. (2002). Health stresses and depressive symptomatology in the elderly: The importance of health engagement control strategies. *Health Psychology, 21,* 340–348. http://dx.doi.org/10.1037/0278-6133.21.4.340

Wrosch, C., Schulz, R., & Heckhausen, J. (2004). Health stresses and depressive symptomatology in the elderly: A control-process approach. *Current Directions in Psychological Science, 13,* 17–20. http://dx.doi.org/10.1111/j.0963-7214.2004.01301005.x

Wrosch, C., Schulz, R., Miller, G. E., Lupien, S., & Dunne, E. (2007). Physical health problems, depressive mood, and cortisol secretion in old age: Buffer effects of health engagement control strategies. *Health Psychology, 26,* 341–349. http://dx.doi.org/10.1037/0278-6133.26.3.341

Xu, R. (2003). Measuring explained variation in linear mixed effects models. *Statistics in Medicine, 22,* 3527–3541. http://dx.doi.org/10.1002/sim.1572

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