Developmental Regulation Across the Life Span: Toward a New Synthesis

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How can individuals regulate their own development to live happy, healthy, and productive lives? Major theories of developmental regulation across the life span have been proposed (e.g., dual-process model of assimilation and accommodation; motivational theory of life-span development; model of selection, optimization, and compensation), but they have rarely been integrated. We provide an integration of key processes and predictions postulated by the 3 theories. Moreover, we present evidence from 2 age-heterogeneous, cross-sectional studies showing that the different processes of developmental regulation proposed by the different theories center around 3 key processes (i.e., goal engagement, goal disengagement, and metaregulation), which are positively associated with age and well-being. We conclude by proposing an agenda for future research.

Keywords: developmental regulation, goals, life-span development, successful development

Supplemental materials: http://dx.doi.org/10.1037/a0029231.supp

A central assumption in developmental research is that individuals shape, influence, or regulate their development across the life span (e.g., Bühler, 1933; Lerner & Busch-Rossnagel, 1981). Myriad studies have shown that how individuals regulate their development has consequences for their well-being, relationship and career success, mental health, physical health, and even longevity (e.g., Brandtstädter, 2009; Freund, 2008; Heckhausen, Wrosch, & Schulz, 2010). Recent studies have provided insights into the physiological and neuronal processes involved in core processes of developmental regulation (e.g., Brassen, Gamer, Peters, Gluth, & Büchel, 2012), thereby opening up exciting avenues for future research. Moreover, understanding how individuals regulate their development successfully can inform interventions (Gitlin, Hauck, Winter, Dennis, & Schulz, 2006). Thus, research on developmental regulation is an important field of inquiry.

However, the field of developmental regulation in its current state may seem confusing to anyone not closely familiar with it. This article focuses on three major theories of developmental regulation that have been proposed: the *dual-process model of assimilative and accommodative coping* (e.g., Brandtstädter, 1989, 2009; Brandtstädter & Renner, 1990; Brandtstädter & Rothermund, 2002); the *motivational theory of life-span development* (MTD) and its theoretical precursors (e.g., Heckhausen & Schulz, 1993, 1995; Heckhausen et al., 2010; Schulz & Heckhausen, 1996); and the *model of selection, optimization, and compensation* (SOC; e.g., Baltes & Baltes, 1990; Freund, 2008; Freund & Baltes, 2002; Lerner, Freund, De Stefanis, & Habermas, 2001).[1] All three theories have spurred a plethora of empirical studies since their introduction more than two decades ago. They all address the vital role individuals play in regulating their own development. They all share a focus on successful, adaptive, or positive development. And they all share a context-sensitive perspective formulating predictions about what regulation processes are particularly adaptive in what contexts (e.g., afforded by different life stages). However, the theories also arrive at diverging predictions, and we elaborate on some in this article.

Surprisingly, only a few researchers (e.g., Boerner & Jopp, 2007; Poulin, Haase, & Heckhausen, 2005) have attempted a conceptual integration of the three theories, and an empirical integration is missing to date. We believe an integration of the

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[1] This article does not cover other important theories that address motivation and regulation in human development (e.g., Carstensen, Isaacowitz, & Charles, 1999; Salmela-Aro, 2009). For the dual-process model, we limit ourselves to reviewing the two processes of assimilation and accommodation because the majority of work (and the model name) focuses on these two processes (a third proposed process refers to immunization, the negation of potentially self-discrepant evidence).

three theories is timely for at least three reasons. First, the three theories of developmental regulation and the great bodies of empirical work they inspired have existed side by side for more than two decades without much cross-talk; an integrated approach could reduce confusion and promote communication. Second, an integrated approach could highlight how research on developmental regulation offers insights into questions of broad interest not only to psychology but also public health, economics, sociology, and neuroscience, as well as applied research. Third, we hope that an integration will inspire future research. Thus, in this article, we (1) provide a conceptual integration of the three theories (we do not seek to offer a new theory), (2) present findings from two studies in support of an integrative approach, and (3) propose an agenda for future research.

