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Commentary

# Best news yet on the six-factor model of well-being ☆

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**Abstract**

This study provides a response to Springer and Hauser's claim that the Ryff Scales of Psychological Well-Being do not comprise six dimensions. We show that their analyses support the theory-guided six-factor model, although their interpretations of the data reveal a lack of understanding of the construct-oriented approach to personality assessment. We also review evidence from five categories of studies (i.e., factorial validity, psychological correlates, sociodemographic correlates, biological correlates, and intervention studies) that document the distinctiveness of the six dimensions of well-being, including among subscales that are highly correlated. We conclude with an examination of the methodological corrections (negative items, adjacent items, and redundant items) employed by Springer and Hauser, finding all to be problematic, either in terms of scientific rationale or method of implementation, or both. Correlations among latent constructs resulting from these analyses are thus highly questionable.


## 1. Introduction

Because the study of well-being has gained prominence across the social sciences, investigations addressing what it is and how it can be reliably and validly measured are important. Toward that end, Springer and Hauser present data from three large samples, including two national surveys. Their conclusions from these analyses are, however,

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unwarranted and reflect a failure to understand the construct-oriented approach to personality assessment. Their summary of evidence regarding the dimensionality of well-being is also incomplete, and their analytic procedures to correct for method artifacts are problematic on multiple grounds. We elaborate these points below.

## 2. Key take-home message: the six-factor model works

The final word from Springer and Hauser's lengthy exercise focuses on what PWB is *not*, rather than what it *is*. The claim that "RPWB does not measure six distinct dimensions of psychological well-being" (p. 1100) is not helpful for those who want to study well-being. Is the message that the six-factor model be replaced with something else, such as a three-, or four-, or five-factor model, and more importantly, what should the substantive content of the reduced factors be? On these questions, Springer and Hauser offer no guidance. Rather, they invest much effort in trying to discredit what their own analyses show—namely, that the best fitting model (#3–7 in Table 3) was, in fact, the theory-driven six-factor model originally proposed by Ryff (1989). This result held after fitting ten different models, including those with methodological corrections and those with constraints on the number of factors. Model 3–7 was nonetheless dismissed due to the high intercorrelations among the latent constructs—"there is almost complete overlap between the subscales after taking into account methodological confounders." As such, the authors report being surprised that a reduced factor model did not improve the fit indices—"given the extremely high factor correlations, we expected that models constraining self-acceptance, purpose in life, and environmental mastery to reflect only a single factor would fit better than the unconstrained models." Their expectation was not supported.

Springer and Hauser then provided a convoluted argument to explain how it is that a six-factor model can somehow best fit the data, while simultaneously not indicate that the six factors are distinct. The first explanation pertained to the large sample size, which though touted as a strength of the study in the introduction, becomes a reason for dismissing the lack of evidence in support of a reduced-factor model: "With a sample this large, almost any deviation will produce a statistically significant difference in chi-square, whether or not the difference is substantively meaningful." Their second reason pertains to the scale construction process, where they state that the "way the RPWB subscales were originally created may make it impossible to find that the scales/constructs are identical statistically, even if the substantive differences between them are truly negligible." Specifically, they quote from Ryff (1989): "items that correlated more highly with a scale other than their own or that showed low correlations with their total scale were [not included in the RPWB]" (p.1072), and then they elaborate with the following statement: "In other words, it is possible that the design of the RPWB model capitalized on *incidental*, but persistent differences among items." This observation reveals a singular lack of understanding of the construct-oriented (i.e., theory-driven) approach to assessment of psychological phenomena, which we elaborate below.

## 3. The construct-oriented approach to scale construction

The central purpose of the original study (Ryff, 1989) was to generate a theory-based empirical approach to what it means to be mentally healthy. Although social scientists had long studied subjective well-being, key indicators (e.g., life satisfaction, happiness,

and positive affect) lacked theoretical underpinnings, and thereby, neglected aspects of positive psychological functioning described in conceptions of life-span development (Bühler, 1935; Bühler and Massarik, 1968; Erikson, 1959; Neugarten, 1973), maturity (Allport, 1961), self-actualization (Maslow, 1968), individuation (Jung, 1933), the fully functioning person (Rogers, 1961), and positive mental health (Jahoda, 1958). But these perspectives lacked credible assessment tools. Ryff (1989) thus sought to identify primary points of convergence among them, and the shared themes that emerged from this integration became the six dimensions for scale development.

Definitions of the six dimensions (autonomy, environmental mastery, personal growth, purpose in life, and positive relations with others, self-acceptance) are provided in Ryff (1989). For present purposes, the key issues pertain to how these definitions provided the basis for *constructing and evaluating* six new assessment scales. As stated in the original article, "the operationalization of the proposed dimensions of psychological well-being is based on the construct-oriented approach to personality assessment (Wiggins, 1980). Of key importance in the empirical translation is the presence of psychological theory that specifies the constructs of interest. Each of the six dimensions described earlier are theoretical constructs that point to different aspects of positive functioning. The objective is to develop structured, self-report instruments that serve as indicators of these constructs" (Ryff, 1989, p. 1072).

