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Repetitive Thought Dimensions, Psychological Well-being and Perceived Growth in Older Adults: A Multilevel, Prospective Study

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Abstract

Background and Objectives—Forms of repetitive thought (RT) such as worry are clearly related to states such as anxiety and depression. However, the presence of other forms such as reminiscing suggests that RT could also relate to eudaimonic well-being. Furthermore, a largely overlooked characteristic, total tendency to engage in RT, may associate with a particular kind of eudaimonic well-being, namely, perceived growth.

Design—Older adults (N = 150) were interviewed semi-annually for up to 10 waves.

Methods—Participants completed a battery of RT measures at baseline and annual assessments of psychological well-being (PWB) and perceived growth. Multilevel models tested the prospective, between-person relationships between baseline RT and future PWB and perceived growth.

Results—RT qualities prospectively predicted both PWB and perceived growth: more positive valence best predicted PWB whereas more negative valence and more total RT best predicted perceived growth. Furthermore, RT qualities largely accounted for a negative between-person relationship between PWB and perceived growth.

Conclusions—Different qualities of RT promoted different kinds of eudaimonic well-being, and a negative association between different kinds of eudaimonic well-being could be attributed to their different RT antecedents.

Keywords

rumination; processing; perceived growth; eudaimonic well-being; psychological well-being

Repetitive thought (RT), the "process of thinking attentively, repetitively, or frequently about oneself and one's world" (Segerstrom, Stanton, Alden, & Shortridge, 2003, p. 909), encompasses constructs such as worry and rumination that have been consistently associated with lower hedonic well-being (Watkins, 2008). Hedonic well-being reflects a view of well-being as consisting of pleasure or happiness, which are notably lacking in states such as

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anxiety or depression (Ryan & Deci, 2001). A less well explored possibility is that RT might also be associated with eudaimonic well-being (EWB). EWB reflects a view of well-being as consisting of social and existential growth and fulfillment (Ryan & Deci, 2001; Ryff & Singer, 2008). An abundance of RT such as reflection, reminiscing, and emotional processing could promote positive feelings about and appraisals of oneself and one's environment and enhance well-being. The purpose of the present study was to extend the substantial literature on RT's relationship to hedonic well-being to an examination of its relationship to EWB. In this longitudinal, prospective study, different dimensional qualities of RT predicted different forms of EWB.

Types of eudaemonic well-being

Whereas hedonic well-being and ill-being are reflected in, for example, happiness and depression, EWB is reflected in, for example, social connectedness, autonomy, and mastery. Measures of EWB are only modestly associated with those of hedonic well-being (Ryff & Keyes, 1995). The distinctiveness of these two kinds of well-being is further demonstrated by conditions in which EWB is maintained even in the presence of hedonic unpleasantness. For example, increases in physical pain over a decade correlated with increases in negative affect but not decreases in EWB (Phelan & Heidrich, 2007). As another example, aging is associated with hedonically unpleasant developments such as losses, but some qualities of EWB, especially those related to mastery and personal relationships, may increase across the lifespan (Ryff & Keyes, 1995; Springer, Pudrovska, & Hauser, 2011). Furthermore, higher EWB can predict important outcomes above and beyond hedonic predictors. After controlling for depressive symptoms, EWB was associated with lower indices of systemic inflammation, themselves robust predictors of mortality (Akbaraly et al., 2013; Friedman, Hayney, Love, Singer, & Ryff, 2007). Therefore, it is important to a full understanding of health to identify those characteristics and processes that promote EWB.

Within EWB, one can distinguish between psychological well-being (PWB), which comprises positive psychological functioning (Ryff, 1989), and perceived growth, the subjective sense of positive psychological change, which comprises the perception that one's functioning has grown or improved (Tedeschi & Calhoun, 2004). Although PWB and perceived growth share substantive domains, such as social relationships and mastery, as well as a foundation in eudaimonic traditions (Durkin & Joseph, 2009; Joseph, Murphy, & Regel, 2012), the two tend to be unrelated empirically and can even correlate negatively (Frazier & Kaler, 2006; Frazier et al., 2009). Although RT is hypothesized to promote both PWB and perceived growth, it is possible that different properties of RT should promote each, and this difference may account for their not being more closely related. This relationship is analogous to the third-variable problem, in which a third variable is responsible for an association between two other variables. In this case, we propose that the "third variables" (RT) are responsible for a *dissociation* between PWB and perceived growth.