Three Theories of Developmental Regulation: A Conceptual Integration

Key Processes of Developmental Regulation

The three theories of developmental regulation together suggest 11 different processes of developmental regulation (see Table 1).

Extending our earlier work (Poulin et al., 2005), we suggest that the 11 theory-specific processes center around three key processes of developmental regulation—*goal engagement*, *goal disengagement*, and *metaregulation* (see Table 1). A related (but not the same) conceptual integration was proposed Boerner and Jopp (2007).

In line with other approaches to agency, motivation, and regulation (e.g., Eccles & Wigfield, 2002; Nurmi & Salmela-Aro, 2002; Shah & Gardner, 2008), we view goals—mental representation of desired states (e.g., have a child, pursue a career, stay healthy)—as cornerstones of developmental regulation. When individuals experience discrepancies between their present state and their goals, they use regulatory strategies. They can either *engage with the goal* and thereby try to attain it or they can *disengage from the goal* and let go of it. These two modes of regulation appear in a number of theories (e.g., Carver & Scheier, 1998; James, 1890; Klinger, 1975).

How do the different processes proposed by the different theories map onto goal engagement and goal disengagement? The dual-process model contrasts processes of assimilation (or tenacious goal pursuit) with processes of accommodation (or flexible goal adjustment), processes that serve goal engagement and goal

Table 1

Processes of Developmental Regulation in the Dual-Process, MTD, and SOC Models

Dual-process model	MTD	SOC
	Metaregulation	
	Optimization (MTD): Match goals to opportunities; manage inter-domain and long-term consequences; maintain diversity of goals	
	Goal engagement	
Assimilation: Tenacious goal pursuit, persisting commitment; corrective and compensatory efforts to maintain goal; goal-focused resource mobilization	*Selective primary control:* Invest behavior, effort, time, skills, persistence *Compensatory primary control:* Seek out help or unusual means or ways to overcome shortfall of primary control resources *Selective secondary control:* Avoid distractions; enhance perceived control; imagine positive incentives of goal attainment	*Elective selection:* Specification of goals; goal system; contextualization of goals; goal commitment *Aspects of loss-based selection:* Focus on most important goals *Optimization (SOC):* Attentional focus; seizing the right moment; persistence; acquiring new skills/resources; practice of skills; resource allocation; modeling successful others *Compensation:* Substitution of means; use of external aids/help of others; use of therapeutic interventions; acquiring new skills/resources; activation of unused skills/resources; changes in resource allocation; modeling of successful others who compensate; neglect of optimizing other means
	Goal disengagement	
Accommodation: Adjusting goals to constraints; positive reappraisal of loss, benefit finding; channeling resources to new, feasible goals	*Compensatory secondary control:* Distancing from goal (devalue chosen goal, downgrade importance of goal, enhance value of conflicting goals); self-protection (protect motivational resources from negative implications of failure or loss experiences)	*Aspects of loss-based selection:* Reconstruction of goal hierarchy; adaptation of standards

Note. Dual-process model = dual-process model of assimilative and accommodative coping (conceptual definitions based on Brandtstädter, 2009); MTD = motivational theory of life-span development (conceptual definitions based on Heckhausen et al., 2010); SOC = model of selection, optimization, and compensation (conceptual definitions based on Freund & Baltes, 2002).

disengagement, respectively. MDT distinguishes between primary control strategies (targeted at the environment) and secondary control strategies (targeted at the self; see Rothbaum, Weisz, & Snyder, 1982). MDT postulates that primary control strategies as well as selective secondary control strategies serve goal engagement, whereas compensatory secondary control serves goal disengagement. The SOC model originally proposed three processes of selection, optimization, and compensation that all serve adaptive mastery (Marsiske, Lang, Baltes, & Baltes, 1995) or goal engagement. Later, a distinction was introduced between elective selection and loss-based selection (Freund & Baltes, 2002). We propose that elective selection can be interpreted as serving goal engagement and that some aspects of loss-based selection serve goal disengagement. A third regulatory process is proposed by MTD and addresses *metaregulation* of goal engagement and disengagement (see Table 1). Metaregulation guides adaptive goal choice across domains, ensuring that goals (1) are congruent with contextual opportunities for goal attainment, (2) have adaptive interdomain and long-term consequences, and (3) provide a sufficient diversity of goals. Thus, through metaregulation individuals take into account contextual opportunities for goal attainment (e.g., biological, social, economic) and flexibly activate goal engagement and disengagement to promote successful development. MDT refers to this metaregulatory process as optimization.[2]