The scale construction process involved multiple steps. First, based on the underlying theory, definitions for high scorers and low scorers on each dimension were generated. Three independent writers then composed self-descriptive items that fit with the theoretical definitions and that could be applicable to both sexes as well as adults of any age. Initial pools of approximately 80 items for each scale were culled using these criteria: ambiguity or redundancy of item, lack of fit of item with scale definition, lack of distinctiveness of item with items from other scales, and inability of item to produce a variable response. The remaining item pools, consisting of 32 items per scale (16 positive and 16 negative) were then administered to the research sample (321 young, middle, and older-aged adults).

Using these data, item-to-scale correlations were computed for all of the items with all scales. The critical test at this stage in refining the item pools was, indeed, that each item had to correlate more highly with its own scale than another scale. *Such a requirement is the essence of the construct-oriented approach*. Items failing to meet this criterion, or that had low correlations with their parent scale were deleted. The process was iterative—i.e., items from each scale were eliminated one at a time and then all correlations were calculated anew, given that deletion of any item meant that the overall scale had been empirically reconfigured. The process was terminated when each scale was reduced to 20 items, divided equally between items written to operationalize high-scoring versus low-scoring definitions described above. This number was chosen on the basis of parallels to other construct-based approaches to the assessment of personality, such as the Personality Research Form (Jackson, 1967), based on Murray's (1938) theory of psychological need, which included 16-items per scale.

Using these 20-item scales, internal consistency coefficients and test–retest reliability coefficients (over a 6-week period) were reported, with the former ranging from .86 to .93 and the latter ranging from .81 to .88. Correlations of the six dimensions with prior measures of well-being (e.g., life satisfaction, affect balance, self-esteem, internal sense of control, and morale) and ill-being (e.g., depression, external sense of control) were also examined to assess convergent and discriminant validity. All correlations of the new scales

with prior measures of well-being were significant and positive, while all correlations with prior measures of ill-being were significant and negative.

Two key points from the above steps are relevant to the Springer and Hauser's paper. First, and most importantly, the process of constructing the item pools was hardly "incidental." On the contrary, from beginning to end, it was driven by the goal of creating pools of items that had strong empirical ties to the theoretical constructs from which they had been generated. *This conceptually driven approach and its accompanying item-by-item-evaluation procedures are, indeed, the most likely explanations for why the six-factor model is still standing after being challenged by numerous methodological artifacts as well as reduced number of factors.*

Second, even in this initial publication, high intercorrelations among the scales were closely scrutinized. Given that all scales were intended to measure positive mental health, it was expected that they would be positively correlated with each other, and they were, with the coefficients ranging from .32 to.76. However, the higher correlations "raise the potential problem of the criteria not being empirically distinct from one another. This appears to be the case with certain dimensions, such as self-acceptance and environmental mastery, which correlate .76, and with self-acceptance and purpose in life, which correlate .72. Such outcomes suggest the scales may be measuring the same underlying construct." (Ryff, 1989, p. 1074). Other sources of evidence nonetheless suggested distinctiveness. First, the scale construction process, as described above, required items that were empirically distinct across the various scales. Second, the scales showed differential patterns of association with other measures. For example, although purpose in life was highly correlated with self-acceptance, the former showed generally lower correlations with life satisfaction, affect balance, and self-esteem than the latter. Third, strongly linked measures of well-being showed differential age trajectories. Self-acceptance, for example, showed no significant age differences when young adults, midlife adults, and old-aged adults were compared, but environmental mastery showed significant increments from young adulthood to midlife and old age. Putting these sources of evidence together, the provisional conclusion from Ryff (1989) was that six dimensions of well-being were sufficiently distinct to warrant further empirical investigation.

## 4. Multiple sources of evidence for the dimensionality of PWB

Adjudicating the dimensionality of psychological well-being requires assembling multiple types of evidence, five categories of which are considered below. The first pertains to studies of factorial validity, the second to studies of the psychological correlates and cross-time dynamics of PWB, the third to assessments of the sociodemographic correlates of well-being, the fourth to studies of biological correlates of well-being, and the fifth to intervention efforts designed to promote positive functioning.

### *4.1. Factor analytic studies*

To date, six-factor analytic studies of PWB, including Springer and Hauser, have been published. Only one (Kafka and Kozma, 2002) failed to provide support for the six-factor model, but that study is not credible, given the size of the sample ($N = 277$) relative to the number of PWB items (120) factor analyzed and the use of principal components analysis

with varimax rotation. Using a rotation technique that requires the factors to be orthogonal, when extensive evidence documents that they are correlated, invalidates the study. The remaining five studies include Clarke et al. (2001), Ryff and Keyes (1995), Van Dierendonck (2004), Chen and Chan (2005), and Springer and Hauser (2005). All used confirmatory factor analytic procedures, and all provided evidence that the best-fitting model is, in fact, the theory-guided six-factor model.

The study by Clarke et al. (2001), based on a nationally representative sample of Canadian seniors ($N = 4960$), tested nine different models and reached the following conclusion: "Confirmatory factor analyses with data from a nationally representative sample of Canadian seniors *support the multidimensional structure of the Ryff measure. Each of the six theoretical dimensions of well-being was found to be a distinct factor in its own right, as indicated by the significant reduction in chi-square in each of the six two-factor models from the single-factor model. Moreover, the six-factor model was found to generate improvement in fit over a model with fewer factors*." (p. 86).