Repetitive thought dimensions, psychological well-being, and perceived growth

The present study tests the hypothesis that RT is prospectively associated with PWB and perceived growth. One can consider the properties of a person's RT by using a multidimensional model that reduces the many discrete forms (e.g., worry, rumination, reflection) to a few important dimensions. Such models indicate that RT can be characterized along qualitative dimensions of valence (whether the balance of thoughts leans toward positive or negative topics) and purpose (whether the balance of thoughts leans toward uncertain and searching topics and processes or certain and solving topics and processes) and a quantitative dimension of total tendency to engage in all kinds of RT (Evans & Segerstrom, 2011; Segerstrom et al., 2003; Segerstrom, Roach, Evans, Schipper, & Darville, 2010). This dimensional approach to RT potentially provides greater clarity about *why* RT associates with both hedonic and eudaimonic well-being than does the use of discrete types. For example, depressive rumination, a discrete type of RT, is a composite of the tendency to engage in repetitive thought (high total) that has negative valence and searching purpose (Segerstrom et al., 2003, 2010). Which of these properties accounts for effects of depressive rumination would be obscure from a total depressive rumination score.

The valence dimension of RT may be the most influential for many forms of well-being and ill-being. The RT amplification hypothesis (Watkins, 2008) posits that repetitive focus on either positive or negative content makes it stronger and more salient, consolidated, and elaborated, and thereby strengthens the relationship between cognitive appraisals of a domain (e.g., one's feelings or relationships) and a sense of well- or ill-being in that domain. For example, someone who repetitively savors recent accomplishments at work might have a sense of higher mastery. More positively valenced RT correlated cross-sectionally with higher hedonic well-being (e.g., positive mood) in young adults and middle-aged women (Segerstrom et al., 2003). More positively valenced RT also correlated cross-sectionally with higher composite hedonic and psychological well-being in older adults (Segerstrom et al., 2010). However, whether RT valence prospectively and specifically predicts PWB has not been tested. We hypothesized that positive valence would prospectively predict higher PWB.

As for perceived growth, deliberate, positive but not intrusive, negative RT correlated with perceived growth in data from mixed trauma (Stockton, Hunt, & Joseph, 2011) and breast cancer (Chan, Ho, Tedeschi, & Leung, 2011) samples, suggesting that positive valence also promotes perceived growth. However, there is more consistent evidence for the dimension of RT total. RT total, reflecting a person's general tendency to think repetitively, has received less attention than has valence. However, in many theoretical models, perceived growth results from cognitive "work" that functions to either assimilate information about the self and the world into existing schemas or to accommodate existing schemas to incorporate such information. To the degree that a person thinks repetitively, then, he or she engages in this cognitive "work", and perceived growth is more likely (Joseph et al., 2012; Tedeschi & Calhoun, 2004). Empirically, perceived growth correlated with a composite measure of RT including intrusive thoughts, benefit-finding, and reflection in young adults

(Calhoun, Cann, Tedeschi, & McMillan, 2000) and with both “intrusive” (negative, unwanted) and “deliberate” (purposeful) RT in young adults and cancer survivors (Lindstrom, Cann, Calhoun, & Tedeschi, 2011; Morris & Shakespeare-Finch, 2011; Salsman, Segerstrom, Brechting, Carlson, & Andrykowski, 2009; Taku, Calhoun, Cann, & Tedeschi, 2008; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012). The relationship between high total RT and perceived growth seems best supported. We hypothesized therefore that higher total RT would be the best prospective predictor of perceived growth.

RT purpose may also be important to EWB. Searching for meaning is commonly cited as an important precursor to perceived growth, and openness to experience correlates both with searching RT and reports of growth (Segerstrom et al., 2003; Zoellner, Rabe, Karl, & Maercker, 2008). However, RT purpose was largely unrelated to composite hedonic and PWB in older adults (Segerstrom et al., 2010), and there is little empirical evidence regarding the role of RT purpose in predicting perceived growth. Therefore, the relationship of this dimension to these two aspects of well-being needs to be explicitly investigated using the dimensional model of RT.

Finally, there is abundant evidence that RT and particularly the valence dimension are associated with hedonic ill-being, such as depression and anxiety (Watkins, 2008). It is important, therefore, to confirm that any effects of RT on EWB are not epiphenomena of the effects of RT on hedonic ill-being.

The present study

The present study tested four primary hypotheses. First, consistent with previous findings, PWB and perceived growth will not be positively associated with each other. Second, RT dimensions should be prospectively associated with both PWB and perceived growth, but different dimensions of RT should predict each. Specifically, more positive RT valence should prospectively predict higher PWB but not more perceived growth, and more total RT should prospectively predict higher perceived growth but not higher PWB. The valence and total coefficients predicting PWB and perceived growth should therefore be significantly different from each other. Third, because the RT predictors of PWB and perceived growth are different, controlling for RT dimensions should cause the two measures of EWB to become more positively associated with each other. Fourth, RT dimensions should predict EWB above and beyond depressive symptoms.