This conceptual integration provides a frame of reference to integrate theory-specific predictions and empirical findings regarding (1) age differences in processes of developmental regulation and (2) their associations with well-being. Both are important areas of inquiry addressed by all three theories.

Age Differences in Key Processes of Developmental Regulation

All three theories postulate that individuals adjust their strategies of developmental regulation to deal with age-specific biopsychosocial opportunities and challenges. The theories converge in predicting higher levels of goal disengagement in older adulthood. However, they disagree about age differences in goal engagement, predicting decline (Brandtstädter, 2009), stability (Heckhausen et al., 2010), nonlinear age differences, or increases in specific SOC processes of goal engagement (Freund, 2008; Freund & Baltes, 2002).

These differences appear to be grounded in differences in what the theories view as the fundamental function of developmental regulation (for a detailed discussion see Poulin et al., 2005). The dual-process model assumes that this function is to preserve self-consistency across the life span. Thus, individuals should reduce discrepancies through goal engagement at younger ages, and, as opportunities for goal attainment shrink with age, they should shift their preferred mode of discrepancy reduction to goal disengagement. MDT, in contrast, assumes that the function of developmental regulation is to maximize primary control capacity, which can be achieved by pursuing attainable goals and disengaging from goals that have become unattainable or too costly to pursue. Thus, individuals should always be inclined to engage with goals, with the specific goals of engagement changing across the life span. Finally, SOC assumes that the function of developmental regulation is to manage one's resources to maximize gains and minimize losses (Freund, 2008). Thus, SOC arrives at different predictions

for the different SOC-specific processes of goal engagement (Freund, 2008), but other work has also emphasized the particular importance of goal engagement in old age (Freund, Nikitin, & Ritter, 2009).

Empirical studies have demonstrated higher levels of goal disengagement processes in older adults (e.g., Brandtstädter & Renner, 1990; Frazier, Newman, & Jaccard, 2007; Wrosch, Heckhausen, & Lachman, 2000). In contrast, empirical evidence has been inconclusive about age differences in goal engagement. Studies have found lower (e.g., Brandtstädter & Renner, 1990; Rothermund & Brandtstädter, 2003), stable (e.g., Heckhausen, 1997), and higher (e.g., Riediger, Freund, & Baltes, 2005; Wrosch et al., 2000) levels of goal engagement with higher age. Freund and Baltes (2002) found that age differences in the SOC processes followed an inverted U-shaped curve that peaked in midlife, except for elective selection, which was higher in older adulthood. Finally, age differences in metaregulation have not received much attention, but one study has shown higher metaregulation in older age (Frazier et al., 2007). Most existing studies on age differences in developmental regulation are limited by their cross-sectional design (but see, e.g., Rothermund & Brandtstädter, 2003).

Associations Between Key Processes of Developmental Regulation and Well-Being

All three theories postulate that engaging in attainable goals is important for successful development. The dual-process model and MDT, as well as the newer version of the SOC model (encompassing loss-based selection), further postulate that disengaging from unattainable goals is likewise crucial for successful development. We focus on one important aspect of successful development here, well-being (Diener, 2000; Ryff & Keyes, 1995). Cross-sectional, longitudinal, and intervention studies have shown that both goal engagement and goal disengagement abilities positively predict well-being (e.g., Brandtstädter & Renner, 1990; Freund & Baltes, 1998, 2002; Gestsdóttir & Lerner, 2007; Haase, Heckhausen, & Köller, 2008; Haase, Heckhausen, & Silbereisen, in press; Heckhausen et al., 2010; Salmela-Aro, 2009; Wiese, Freund, & Baltes, 2002; Wrosch, Dunne, Scheier, & Schulz, 2006). Moreover, MTD suggests that metaregulation promotes engagement with and disengagement from goals and in this way has a positive indirect effect on well-being. This proposition has not been examined.