This study also provided evidence for the multidimensionality of PWB from other sources, via reference to a previous publication (Clarke et al., 2000), in which the six dimensions of well-being exhibited differential profiles by age, gender, and health status. The authors emphasized that these outcomes had been replicated across multiple studies: "The fact that these differential well-being patterns by health and sociodemographic characteristics replicate those found in American data, with both the larger 120-item Ryff scale (Ryff, 1989) and the shorter 18-item version (Ryff and Keyes, 1995), serves to underscore the underlying multidimensional foundation of the Ryff measure of well-being." (p. 86–87). At the same time, Clarke et al. (2001) offered useful criticism about the content of four specific items from the 18-item inventory, suggesting they needed to be modified or replaced to improve the psychometric performance of the individual scales. To illustrate the need for such refinement, they provided a six-factor model that allowed these items to load on more than one dimension of well-being.

Prior to the Canadian study, Ryff and Keyes (1995) had performed confirmatory factor analysis on a probability sample of U.S. adults ($N = 1108$), aged 25 or older. Using the 18-item version of the well-being inventory, this study examined five different models, some including method artifacts and others constraining the number of factors. The best fitting model was the six-factor model that included a single, second-order super factor. This hierarchical structure conveyed that six factors fit the data and that these factors come together as a single latent construct at a second-order level. Springer and Hauser noted that they reran these models and were able to reproduce the results.

Van Dierendonck (2004) examined the dimensionality of well-being with two Dutch samples, one of college students ($N = 233$) and the other of community members ($N = 420$). Six different models that included method artifacts and differing numbers of factors were tested. Fit indices for the longer scales (9-item, 14-item) were unacceptably low for both samples. For the 3-item scale, the best fitting model in both samples was the six-factor model with a single second-order factor, thus replicating Ryff and Keyes (1995). No other more parsimonious models showed substantial improvement in fit statistics over the theory-guided six-factor model. Puzzling over the competing psychometric priorities between internal consistency, wherein longer scales showed better $\alpha$ coefficients than shorter scales, and factorial validity, where fit indices were dramatically better for shorter versus longer scales, the authors also tested new scales of 6–8 items in length. These produced no outcomes challenging the six-factor model.

Chen and Chan (2005) examined the dimensionality of well-being using 4-item scales with a Chinese sample of adults ($N = 1{,}259$) in Hong Kong. Based on preliminary analyses, they found that some translated items from the Ryff and Keyes (1995) 3-item scales posed semantic problems for Chinese respondents. Thus, they tested items from the 14-item scales, and then used some items these to generate a 4-item version that was used in their confirmatory factor analysis with the larger sample. Three competing models were tested, and the 6-factor model provided the best fit to the data, with moderate fit indices.

Springer and Hauser brought three new samples to the above progression, including two national surveys of Americans (MIDUS, NSFH II). They also included various methodological refinements (i.e., polychoric correlation matrices, weighted least squares estimation, tests of three method artifacts: negative wording, adjacency effects, and item redundancy). Data from the WLS self-administered questionnaire (7-items per scale) received the bulk of the model fitting analyses, as illustrated by the 10 models tested in Table 3. The six-factor model emerged as the best-fitting model, and as such, was *the only* model investigated with MIDUS and NSFH II samples, where additional methodological corrections were included (see Table 5). Across all of these samples and analyses, *no evidence was found for a better-fitting, more parsimonious model of psychological well-being than the original six-factor model proposed by* Ryff (1989). Thus, the factorial validity of the theory-guided model of PWB was strengthened by their analyses. However, they neglected to consider other sources of evidence for the dimensionality of PWB.

### 4.2. Psychological correlates of well-being and cross-time change

One argument for a multidimensional model of well-being pertains to the scientific interests that investigators bring to the topic. For example, some have chosen a priori to focus on only select dimensions to address particular questions of interest such as the links between career goals and life purpose (Carr, 1997), or early adult identity status and later adult environmental mastery and personal growth (Helson and Srivastava, 2001), or emotional intelligence and positive relations with others (Lopes et al., 2003), or spirituality and personal growth and positive relations with others (Wink and Dillon, 2003). Still others have used all six scales, but then employed a composite PWB score to show how *overall well-being* is linked with self-enhancing cognitions (Taylor et al., 2003a,b), personal goals (Riediger and Freund, 2004), or socioeconomic factors (Marmot et al., 1997, 1998).