Method

Participants

Participants were 150 community-dwelling older adults over the age of 60 (mean = 75 years; range = 60 – 93 at study entry). All participants were married at study entry, but no dyads were included in the sample to avoid dyadic dependency in the data. Consistent with the gender ratio in older age, 42% of the sample was male and 58%, female. The majority of the sample was white (96%) and the remainder, African-American (4%). Because the parent study (see Eisenlohr-Moul & Segerstrom, 2013; Segerstrom, in press; Segerstrom et al., 2010, 2012; Segerstrom, Hardy, Evans, & Greenberg, 2012) also involved measurement of

immune parameters, exclusion criteria at enrollment included diseases or disorders affecting the immune system, chemotherapy or radiation treatment within the past 5 years, unwillingness to undergo vaccination or venipuncture, immunomodulatory medications including opiates and steroids, and more than two of the following classes of medications: psychotropics, antihypertensives, hormone replacement, or thyroid supplements. Additional descriptive statistics with regard to the measures described below are found in the Supplemental Material.

Procedure

Participants were recruited from a volunteer subject pool maintained by the Sanders-Brown Center on Aging at the University of Kentucky. Prospective participants were contacted and screened by phone. Those who were interested and eligible were enrolled, provided written informed consent, and completed questionnaire measures verbally with the assistance of response cards and a research assistant. These interviews took place at 6-month intervals over up to 10 waves. Participants received a $20 gift card at each completed wave. Of the 150 participants who completed Wave 1, 135 completed Wave 2; 124, Wave 3; 117, Wave 4; 111, Wave 5; 109, Wave 6; 102, Wave 7; 97, Wave 8; 71, Wave 9; and 59, Wave 10. Data were missing at later waves due to dropout (n = 64; 344 missing waves) and death (n = 6; 43 missing waves). In addition, because some participants were recruited later than others, those participants were able to complete only between 7 and 9 waves before the end of the study (78 missing waves). Overall, 1,035 waves of data were available for analysis. A higher number of completed waves was modestly associated (*r*s ~ .2) with higher PWB, fewer depressive symptoms, and younger age (see Supplemental Material). The protocol was approved by the Institutional Review Board at the University of Kentucky.

Measures

Perceived growth—Perceived growth was measured with the 21-item Post-Traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). Rather than keying responses to a particular event, participants were asked only to report the amount of growth that they had experienced over the past year. This modification avoids the measurement complication in which respondents to the scale have to correctly attribute changes in their lives to particular events (Tennen & Affleck, 2009). To reduce participant burden and given the expectation that growth across the sample would be difficult to detect in a shorter period of time, perceived growth was administered at even-numbered waves (i.e., yearly). The ICC for the PTGI was .48, indicating that there was a stable individual difference in the perception of more or less growth. It is this individual difference that we predicted was rooted in trait RT.

Because models prospectively predicted the totality of PTGI scores over time, reliability of the PTGI in the present sample was calculated using Cranford et al., 2006's Equation 4, which calculates reliability (between persons) of the average of measures taken over multiple fixed occasions. Variance estimates crossing people, waves, and items were obtained using SAS Proc Mixed. For the total PTGI score, reliability was .98.

PWB—PWB was measured with the 54-item Scales of Psychological Well-Being (SPWB; Ryff, 1989). To reduce participant burden and given the expectation that PWB would be

relatively stable, PWB was administered at odd-numbered waves (i.e., yearly). The ICC for the SPWB was .83. Therefore, although mean-level changes in SPWB might have occurred over time (cf., Ryff, 1989), those having the highest SPWB scores at any given point in the study tended to be the same across the study period. It is this individual difference that we predicted was rooted in trait RT properties. For the total SPWB score, reliability in the present sample was .99.

Repetitive thought—Trait RT was measured at Wave 1 and Wave 6 using a number of scales that were selected to represent different kinds of RT. Measures included the Penn State Worry Scale (Meyer, Miller, Metzger, & Borkovec, 1990), the intrusions subscale of the Impact of Event Scale (Horowitz, Wilner, & Alvarez, 1979), three factors of the depressive rumination subscale of the Response Styles Questionnaire (self-analysis, self-reproach, and symptom focus; Nolen-Hoeksema, 1991; Segerstrom et al., 2003), the lack of control factor of the Rumination Scale (Martin, Tesser, & McIntosh, 1993; Segerstrom et al., 2003), rumination and reflection from the Rumination-Reflection Questionnaire (Trapnell & Campbell, 1999), anticipation, savoring, and reminiscing from the Savoring Beliefs Scale (Bryant, 2003), and emotional processing from the Emotional Approach Coping questionnaire (Stanton, Kirk, Cameron, & Danoff-Burg, 2000). Internal reliabilities for the scales ranged from .72 to .92.