Finally, the theories formulate assumptions about the adaptive value of goal engagement and goal disengagement at different life stages. The dual-process model and MDT, as well as more recent work in the SOC tradition (Freund et al., 2009), predict that goal disengagement is particularly adaptive at older ages, when control opportunities are limited (e.g., supported cross-sectionally by Wrosch et al., 2000). In contrast, the three theories diverge in their predictions on how age moderates effects of goal engagement on well-being. The dual-process model and MTD suggest that goal engagement is particularly beneficial for well-being at younger

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[2] Both MDT and SOC conceptualize processes of optimization that map onto different key processes of developmental regulation. Thus, to avoid confusion we refer to the model-specific processes of metaregulation as "optimization (MDT)" and "optimization (SOC)."

ages, when control opportunities are plentiful (e.g., supported cross-sectionally by Wrosch et al., 2000). In contrast, the SOC model proposes that goal engagement becomes increasingly adaptive in old age, when resources are limited (e.g., supported cross-sectionally and longitudinally by Jopp & Smith, 2006). Again, these different predictions appear to be grounded in what the theories view as the fundamental function of developmental regulation (see above).

The Present Studies

In this article, we present a conceptual integration of the dual-process, MTD, and SOC models. We also present evidence from two age-heterogeneous and cross-sectional studies that are limited in some important ways but that outline the potential of this integrative approach. The two studies have three aims. First, we test whether an integrative structural equation model composed of the three processes of goal engagement, goal disengagement, and metaregulation shows reasonable fit to the different theory-specific measures. Moreover, we compare this integrative three-process model to several alternative integrative models (see the online supplemental materials [OSM]). Second, we examine age differences in these processes of developmental regulation. Third, we test a model that fuses predictions from all three theories (see Figure 1), assuming that metaregulation predicts higher goal engagement and goal disengagement, which in turn predict higher well-being. We also explore whether age moderates associations between goal engagement/goal disengagement and well-being. Study 1 (S1) examines the dual-process theory and MTD. Study 2 (S2) examines all three theories using a data set that was previously analyzed for a different purpose (see Freund & Baltes,

2002). Note that loss-based selection was not assessed in this study, because the concept was added later to the SOC model.

Method

In the following, we present important methodological information. Detailed information is provided in the online supplemental material (OSM).

Statistical Analyses

Data were analyzed separately for S1 and S2 using structural equation modeling (SEM; see OSM for detailed information). We used comparative fit index (CFI; $> .90$) and root-mean-square error of approximation (RMSEA; $< .08$) as indicators of reasonable model fit and used chi-square difference tests ($ps < .05$) to compare alternative models and test for moderation by age. Items were parceled into three indicators for each latent (theory-specific) variable of developmental regulation. When repeating all analyses using two-item parcels per latent variable, the results remained essentially stable.