Among studies employing all six dimensions of well-being and analyzing the data separately for each dimension, additional evidence is available to evaluate the empirical distinctiveness of the six dimensions. We will first highlight selective findings from Ryff and colleagues and then note other illustrative studies. In a longitudinal study of aging women, Kling et al. (1997a) used self-ratings in specific life domains (health, family, friends, economics, and daily activities) to predict cross-time change in PWB. Although some domains (e.g., health, daily activities) predicted similar increments in well-being across almost all scales of PWB (except autonomy), other domains predicted distinctive patterns of change (i.e., only self-acceptance for the economics domain; only autonomy, environmental mastery, self-acceptance, and positive relations for the family domain). Importantly, there were *no two or three combinations of well-being scales that showed the same pattern of outcomes* across self-ratings in the various life domains. Similarly, Kling et al. (1997b) combined this longitudinal study with another longitudinal aging sample, and found parallels

in cross-time changes for select aspects of well-being (autonomy, environmental mastery, and self-acceptance), but distinctiveness for others (personal growth, purpose in life). Further evidence linking two types of coping strategies (emotion-focused, problem-focused) to changes in PWB, also revealed that *no two or three PWB scales showed the same pattern of effects.*

Kwan et al. (2003) used four waves of longitudinal data from the first study above to predict changes in PWB as a function of social comparison processes and reflected appraisals. Their findings also showed that *no two or three scales of PWB had the same pattern of effects across the various cross-time analyses.* Two additional studies, one predicting well-being from later life health status and social comparison processes (Heidrich and Ryff, 1993), and another using baseline well-being to predict later emotional outcomes (e.g., aggravation, sadness) following relocation (Smider et al., 1996), also offered evidence of distinctive patterns among the well-being scales. Finally, Schmutte and Ryff (1997) linked psychological well-being to personality traits, while controlling for source overlap (i.e., respondents rated themselves both on well-being and personality) as well as measurement overlap in affective and evaluative content of the items. The most stringent analyses, which used spousal ratings of target respondents and statistical controls for measurement overlap, revealed that *no two or three dimensions of well-being showed the same pattern of association with personality traits.*

Maier and Lachman (2000) use MIDUS data to examine the adult well-being consequences of early parental loss and parental divorce. For men, parental divorce was associated with lower positive relations with others, self-acceptance, and environmental mastery, but the same experience was not significantly linked to any dimension of PWB for women. Parental death, in turn, predicted greater autonomy for men, but higher likelihood of depression for women. Hemenover (2003) used a pre-post design to examine the impact of disclosing trauma on psychological well-being and distress. Results revealed that trauma participants increased in environmental mastery, personal growth, and self-acceptance from the pre to posttest, while control participants showed a decline in autonomy. Again, the findings were not uniform across any subset of PWB scales.

McKinley (1999) linked body consciousness to well-being in a sample of college-aged daughters and their middle-aged mothers. For measures of body self-esteem and body shame, correlations were significant with all aspects of PWB, although not always for both samples. Body surveillance, however, was strongly negatively correlated only with autonomy for mothers, although with all aspects of PWB (except positive relations) for daughters. Beliefs about body control were significantly linked with autonomy, environmental mastery, and purpose in life for daughters, but for mothers, the links were evident only for personal growth and purpose in life. Thus, depending on the dimension of body consciousness considered and the daughter versus mother sample, the pattern of findings was differentiated across the PWB scales.

Kirby et al. (2004) examined the links between spiritual beliefs and psychological well-being among frail and non-frail older adults. After controlling for various sociodemographic factors, it was found that frailty was a negative correlate of PWB (all dimensions). However, spirituality was a significant correlate of only personal growth and positive relations with others. Spirituality was also found to moderate the effects of frailty on PWB (measured as a composite).

The above selective summary provides additional evidence that the six scales of well-being, or subsets of them, do not behave in identical ways when their associations

with other psychological constructs or life challenges are investigated. However, these studies mostly related self-reported well-being with other self-reported phenomena, thereby inflating the overall pattern of associations. Thus, it is useful to examine sociodemographic and biological correlates that do not suffer from this problem.

### 4.3. Sociodemographic correlates of well-being

Multiple publications (Clarke et al., 2000; Ryff, 1989, 1991; Ryff and Keyes, 1995) have documented that highly correlated dimensions of PWB nonetheless reveal distinct profiles by age and gender. For example, environmental mastery shows age increments, while purpose in life and personal growth show age decrements, and self-acceptance shows little age variation. Most of these patterns have also been observed with ethnic/minority samples (Ryff et al., 2004a). Springer and Hauser dismiss the age evidence on the grounds that such effects are evident only in cross-sectional studies. This argument misses the point: whether the differences are due to aging processes or cohort differences does not matter with regard to the dimensionality of well-being. Either interpretation could hold, and it would demonstrate that highly correlated aspects of well-being may show differential change as individuals grow older, or as a function of the period of time through which they have lived.

Other evidence of distinctiveness among highly correlated dimensions of well-being comes from research on marital status and changes therein (Marks and Lambert, 1998). Conducted with the first two waves of NSFH data, this work has shown that men and women who are separated or divorced have significantly lower levels of self-acceptance and positive relations with others compared to those who are married. Alternatively, women who are widowed show lower levels of purpose in life and self-acceptance compared to those who are married. The continuously never married, in turn, show higher levels of personal growth, along with lower levels of self-acceptance and positive relations with others than those who are married.

With regard to marital status change, Marks and Lambert (1998) show further effects that are not uniform across the various dimensions of PWB. For example, for women (but not men), the transition from being separated/divorced/widowed to being remarried is associated with higher levels of personal growth compared to the married. Alternatively, the move from being married to being separated or divorced is linked with self-acceptance, environmental mastery, and purpose in life for both men and women, but women also show lower levels of autonomy and environmental mastery related to this marital transition. In addition, in the move from being never married to married, women show higher levels of all six aspects of PWB compared to the continuously married, but men show higher levels only for purpose in life, environmental mastery, and personal growth.