Prior to the present analysis, the structure of trait RT and the resultant scores were established in a larger sample (N = 179) of which the present sample (N = 150) is a majority subset (Segerstrom et al., 2010). Specifically, multidimensional scaling (ALSCAL, SPSS), a distance-based technique well suited to the characterization of complex spaces (e.g., circumplex structure, which the structure of RT resembles; Evans & Segerstrom, 2011; Segerstrom et al., 2003, 2010) were used to establish the low-dimensional “space” occupied by the selected measures. Distances between RT measures were calculated from correlations and treated as interval data. Kruskal’s Stress 1 values for one-, two-, and three-dimensional models were .158, .091, and .056, respectively, but examination of the third dimension indicated that it reflected measurement artifact. Results from those analyses indicated that the scales were situated in a two-dimensional space defined by orthogonal valence (low = negative to high = positive) and purpose (low = solving to high = searching) dimensions (which together accounted for 82% of variance across scales). For the present analyses, valence and purpose dimension scores were calculated as the weighted sum of relevant scale scores and used as measures of qualitatively distinct aspects of RT. As well, a total RT score, computed as the sum of all the scale scores, was considered as a quantitative measure of the total tendency to engage in RT (average correlation among scale scores = .21). Dimension scores were standardized (Z scores) for further analyses.

Depressive symptoms—Depressive symptoms were measured with the Geriatric Depression Scale (Yesavage et al., 1983). The GDS is appropriate for administration to older adults, who may have inflated scores on other depression measures due to somatic complaints associated with aging. The GDS was administered at every wave. Because we were interested in the overlapping variance between the GDS and the between-person predictor of RT, a mean GDS score across all waves (i.e., a between-person variable) was

calculated. For the total GDS score, between-person reliability in the present sample was .99.

Data analysis

The nested nature of the data (occasions nested within persons) was accommodated using multilevel models. Specifically, substantive hypotheses were tested using multivariate models with dual outcomes, PWB and perceived growth (PG). At the within-person level (Level 1), the substantive models (see descriptions of Models 2 to 5, below) took the form

$$PWB_{it} = \beta_{PWB0i} + \beta_{PWB1i}\, Aging_{it} + e_{EWBit}$$

$$PG_{it} = \beta_{PG0i} + \beta_{PG1i}\, Aging_{it} + e_{PGit}$$

where PWB and perceived growth scores for person i at wave t were modeled as a function of person-specific intercepts, β_{0i}s, and rates of aging over time, β_{1i}s, and where wave-specific residuals, e_{it}s, may be correlated and/or have an autoregressive structure. As both PWB and perceived growth were administered once in each study year, aging was modeled as study year (0–4) for both variables.

At the between-person level (Level 2), the person-specific intercepts and slopes were all modeled as a function of the RT dimensions and depressive symptoms (see descriptions of Models 2 to 5, below). For example, in Model 5, for the PWB intercept,

$$\beta_{PWB0i} = \gamma_{PWB00} + \gamma_{PWB01}\, Age_i + \gamma_{PWB02}\, Valence_i + \gamma_{PWB03}\, Purpose_i + \gamma_{PWB04}\, Total_i + \gamma_{PWB05}\, Depression_i + u_{PWBit}$$

where the γs indicate sample-level effects, and where the residual between-person differences, u_is, may be correlated but are orthogonal to the Level 1 residuals. Working from this general structure, five sub-models were used to test the hypotheses.

Model 1 established the proper structure for residuals using dummy variables for each multivariate outcome as above (see e.g., Bolger & Laurenceau, 2013, Chapter 8), but with no predictors.

Model 2 added time-based predictors: aging (study year) at Level 1 and age at study entry at Level 2, along with their quadratic counterparts (e.g., age^2). Non-significant higher order interactions were trimmed for parsimony.

Model 3 added RT dimension scores (valence, purpose, and total) as between-person predictors. The multivariate approach allowed us to test whether or not the predictors had identical effects on both outcomes (PWB and perceived growth). Model 3 constrained the parameters governing the association of each predictor with each outcome to be equal (e.g., $\gamma_{PWB02} = \gamma_{PG02}$). Model 4 released those constraints and tested whether the associations differ.