Participants and Procedure

S1 examined 262 participants (52.7% females) from three age groups: young adults ($n = 86$; age $= 20–35$ years), middle-aged adults ($n = 88$; age $= 40–55$), and older adults ($n = 88$; age $= 60–85$). S2 included an independent sample previously analyzed by Freund and Baltes (2002; Study 1) consisting of 223 participants (58.3% females) from three age groups: adolescents and young adults ($n = 90$; age $= 14–35$), middle-aged
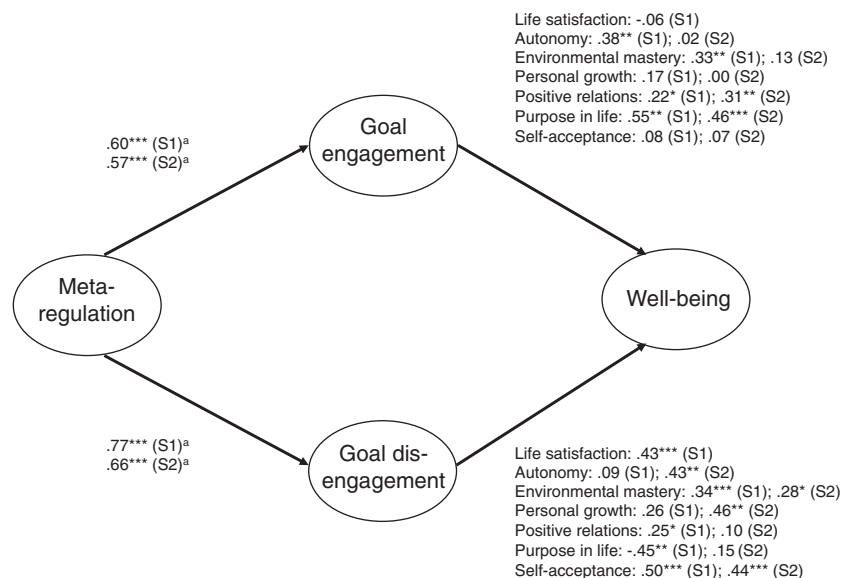

Figure 1. Key processes of developmental regulation and well-being: Overview of results. Standardized regression coefficients (β) from separate structural equation models (structural part) for each aspect of well-being are shown. S2 analyzed manifest well-being variables. S1 = Study 1; S2 = Study 2.
[a] Average across models.
* $p < .05$. ** $p < .01$. *** $p < .001$.

adults ($n = 67$; age = 36–55), and older adults ($n = 66$; age = 56–87; detailed information is provided in OSM).

Measures

OSM Tables 1–4 provide detailed information regarding example items, the number of items, internal consistencies, and SEM measurement models for all measures.

Developmental regulation. We analyzed measures of developmental regulation widely used by each theory. Processes postulated by the dual-process model were measured using a 30-item (S1) and a 20-item (S2) version of the Tenacious Goal Pursuit and Flexible Goal Adjustment (Tenflex) Scales (Brandtstädter & Renner, 1990). The Tenflex Scale was revised to exclude reverse-coded items to improve measurement quality (see Henselmans et al., 2011; Mueller & Kim, 2004). Processes postulated by MTD were assessed, excluding two optimization (MDT) items (see OSM), using the 80-item version (S1) and the 42-item version (S2) of the Optimization in Primary and Secondary Control Scales (Heckhausen, Schulz, & Wrosch, 1998). SOC processes were measured in S2 using a forced-choice 36-item version of the SOC scales (see Freund & Baltes, 2002). Loss-based selection was not assessed, because the concept was added after the original introduction of the SOC model. Measurement properties of these measures were largely satisfactory (αs ranged from .68 to .91, see OSM Table 1; SEM measurement models showed reasonable fit, CFI > .90, RMSEA ≤ .08, with the exception of the dual-process model, RMSEA ≤ .091, see OSM Table 2).

Well-being. In S1, *life satisfaction* was measured by four items using an adapted version of the Temporal Satisfaction With Life Scale (Pavot, Diener, & Suh, 1998), which showed good measurement properties (see OSM Tables 3 and 4). In S1 and S2, six dimensions of psychological well-being were measured following Ryff and Keyes (1995): *autonomy, environmental mastery, personal growth, positive relations, purpose in life*, and *self-*

acceptance. In S2, all psychological well-being measures showed satisfactory internal consistencies (αs ranged between .71 and .87; see OSM Table 3). However, S1 used the three-item scales of psychological well-being recommended by Ryff and Keyes (1995) and obtained low Cronbach's alphas for select scales (αs ranged between .37 and .77; see OSM Table 3), similar to results by Ryff and Keyes. Yet, the SEM measurement model for the psychological well-being scale showed satisfactory fit in S1 (see OSM Table 4), again similar to results by Ryff and Keyes.

Results

Means, standard deviations, and intercorrelations for all variables are presented in OSM Tables 5 and 6. All variables were normally distributed (|skewness and kurtosis| < 1.59).