When such transitions occur also matters. For example, among those over the age of 40, going from being married to divorced or separated was, for women, linked with higher levels of positive relations with others, compared to the continuously married, whereas for men, the same transition was linked with higher levels of self-acceptance compared to the continuously married. Women who moved from being married to being widowed after the age of 40 also show higher levels of purpose in life compared to the continuously married.

Taken as a whole, these findings with a national sample of Americans show that different aspects of well-being are distinctively linked with different marital status and the dynamics therein. *In fact, none of the six aspects of PWB showed the same pattern of findings across these analyses.* As stated by Marks and Lamber, "These contrasting results

confirm that taking a multidimensional approach to well-being is important in accurately understanding the determinants of psychological well-being. . .'' (p. 673).

### 4.4. Biological correlates of well-being

Psychological well-being has become a focus in studies of rheumatoid arthritis and fibromyalgia. Mangelli et al. (2002) measured the six dimensions of PWB among 104 rheumatology clinic outpatients, who were also assessed for pain, diseased activity, depression, and anxiety. A key finding was that chronic illness in general, rather than arthritis in particular, affected PWB. However, only environmental mastery and self-rated disability contributed significantly to the absence of mood disturbance among members of the clinic sample. A subsequent study by Schleicher et al. (2005) investigated PWB in a sample of 132 women, most of whom had fibromyalgia (FM) ($n = 64$), others of whom had rheumatoid arthritis (RA) ($n = 20$), and the remaining were a healthy control (HC) group ($n = 48$). An initial finding was that women with FM reported significantly lower PWB (on all scales except autonomy) than did RA and HC women. However, correlational evidence showed considerable differentiation in links between PWB and assessments of tender points, dolorimeter (pain threshold), self-reported pain, disability, fatigue, and social networks. Autonomy and self-acceptance were correlated negatively with tender points and positively with pain threshold only for healthy controls, while self-reported pain correlated negatively with environmental mastery and purpose in life for HC and RA. The latter group also showed significant negative associations between self-reported pain and personal growth and positive relations with others. Fatigue was negatively correlated with all aspects of PWB (except personal growth) for the FM group, but especially so for environmental mastery (−.61) and self-acceptance (−.57). Negative, but distinctive, associations with fatigue were also found for the HC group and the RH group. Environmental mastery was also found to mediate the association between social networks and fatigue and disability in women with FM. The authors concluded: ''The emergence of this scale [environmental mastery] as a predictor of disability is especially poignant because FM patients tend to feel little control over their condition and this uncontrollability has been linked with greater pain, disability, and depression.'' (p. 237).

Taylor et al. (2003a,b) examined links between overall PWB and various biomarkers (cardiovascular reactivity and recovery, salivary cortisol) in a laboratory stress challenge ($N = 92$). Analyses showed that PWB resources mediated the link between self-enhancement and levels of salivary cortisol. Lindfors and Lundberg (2002) examined associations between overall PWB and numerous physiological indicators (blood pressure, catecholamines, and cortisol) assessed in a sample of adults ($N = 26$) on two separate workdays. Those with high PWB had significantly lower levels of salivary cortisol from morning to the evening compared to those with low PWB, and those with high PWB also reported significantly fewer general health symptoms and musculoskeletal symptoms than those with low PWB. Evidence for the six specific dimensions was not reported.

Ryff et al. (2004b) examined links between the six dimensions of PWB and cardiovascular, neuroendocrine, and immune biomarkers in a sample of aging women ($N = 135$), with the outcomes showing highly differentiated patterns across the separate measures of well-being. For example, diurnal patterns of salivary cortisol were significantly linked with purpose in life and personal growth among the oldest (age 75+) respondents, such that those with higher purpose and growth started the day with lower levels of salivary

cortisol and stayed lower throughout the day than those with lower purpose and growth. Autonomy also showed significant positive associations with levels of norepinephrine, while purpose in life showed significant negative associations with an immune/inflammatory measure (sIL-6r, the soluble receptor for interleukin-6).

Cardiovascular measures revealed additional diversity in correlates with PWB scales. Positive relations with others showed the most extensive links—significant negative associations were evident with weight, waist/hip ratio, and glycosylated hemoglobin (a marker for insulin resistance). Personal growth, in turn, was significantly positively correlated with HDL cholesterol (the "good" cholesterol) as well as significantly negatively correlated with total/HDL cholesterol. Purpose in life was also significantly positively correlated with HDL cholesterol, but also significantly negatively correlated with waist-hip ratio. Environmental mastery and self-acceptance were both significantly negatively correlated with glycosylated hemoglobin.

The same study also included objectively measured sleep assessments (using the Nightcap; Mamelak and Hobson, 1989). For these analyses, it was environmental mastery that showed the strongest effects, being significantly positively correlated with length of REM sleep, sleep duration, total time in bed, and significantly negatively correlated with REM latency (time until first onset of sleep). Positive relations with others was significantly negatively correlated with body movement and significantly positive correlated with length of REM sleep, while purpose in life was significantly negatively correlated with body movement.