Finally, Model 5 added depressive symptoms at Level 2 to determine whether the effects of the RT dimensions were independent of known associations between RT and depressive symptoms.

All models were fit to the data using SAS 9.3 Proc Mixed using maximum likelihood estimation (method = ML) assuming incomplete data as missing at random (see e.g., Bolger & Laurenceau, 2013; Singer, 1998). The degrees of freedom for tests of individual effects were calculated using the between-within method, which divides the residual degrees of freedom into a within-person and a between-person portion and assigns the relevant value to each effect (e.g., between-person portion for RT, depressive symptoms, age; within-person portion for wave). Age was centered around the sample (grand) mean. Aging (study year) was centered around the first study year. Age and aging effects are difference or change per year. All other predictors were sample mean (grand mean) centered and standardized to facilitate interpretation. For standardized predictors, effects are the SD difference in the outcome measure associated with a 1 SD change in the predictor. The zero-order correlations among the variables can be found in the Supplemental Online Material.

Results

Dimensional stability of RT

To demonstrate the trait-like properties of the RT dimensions for the purposes of the present study, test-retest correlations were obtained from re-administration at Wave 6 (n = 109). Recreating the multidimensional scaling model described above using the Wave 6 measures resulted in valence and purpose dimensions that were highly correlated with Wave 1 (r = .97 and .78, respectively), indicating that the measures were located in the same dimensional space at Waves 1 and 6. Most important, individuals' dimension scores at Wave 6 correlated highly with Wave 1 scores: valence, r = .60, p < .001; purpose, r = .52, p < .001; total, r = .66, p < .001. Therefore, these scales and the dimension scores derived from them were largely capturing stable individual differences in RT dimensions. Only Wave 1 scores were used in analysis so as to provide estimates of the *prospective* influence of RT on subsequent PWB.

Multilevel models: The structure of PWB and perceived growth

Our first hypothesis was that PWB and perceived growth would not be positively associated with each other. Table 1, Model 1 shows the structure of the null model (with standardized PWB and perceived growth). There was significant between-person (Level 2) variance in both PWB and perceived growth. Most importantly, there was a significant, negative covariation between them at Level 2, although not at Level 1. Therefore, the first hypothesis was supported; in fact, the two measures were negatively associated with each other.

Table 1, Model 2 added effects of age at study entry and aging (in years). We explored quadratic effects of age and aging and found only one such significant effect, a quadratic effect of age on PWB. In the trimmed Model 2, the negative relationship between age at study entry and PWB across the study period was more pronounced at older ages (quadratic age p = .02), but there was little change in PWB over time (p = .21). In contrast, older people did not perceive significantly less growth than their younger counterparts (p = .18), but participants perceived significantly less growth over time (p = .03). Adding age and aging did not affect the negative relationship between PWB and perceived growth. This model originally included a random effect of aging, allowing people to have different slopes

of change in PWB and perceived growth over time; however, there was little evidence for variance in the change in either PWB or PG over time in this sample (τ^2 (PWB slope) = .01, SE = .01, p = .13; τ^2 (PG slope) = .01, SE = .02, p = .25). Therefore, these random effects were not included in the final model.

Multilevel models: Repetitive thought, psychological well-being, and perceived growth

Our second hypothesis was that RT dimensions would predict PWB and perceived growth differentially. Table 1, Model 3 shows the effect of adding RT dimensions (valence, purpose, and total) without allowing such effects to differ across PWB and perceived growth. Although there was an improvement in model fit (AIC) and a significant effect of more positively valenced RT on higher PWB and perceived growth, there were indications that this was not the best-fitting model. Note especially that the Level 2 variance in PWB was reduced in Model 3 compared with Model 2 ((.84−.43)/.84 = 49% of variance explained), as one would expect, but the unexplained Level 2 variance in perceived growth *increased*. This ill-fitting model demonstrated that the RT predictors of EWB could not be the same across both outcomes.

Table 1, Model 4 allowed the effects of RT to vary across PWB and perceived growth. This relaxation of the model was effected in two ways to yield two kinds of information about the differential effects of RT. First, interactions between the RT dimensions and both outcome dummy codes were included; in this case, the terms show the effects of RT dimensions on each outcome (PWB and perceived growth). Second, only interactions between the RT dimensions and one outcome dummy code were included; in this case, the interaction term shows the *difference* in RT effects on the two outcomes (PWB vs. perceived growth). The model structure is otherwise the same in both approaches. RT dimensions accounted for 64% of the variance in PWB compared with Model 2 ((.84−.30)/.84) and 22% of the variance in perceived growth ((.41−.32)/.41). More positive RT was prospectively and significantly associated with higher PWB (p < .0001) but lower perceived growth (p = .01). More total RT was prospectively and significantly associated with more perceived growth (p = .002) but had no significant relationship to PWB (p = .42). Purpose was not significantly related to either PWB (p = .87) or perceived growth (p = .92). There were significant differences for both valence (p < .0001) and total (p = .005) in their relationships to PWB versus perceived growth, in support of the second hypothesis.