Key Processes of Developmental Regulation

We specified an SEM model to test whether the different theory-specific processes reflected the three processes of developmental regulation in line with our suggestions. Specifically, engagement and goal disengagement were modeled as second-order factors with loadings on the respective theory-specific measures as first-order factors as presented in Table 1. Metaregulation was modeled as a first-order factor (because this process was postulated by only one theory and represented by one measure). Results are shown in Table 2.

The integrative model showed reasonable fit regarding RMSEA and CFI (only the CFI was less than .90 in S2). Factor loadings of the theory-specific measures on goal engagement and goal disengagement were all significant but varied between measures (see Table 2). Metaregulation correlated positively with goal engagement (S1: $r = .59$; S2: $r = .56$) and goal disengagement (S1: $r = .78$; S2: $r = .86$), which were also positively correlated with each other (S1: $r = .53$; S2: $r = .53$; all ps < .01). In both studies, none

Table 2
Integrative Model of Developmental Regulation: Factor Loadings, Explained Variances, and Model Fit

Measure	Study 1			Study 2		
	GE[a]	GD[a]	MR[b]	GE[a]	GD[a]	MR[b]
AS	.75 (.56)	.00	.00	.77 (.60)	.00	.00
SPC	.96 (.93)	.00	.00	.94 (.89)	.00	.00
CPC	.34 (.12)	.00	.00	.54 (.29)	.00	.00
SSC	.84 (.71)	.00	.00	.73 (.54)	.00	.00
ES	—	—	—	.46 (.21)	.00	.00
OPT (SOC)	—	—	—	.79 (.63)	.00	.00
COM	—	—	—	.73 (.54)	.00	.00
AC	.00	.84 (.70)	.00	.00	.54 (.29)	.00
CSC	.00	.74 (.55)	.00	.00	.45 (.20)	.00
OPT (MTD)	.00	.00	.75–.81 (.56–.66)	.00	.00	.64–.82 (.41–.67)
Model fit	$\chi^2(180) = 398.71$, $p < .001$; CFI = .94; RMSEA = .068			$\chi^2(393) = 810.20$, $p < .001$; CFI = .86; RMSEA = .069		

Note. Factor loadings shown for all measures (with explained variances in parentheses). Dashes indicate SOC processes (i.e., ES; OPT [SOC]; COM) that were not assessed in Study 1. GE = goal engagement; GD = goal disengagement; MR = metaregulation; AS = assimilation (i.e., tenacious goal pursuit); SPC = selective primary control; CPC = compensatory primary control; SSC = selective secondary control; ES = elective selection; OPT (SOC) = optimization (model of selection, optimization, and compensation); COM = compensation; AC = accommodation (i.e., flexible goal adjustment); CSC = compensatory secondary control; OPT (MTD) = optimization (motivational theory of life-span development); CFI = comparative fit index; RMSEA = root-mean-square error of approximation.
[a] Second-order factors. [b] First-order factor (loadings and explained variances of item parcels). For detailed information see the online supplemental materials.

of several alternative models showed better fit than the integrative three-process model of goal engagement, goal disengagement, and metaregulation (see OSM Table 7).

Age Differences in the Processes of Developmental Regulation

Age differences in the processes of developmental regulation were consistent across studies. Older age predicted higher goal engagement (S1: $\beta = .36$, $p < .001$; S2: $\beta = .21$, $p < .01$), higher goal disengagement (S1: $\beta = .41$, $p < .001$; S2: $\beta = .35$, $p < .05$), and higher metaregulation (S1: $\beta = .24$, $p < .001$; S2: $\beta = .16$, $p < .05$). Age differences in these processes of developmental regulation appeared to be linear.