Using a subsample of respondents ($N = 84$) from the WLS, Urry et al. (2004) have examined the neural correlates of PWB. Using frontal EEG assessments, it was found that those with higher well-being had greater left than right superior frontal activation (referred to as EEG "asymmetry"). This effect held for all aspects of PWB except autonomy. However, when activation scores were examined separately for the left and right hemispheres, only three PWB scales (self-acceptance, environmental mastery, and personal growth) showed significant negative links with left hemispheric activation.

Taken together, the above biological evidence must be viewed with caution as the samples are small and the studies are few in number. Nonetheless, nothing in them supports the claim that any two or three dimensions of PWB show identical neurobiological correlates. On the contrary, these data add to the preceding evidence that the six dimensions of PWB have distinctive patterns of correlates with other phenomena.

### *4.5. Intervention studies: well-being and recovery from depression*

Intervention research has also grown up around the theory-guided model of PWB. Fava and colleagues (Fava et al., 1998, 2004; Fava, 1999) have developed an approach to the treatment of recurrent depression, known as "well-being therapy." It is administered during the residual phase of treatment, when major depressive symptoms have subsided, but risk of relapse remains high. The treatment requires individuals to keep diaries of daily experiences, but with a focus on *only* positive happenings. These patient-generated reports of positive experiences are then linked with relevant dimensions of PWB in the Ryff model (e.g., the patient writes about good interaction with another person, and the therapist then elaborates on the meaning of positive relations with others). The therapist also clarifies how the patient's thought processes may undermine, or prematurely curtail, their experience of such positive occurrences. This treatment, focused on promoting and

sustaining experiences of well-being, has shown a significantly lower relapse rate (40%) over a 6-year follow-up, compared to clinical management (90%).

For present purposes, we emphasize that *even if* some subset of the six theory-guided dimensions of PWB were found to be highly overlapping, practitioners trying to improve people's lives based on a theory of well-being would find it unhelpful to construe any of the six dimensions (e.g., self-acceptance, environmental mastery, and purpose in life) as equivalent, *as each points to different challenges facing the troubled client*. Guided by the conceptual meanings of, and empirical referents for, each dimension, the therapist can thus fine-tune treatment to the unique vulnerabilities and strengths of each patient.

### *4.6. Summary of the evidence*

Springer and Hauser examined only one of the above sources of evidence (factorial validity) and concluded that the PWB model does not include six distinct dimensions, although no viable alternative was proposed. Their argument focused exclusively on correlations among latent constructs, but ignored evidence across five-factor analytic studies, including their own, that the best fitting model is the theory-guided six-factor model. Moreover, even if the latent constructs are highly correlated, the above sources of additional evidence (psychological, sociodemographic, and biological correlates) still stand. That is, environmental mastery, self-acceptance, and purpose in life may be highly correlated, but there is still evidence of distinctiveness among these scales. For example, it is environmental mastery, but not self-acceptance, that contributed significantly to ratings of mood disturbance among patients with rheumatoid arthritis and also contributed uniquely to links between social networks and disability among fibromyalgia patients. In addition, it is environmental mastery, but not self-acceptance, that was correlated with multiple indices of sleep (i.e., length of REM, first REM onset, sleep duration, and total time in bed). Alternatively, it is self-acceptance, but not environmental mastery, that was linked, for both men and women, with being divorced or separated compared to being married, and with change in marital status (from being married to being divorced or separated) for men over the age of 40. The distinctiveness of purpose in life, as summarized above, is even more extensive and is not worth reiterating here. Thus, at this stage in the scientific enterprise, when researchers across multiple fields are incorporating the model of PWB into their studies, we strongly encourage that they include all six dimensions. Examining the distinctiveness versus similarity among the underlying dimensions of well-being is one of the most important questions they could ask of their data and, in so doing contribute to the meaning and measurement of well-being.

## 5. Questions about method artifacts

The methodological corrections included by Springer and Hauser's model-fitting exercise have, in our view, dubious standing, conceptually and empirically. This, in turn, points to problems in correlations among latent constructs that emerge from the "corrected" models. Some of these problems reflect differences between psychology and sociology in their respective views of what constitutes good psychometric practice.

Although the model-fitting with WLS mail survey data posed no serious challenge to the six-factor model, the three methodological corrections (negative items, adjacent items, and redundant items) did substantially improve fit indices. In the NSFH II and MIDUS

analyses, which examined only the six-factor model, such corrected models also substantially increased the magnitude of correlations among latent constructs. For example, in NSFH II, the uncorrected correlations ranged from .65 to .98, although most (73.3%) were in the .65–.81 range. The corrected latent correlations became substantially higher, ranging from .87 to .99. For MIDUS, the uncorrected latent correlations were notably lower, ranging from .48 to .87, with most (80%) being under .78, but corrected correlations became substantially higher, ranging from .76 to .96. Because Springer and Hauser's primary argument against the six-factor model hinges on the magnitude of associations among latent constructs, it is critical to examine the methodological corrections that produced them.