Our third hypothesis was that the different RT predictors of PWB and perceived growth would account for the relationship (or lack thereof) between them. In Model 4, the previously significant, negative covariation between PWB and perceived growth (−.21, p = .003) was reduced by more than 2 standard errors to near 0 (−.06, p = .14). Therefore, in support of the third hypothesis, the negative relationship between these two measures of PWB was accounted for by their different RT predictors.

Multi-level models: Incremental validity over depressive symptoms

Our fourth hypothesis was that the relationships between RT dimensions and EWB would remain above and beyond any effects on hedonic ill-being. Therefore, depressive symptoms from the GDS were tested as a predictor of PWB and perceived growth (see Table 1, Model

5). After including depressive symptoms in the model, the predicted relationships between RT dimensions and PWB persisted. Only the unpredicted, negative relationship between valence and perceived growth was no longer statistically significant after controlling for depressive symptoms. Therefore, our primary predictions – that RT valence would prospectively predict PWB, whereas RT total would prospectively predict perceived growth – held after controlling for depressive symptoms.

Complementary analyses

Because previous cross-sectional evidence suggested interactions among the RT dimensions (e.g., a valence×total interaction predicted physical health; Segerstrom et al., 2010), all two-way interactions and the three-way interaction among RT dimensions were included in a further model, with effects allowed to vary between the two outcomes. There was only one significant interaction: purpose and total interacted to predict PWB (γ= .16, SE = .05, p = .0007). More searching purpose was associated with higher PWB, but only in the presence of higher total RT. It is important to note that this interaction was not predicted, and so confidence in this result awaits replication. Although we also explored interactive effects of RT dimensions with age and aging, there was no evidence for such effects.

The operationalizations of PWB and perceived growth in the current study share domains of social relationships, personal change, and mastery, but also have unique domains (e.g., SPWB Autonomy). It could be argued that the results above were obtained because of different content in the outcome variables and not necessarily different relationships to RT. However, the differential relationships of RT dimensions with PWB and perceived growth persisted when the content domains were matched (see Supplemental Material).

Discussion

Repetitive thought (RT) has played an important part in models of hedonic ill-being such as anxiety and depression (Watkins, 2008). However, as demonstrated by these data, RT can also contribute to PWB. The present study used a dimensional model of RT to examine the prospective effects of RT on two kinds of EWB: PWB and perceived growth. As predicted, RT valence and total differed in the direction and degree to which they predicted PWB and perceived growth. More positive valence predicted higher PWB and *less* perceived growth; more total RT predicted of more perceived growth but not PWB. The different RT predictors of PWB and perceived growth may contribute to their empirical lack of relatedness. There was a negative covariation between PWB and perceived growth. However, accounting for individual differences in RT reduced this covariation to near zero. Therefore, the inverse relationship between PWB and perceived growth were largely due to their different relationships to RT dimensions.

It was expected that people who engaged in more processing of positive versus negative personal and social information (e.g., more anticipating and processing versus ruminating and worrying) would view their personal and social worlds more positively and therefore experience higher EWB. This interpretation focuses on the consequences of attending to positive versus negative aspects of oneself and one's environment (Watkins, 2008). However, it is also possible that more positive RT contributes to personal and social

environments that actually are more positive. For example, people who anticipate positive interpersonal interactions may then behave more positively toward others and have that positive behavior reciprocated, leading to higher well-being in the interpersonal domain (Miller & Turnbull, 1986). Likewise, people who engage in more planning may come up with more effective actions and have higher well-being in the mastery domain (Taylor, Pham, Rivkin, & Armor, 1998).

It was predicted and found that the total amount of RT was the strongest predictor of perceived growth. Total RT is a relatively ignored dimension of RT, largely because most studies employ single measures of RT (e.g., worry) without considering the context of the person's complete pattern of RT, and interpretation tends to focus on the qualitative aspects of a single measure, such as valence, rather than the quantitative aspect. However, some people may worry or ruminate to the exclusion of positive RT such as reflection and reminiscing, whereas others may worry or ruminate as well as reflect and reminisce. The former people would have highly negatively valenced RT in the context of a moderate total, whereas the latter would have high total RT in the context of relatively neutral valence. These two *patterns* of RT have different implications for PWB.