Processes of Developmental Regulation and Well-Being

The processes of developmental regulation predicted well-being in largely similar ways across studies. Overall, as shown in Figure 1, higher metaregulation predicted higher goal engagement and goal disengagement, which, in turn, predicted higher well-being. Specifically, higher goal engagement consistently predicted higher purpose in life and positive relations. Higher goal disengagement consistently predicted higher life satisfaction, environmental mastery, and self-acceptance (but had a negative association with purpose in life in S1). Metaregulation had positive indirect effects (i.e., mediated by goal engagement and goal disengagement) on all well-being aspects ($ps < .05$) except for purpose in life in S1. These results were obtained by testing six separate SEM models (one for each aspect of well-being; see OSM Table 8). In S1, all models showed reasonable fit (RMSEA ranged from .060 to .067; CFI ranged from .92 to .94). In S2, all models showed reasonable fit regarding RMSEA (ranging from .068 to .070), but CFI ranged from .84 to .85.

Finally, in S2 age moderated some of the obtained effects on well-being ($\Delta\chi^2$: $ps \leq .05$): (1) Goal engagement was positively associated with environmental mastery in the middle-aged group ($\beta = .47$, $p < .01$) but not in the young ($\beta = .13$, $p = .285$) or older ($\beta = -.27$, $p = .120$) age group; (2) goal engagement was more closely associated with purpose in life in the middle-aged group ($\beta = .65$, $p < .001$) than in the young ($\beta = .41$, $p < .01$) or older ($\beta = .34$, $p < .05$) age group; (3) goal disengagement was positively associated with purpose in life in the older age group ($\beta = .48$, $p < .05$) but not in the young ($\beta = .00$, $p = .996$) or middle-aged ($\beta = .10$, $p = .521$) group.

Summary and Limitations

The two studies yielded three main findings. First, they supported an integrative model showing that the different theory-specific processes of developmental regulation center around three key processes—goal engagement, goal disengagement, and metaregulation. They also demonstrated that specific processes from each theory uniquely contribute to one of these three processes (visible in their different factor loadings). Second, across studies, older adults reported the highest levels of goal engagement, goal disengagement, and metaregulation. Third, across studies, higher levels of metaregulation predicted higher levels of goal engagement and goal disengagement, which, in turn, statistically medi-

ated higher levels of well-being (with different associations for different aspects of well-being). Moreover, in Study 2, goal engagement was particularly adaptive in middle adulthood (when opportunities for goal attainment peak but challenges are also higher; see Haase, Seider, Shiota, & Levenson, in press; Lachman, 2004), while goal disengagement appeared to be particularly adaptive in older age (when opportunities for goal attainment are relatively low; Wrosch et al., 2000) for select aspects of well-being.

The two studies yielded largely similar findings, but they also have important limitations. First, the studies were cross-sectional (longitudinal studies incorporating measures from all three theories are presently not available). Second, the measures examined were widely used by each theory and consist of self-report measures that assess explicit developmental regulation at a domain-general level (behavioral, implicit, goal- or domain-specific measures for all three theories were not available). Third, some measures and structural equation models had suboptimal psychometric properties, sample sizes were small, and we lacked a measure of loss-based selection.

Discussion

Human development is not only a product of nature or nurture, of biology or social structure. Across the life span, individuals themselves can shape their own development. This proposition is at the heart of many modern approaches in developmental research. The present article sought to provide an overview and integration of key processes and predictions postulated by three theories of developmental regulation: the dual-process, MDT, and SOC models. Moreover, we presented evidence from two age-heterogeneous cross-sectional studies showing that the different theories center around three processes of developmental regulation (goal engagement, goal disengagement, and metaregulation), which are positively associated with age and well-being. We hope that this article will facilitate communication and inspire future research.

An Agenda for Future Research

Processes of developmental regulation. We propose that three processes of developmental regulation—goal engagement, goal disengagement, and metaregulation—are key regulatory processes underlying the various processes postulated by the three theories; and we presented empirical evidence supporting this proposition. This does by no means imply that future research should abandon studying the theory-specific processes of developmental regulation. Rather, whether to focus on specific or key processes may depend on the research question at hand. When the research question is how specific processes work or how they interact with each other, it will be crucial to examine these specific processes. When the aim is to predict broader consequences of successful development, it may be more useful to examine the processes of goal engagement, goal disengagement, and metaregulation.