### 5.1. Negative items

Several studies were cited to support the claim that "people provide inconsistent answers to negatively and positively worded items" (p. 1090). However, the research cited to justify this modification was questionable. One study included children in grades 2–5 (Marsh, 1986) and another focused on children aged 5–10 (Chapman and Tunmer, 1995). Given what is known about cognitive development during these age periods, it is not surprising that younger children (particularly those with poor reading skills), show inconsistency in responses to positively and negatively worded items about self-concept. The relevance of these findings for adults is dubious at best.

However, even if supportive evidence from age-appropriate samples had been provided, it would not justify correcting for negatively worded items. First, the fact that people respond differently to positive versus negatively worded items does not a priori lead to the conclusion that the former responses are correct and the latter are fraught with error. Such an interpretation requires further evidence, ideally obtained via other methods (e.g., face-to-face interviews) to verify what respondents actually intend to communicate. Second, and more importantly, conceiving of negatively worded items as a method artifact flies in the face of good scale construction practice. Well-validated, frequently used inventories of personality assessment, such as the Personality Research Form (Jackson, 1967), the Jackson Personality Inventory (Jackson, 1976), or the NEO Five Factor Inventory (Costa and McCrae, 1992) routinely include negatively worded items. This is done with the goal of minimizing "acquiescence response bias" (Wiggins, 1980, p. 412), which refers to the tendency to agree with items regardless of their content. Thus, from a scale construction perspective, such items are included to *reduce* measurement error.

Of greater concern, however, is *how* the methodological correction for negatively worded items was carried out. Springer and Hauser defined a negatively worded item as "one to which someone must answer "strongly disagree" to indicate poitive well-being (p. 1090) and then reported that they "allowed all 22 negatively worded items to load on this factor as well as on their corresponding well-being dimensions" (p. 1090). The specific 22 items were not identified, but they appear to be those items that were *negatively scored* (i.e., reverse coded in computing total scale scores). However, not all negatively scored items were negatively worded, and conversely, not all positively scored items were positively worded. Thus, the analyses conducted by Springer and Hauser failed to distinguish clearly between the *wording of items* (stated in the affirmative versus stated in the negative) and the *scoring of items* (positively coded versus negatively/reverse coded), and as such, involved a correction that is uninterpretable.

For example, the item "My decisions are not usually influenced by what everyone else is doing" is a *negatively worded* but *positively scored* item designed to measure autonomy.

Presumably, this item was *not* included in the Springer and Hauser adjustment, despite the fact that it is worded in the negative. Conversely, the item "It seems to me that most other people have more friends than I do" is *positively worded* (i.e., it is stated in the affirmative) but *negatively scored* (reverse coded) item from the positive relations with others scale. Presumably, this item *was* included in the Springer and Hauser adjustment, despite the fact that it is *not* negatively worded. Viewed in total, the WLS mail survey included 22 negatively scored items, but only 9 of them were actually negatively worded, while an additional 3 positively scored items were also negatively worded.

What is strikingly missing from Springer and Hauser's analysis is a *sound rationale* for which items to include in the methodological correction. If the key argument is that items worded in the negative pose greater cognitive challenge to respondents and are thus more error-prone, then the correction should have been conducted with the 12 items from the WLS mail survey that were, in fact, negatively worded (9 negatively scored, 3 positively scored). Alternatively, cognitive complexity may stem, not from how the item is worded, but from having to *disagree* with an item and then correctly record one's response. If this is true, then the items used for methodological correction will differ depending on the *levels of well-being that respondents bring to the task*. For those with high well-being, the correction would be for the negatively coded items, which define the lower scorer on each construct, but for those with low well-being, the correction would be for positively coded items, which define the high scorer on each construct. Stated otherwise, *all respondents must disagree with some items* to accurately render their well-being, but which items this involves will differ depending on how glowing or abysmal their well-being is. These observations only add to the conceptual muddle surrounding the Springer and Hauser efforts to "correct" for negative item method artifacts.

Respondents, it is important to underscore, do not know what constructs are being measured when they complete the questionnaire, nor do they know how the items will be scored. Thus, the only features that matter to them are the substantive content of each item (what it is about), whether the item is worded affirmatively or negatively, and whether they must agree or disagree with the item to correctly convey the response they intend. The two latter distinctions *may* contribute to difficulties in accurately comprehending and responding to items, but compelling evidence for either is missing in Springer and Hauser. Indeed, given the absence of clear conceptual and empirical underpinnings, we suspect our own prior use of a negative-item methodological correction (Ryff and Keyes, 1995).

### 5.2. Adjacent items

Springer and Hauser hypothesized "that a response to a particular question might affect responses to the following, adjacent question." Empirical support for this hypothesis was not provided, nor was the reasoning behind it clarified. Question-order effects in survey studies of well-being have been extensively scrutinized (Schwarz and Strack, 1999), but this work has been singularly unhelpful in offering constructive guidelines for how to deal with such effects, apart from abandoning survey methods entirely in favor of experience-sampling methods (e.g., beeper studies). Moreover, how this prior work informs methodological corrections for adjacent items is far from clear. What explicitly is the concern: temporary accessibility of information, motives for consistency, or something else? More importantly, how do any of these contribute to measurement error, and what evidence would show that such an effect had occurred?