The findings of the present study, in which more negative RT associated with reports of more growth, were in contrast to some recent empirical reports that emphasized the theoretical importance of deliberate over intrusive RT (Chan et al., 2011; Lindstrom et al., 2011; Morris & Shakespeare-Finch, 2011; Stockton et al., 2011; Triplett et al., 2012; see Joseph et al., 2012, for a theoretical account). However, the present study differed from these studies in at least two important ways. First, these reports were all from cross-sectional, retrospective studies in which stressors occurred months to years in the past, and participants were typically asked to retrospect on their thought processes. In contrast, the present study assessed the *prospective* relationship of RT styles to perceived growth. Second, many of these studies used a deliberation scale with significant content overlap with the measure of growth (e.g., "I have thought about the ways cancer has helped me appreciate what I have in life"; Chan et al., 2011). In contrast, the present study used a comprehensive assessment of RT that did not have such clear content overlap, nor did it present potential demand characteristics associated with completing RT items at the same time as the growth measure.

RT dimensions generally had main effects on EWB, with a relative absence of interactions. Synergistic relationships between quantity and quality have been proposed to account for the pronounced effects of RT on various forms of well-being and ill-being (e.g., Watkins, 2008). In the present study, the effects appeared to be additive rather than synergistic. However, it is important to note that the total dimension reflects individual differences within RT. Even those people who report less RT of all types are assumed to have some degree of repetition in their thought. Therefore, main effects of valence should be interpreted as having their effects at most levels of repetition, rather than in the absence of repetition. On the other hand, lesser amounts of repetition may not generate the sense of having changed and grown; more prolonged and extended RT may be necessary.

The correlations of RT dimensions to subsequent PWB and perceived growth were largely independent of depressive symptoms. The gamma weights for the relationships of RT valence to PWB, RT valence to perceived growth, and RT total to perceived growth were reduced after including depressive symptoms in the model, but not markedly so. RT, particularly the valence dimension, has substantial and well-characterized relationships with depression and depressive symptoms. However, these results indicate that RT dimensions are associated with EWB above and beyond such relationships and further support the contention that EWB is more than its overlap with hedonic constructs (Ryff & Keyes, 1995).

A final finding of note has to do with the nature of reports of PWB and perceived growth over time. Ram and Gerstorf (2009) discriminate between time-structured change (e.g., maturation) and net intraindividual variability that is not structured by time (e.g., circumstantial change). There was only modest evidence for time-structured change; both PWB and perceived growth tended to decline by a small amount (< .10 SD) on a yearly basis (cf., Springer et al., 2011). Interestingly, between-person age differences in perceived growth ($\gamma = -.09$) and within-person change with age ($\gamma = -.07$) were of similar magnitude, whereas between-person age differences ($\gamma = -.19$) and within-person change with age ($\gamma = -.02$) were different by an order of magnitude for PWB. This difference in the age-PWB relationship between and within people emphasizes the difficulty in generalizing from the between-person level to the within-person level and the importance of considering selection, maturation, and survival in interpreting cross-sectional age comparisons. There was more evidence in these data for net intraindividual variability, in which the idiosyncratic circumstances of each wave affected reports of growth or PWB at that wave. Therefore, these data suggest that there are two main sources of variability in reports of EWB: trait levels and fluctuations from those levels due to proximal circumstances.

Limitations and future directions

Further research is needed to examine how RT affects positive aspects of well-being such as perceived growth and PWB. First, participants in this study reported growth over a specific period of time and were not asked to attribute their growth to any specific event. The advantage of this method is that it did not require participants to engage in the complex calculus involved in attributing degree of change to one event or another or to isolate the consequences of various events, and it reduced demand characteristics that could arise from linking reports of growth to a particular adverse event (Tennen & Affleck, 2009). However, the dimensional model could and should be applied to models of perceived growth that are linked to specific, traumatic events in order to clarify the role of the various dimensions to such reports of growth.

The present study also employed measures of trait RT. Although RT dimensions were quite stable over 2½ years, they were not perfectly stable. The qualities of episodic RT (i.e., what people are repetitively thinking about at any given point in time) can fluctuate over time (Roach et al., 2010; Segerstrom et al., 2012). These fluctuations in turn associate with fluctuations in negative mood (Segerstrom et al., 2012). Future research could assess how these fluctuations affect the sense of PWB and perceived growth, and vice versa, in longitudinal naturalistic or (quasi-)experimental designs.