We assume that these processes operate at a conscious as well as at a nonconscious level; thus, future research should complement self-report measures by behavioral and implicit measures of developmental regulation (see Greve & Wentura, 2007). Previous

research has used such measures successfully and revealed important insights (e.g., pain sensitivity: Brandtstädter, Voss, & Rothermund, 2004; decision making: Brassen et al., 2012; walking while memorizing: Li, Lindenberger, Freund, & Baltes, 2001; visual attention: Light & Isaacowitz, 2006).

Developmental regulation across the life span. With an increasing proportion of older adults around the globe, it is important to identify domains of psychological functioning that are protected from age-related decline and that may constitute important resources for coping with the challenges of late life (e.g., cognitive decline, health problems, financial burden, loss of social partners). Research has been successful in elucidating aspects of emotional functioning that are preserved or even enhanced in late life (e.g., Scheibe & Carstensen, 2010; Shiota & Levenson, 2009). As discussed and demonstrated in this article, developmental regulation may be another area in which older adults excel. However, present findings are largely based on cross-sectional data, and some predictions and findings (e.g., regarding age differences in goal engagement) are contradictory. Thus, an important task for future research is to examine changes in processes of developmental regulation in longitudinal studies. Ideally, these studies would track changes in specific and key processes of developmental regulation throughout childhood and adolescence until late life.

Sources, consequences, and correlates of developmental regulation. Myriad studies have shown that individuals differ in the extent to which they are able to hold on to attainable goals and let go of unattainable goals and that this has consequences for many outcomes of development and well-being, including relationship and career success, mental health, physical health, immunological functioning, and longevity (e.g., Brandtstädter, 2009; Freund, 2008; Heckhausen et al., 2010; Wrosch, 2011). Future research may also address consequences of metaregulation, a third process of developmental regulation, which has been understudied. In a related vein, the three theories make partly converging and partly diverging predictions about at what life stages the different processes of developmental regulation are particularly adaptive. These predictions deserve further investigation. The underlying assumption is that age serves as a proxy for more (i.e., younger ages) or less (i.e., older ages) opportunities for goal attainment. Note that opportunities for goal attainment also vary across other factors, including health status, gender, ethnicity, socioeconomic status, geographical region, and idiosyncratic factors, outlining other important avenues for studying the influence of developmental regulation in future research. Moreover, more must be learned about sources of individual differences in developmental regulation such as genetic factors, childhood experiences, and cultural influences. Finally, recent research has provided insights into the physiological and neuronal correlates of processes important for developmental regulation (Brassen et al., 2012). Thus, studying the biological correlates of developmental regulation is another exciting avenue for future research.

Unique contributions of the theories. Each of the three theories makes a number of important and unique contributions that we could not elaborate on in this article. For example, the dual-process model addresses nonconscious, subpersonal developmental regulation in depth as well as shifts in goal contents across the life span and the historical context of developmental regulation (e.g., Brandtstädter, 2009; Greve & Wentura, 2007). MDT conceptualizes all three key processes of developmental regulation

(including metaregulation), and it has spurred much empirical work emphasizing the importance of congruence of goal engagement/disengagement with contextual control opportunities (Heckhausen et al., 2010). The SOC model is a metatheory that can be applied to describe regulation not only at the individual level but also at other levels of analysis, from cells to society (Baltes, 1997; Riediger & Ebner, 2007); moreover, recent research has examined shifts in types of goals across the life span (e.g., Ebner, Freund, & Baltes, 2006). All these unique contributions deserve further consideration in integrated research on developmental regulation.

Conclusion

We presented an overview of three major theories of developmental regulation that have rarely been integrated. We provided empirical evidence showing that the different theory-specific processes center around three key processes of developmental regulation (i.e., goal engagement, goal disengagement, and metaregulation), which are positively associated with age and well-being. Finally, we outlined directions for future research. Research on developmental regulation offers important insights into how individuals can shape their own development to live happy, productive, and healthy lives.

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