Finally, these data speak to the relationships among RT, PWB, and perceived growth in older adults. This is a select sample that is not representative of all older adults, and who provided data on only a select set of variables. Furthermore, older adults are a specific population. For example, levels of perceived growth were lower than in a younger adult sample, consistent with the negative relationship between aging and perceived growth within the sample. Further, in contrast with other studies of perceived growth, the sample was not selected for the occurrence of a negative or traumatic event such as a cancer diagnosis or bereavement. However, older adults experience personal and social changes that can affect well-being at a higher rate than do other populations such as undergraduate students.

Conclusion

Theoretical models of psychological health often invoke the influence of RT, whether the specific form is depressive rumination, reminiscing, processing, or something else. However, there are few prospective tests of how RT relates to positive psychological processes such as well-being and growth as opposed to negative processes such as depression and anxiety, or of how fundamental dimensions of RT relate to well-being. This 5-year, prospective study related a dimensional model of RT to PWB and perceived growth, further informing these theories by showing how the underlying qualities of RT contribute to different aspects of positive psychological functioning above and beyond a negative aspect of functioning.

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Table 1

Results of nested models prospectively predicting psychological well-being (PWB) and perceived growth (PG)

	Model 1		Model 2		Model 3		Model 4			Model 5	
Fixed effects[a]	**PWB**	**PG**	**PWB**	**PG**	**PWB**	**PG**	**PWB**	**PG**	**Difference**	**PWB**	**PG**
Intercept	−0.07 (0.08)	0.01 (0.07)	0.08 (0.10)	0.10 (0.08)	0.05 (0.07)	0.11 (0.09)	0.03 (0.07)	0.10 (0.08)	-	0.01 (0.05)	0.09 (0.08)
Aging	-	-	−0.02 (0.02)	−0.07* (0.03)	−0.02 (0.02)	−0.07* (0.03)	−0.02 (0.02)	−0.07* (0.03)	-	−0.02 (0.02)	−0.07* (0.03)
Age	-	-	−0.13 (0.08)	−0.10 (0.07)	−0.12 (0.06)	−0.07 (0.08)	−0.11* (0.05)	−0.08 (0.06)	-	−0.09 (0.06)	−0.09 (0.06)
Age^2	-	-	−0.10* (0.05)	-	−0.06 (0.03)	-	−0.03 (0.03)	-	-	0.01 (0.03)	-
Valence	-	-	-	-	0.36* (0.04)		0.68* (0.05)	−0.16* (0.06)	0.84* (0.08)	0.40* (0.05)	−0.10 (0.07)
Purpose	-	-	-	-	−0.01 (0.04)		0.01 (0.05)	−0.01 (0.06)	0.02 (0.09)	0.04 (0.04)	−0.01 (0.06)
Total	-	-	-	-	0.05 (0.04)		−0.04 (0.05)	0.21* (0.07)	−0.25* (0.09)	0.06 (0.04)	0.19* (0.07)
Depressive symptoms	-	-	-	-	-		-	-	-	−0.45* (0.04)	0.10 (0.08)
Level 2 variance	0.90* (0.12)	0.41* (0.08)	0.84* (0.11)	0.41* (0.08)	0.43* (0.07)	0.64* (0.12)	0.30* (0.05)	0.32* (0.07)	-	0.14* (0.03)	0.32* (0.07)
Level 1 variance	0.59* (0.06)	0.21* (0.02)	0.57* (0.06)	0.21* (0.02)	0.58* (0.06)	0.21* (0.02)	0.58* (0.06)	0.21* (0.02)	-	0.57* (0.06)	0.21* (0.02)
ICC	.60	.66									
Level 2 cov	−0.21* (0.08)		−0.21* (0.07)		−0.24* (0.07)		−0.06 (0.04)		-	−0.02 (0.03)	
Level 1 cov	−0.03 (0.02)		−0.03 (0.02)		−0.03 (0.02)		−0.03 (0.02)		-	−0.03 (0.02)	
AR(1)	0.21* (0.07)		0.20* (0.06)		0.21* (0.07)		0.21* (0.06)		-	0.20* (0.06)	
AIC	2224.0		2212.2		2164.8		2079.9		-	2006.8	

[a] All fixed effects are at Level 2, except aging at Level 1. Both fixed effects and variance estimates are reported with their standard errors (in parentheses).

* $p < .05$.

PWB = psychological well-being, PG = perceived growth, ICC = intraclass correlation, AR(1) = autoregressive (1), AIC = Akaike's information criterion.

Note. Higher values on the valence dimension are more positive; higher values on the purpose dimension are more searching.