Beyond ignoring such fundamental questions in correcting for adjacent items, Springer and Hauser failed to consider how the PWB inventories that we use are constructed. In all of them (of whatever length), there is a systematic mixing of the order of items such that *no two items from the same scale are ever adjacent.* That is, the questionnaires are constructed in such a way that a single item from autonomy is first presented, followed by a single item from environmental mastery, followed by a single item from personal growth, followed by a single item from positive relations with others, followed by a single item from purpose in life, followed by a single item from self-acceptance, and then the sequence is repeated. Thus, items from the same PWB subscale are always separated from each other by multiple items from different subscales. This arrangement is designed explicitly to deal with the possibility of order effects. Taken together, these points suggest that the Springer and Hauser methodological correction for adjacent items is unwarranted.

### *5.3. Redundant items*

A final methodological correction pertained to the decision to allow three pairs of items from the same PWB subscale to correlate given overlap in the manifest content of the items. Here, it is important to reiterate the construct-oriented approach to personality assessment, which requires writing items that reflect the guiding theoretical constructs. As such, items from the same construct have *to be somewhat similar* in content. Nonetheless, it is possible that similarity in some instances may be so high as to indicate duplication. This is perhaps the case with the two items from the personal growth scale, which pertained to not wanting to try new things and not enjoying being in new situations. On the other hand, the two environmental mastery items were not duplicates—one was about management of time and the other was about management of responsibilities. For positive relations with others, one item was about being loving and affectionate, while the other was about giving of one's time to others. Whether respondents (of different age, gender, health status, etc.) perceive such items to be identical is an empirical question, the answer to which would have notably strengthened the rationale for implementing a methodological correction for putatively redundant items.

Taken together the above three methodological corrections did not change the magnitude of correlations among latent constructs in the WLS mail analyses (Table 4), but they did substantially increase the same correlations in analyses of NSFH II data (Table 6) and MIDUS data (Table 7). As such, we question the meaning of these inflated coefficients in the two latter studies, given the numerous problems described above. In all cases, the scientific rationales (conceptual and empirical) for these corrections were inadequate, and in one instance (methodological correction for negatively worded items), the adjustment appears to have been done with the wrong set of items. Thus, whatever claims are made about overlap among latent constructs, the data under consideration should be from the methodologically *uncorrected* models across all samples.

## 6. Tensions between the disciplines and what lies ahead

Throughout this evaluation of Springer and Hauser's methods, there is evidence of disagreement, sometimes along disciplinary lines, as to what constitutes good psychometric practice and credible analytic procedures. In some circles negative-worded items are construed as a source of error, while in others, they are viewed as a tool for reducing error

(acquiescence response bias). Similarly, question-order effects are handled by some by systematically mixing the order of items designed to assess constructs, while others include a methodological correction in a LISREL model. Another tension pertains to the competing disciplinary priorities given to depth of measurement versus sampling scope. At the risk of caricature, it could be said that psychologists give primary emphasis to the former, thereby generating lengthy scales with high internal consistency coefficients that are administered to small homogeneous samples (e.g., college sophomores). In contrast, sociologists give high priority to larger populations on which thin assessments are obtained, thereby giving rise to methodological tools to correct for measurement error.

The rub occurs when researchers attempt to cross disciplinary lines, for example, by bringing carefully constructed psychological constructs into national surveys. The net effect is a mismatch between guidelines for what constitutes good quality measurement and the analytic tools available to assess such quality. This disconnect is illustrated by the above mentioned Van Dierendonck (2004) study, which included multiple versions of the PWB scales (3 items, 9 items, and 14 items). The first finding was that fit indices for the two longer assessments of PWB—for which $\alpha$ coefficients were high, ranging from .77 to .90 for the 14-item scales, and from .61 to .83 for the 9-item scales—were unacceptably low. Conversely, $\alpha$ coefficients for the 3-item scales were unacceptably low, ranging from .17 to .77, but the fit indices were dramatically improved. One conclusion, looming in the background of Springer and Hauser's paper and our response to it, is that the confirmatory factor analytic methods used to evaluate the well-being constructs are *inadequate to the task when the constructs are deeply measured*. If such methods are employed, we would argue that, at a minimum, they should incorporate *multiple, substantively driven criteria of fit.* For example, in evaluating the dimensionality of well-being, there should be more than overall goodness of fit (e.g., Bayesian Information Criteria), such as concern for high internal consistency and high criterion-related validity (e.g, with regard to sociodemographic and/or biological factors). Bush and Mosteller (1959) provide a useful illustration of such a more comprehensive and substantively driven approach, in which they used 14 different criteria to screen among 8 learning models.

In conclusion, we observe that most of the studies described above have been carried out by researchers having substantive interest in the topic of well-being. They use the PWB scales as outcomes, or sometimes as antecedents, which are then linked to other phenomena. Others, however, come to the topic of well-being with methodological hammers (method artifacts, mode effects) looking for nails to pound. We do not dispute the value of such inquiries, but we do see the proliferation of such work, in the absence of serious interest in the subject matter, as unfortunate. As for ourselves, we intend no further engagement in these kinds of exchange as they detract from our larger aims of understanding how well-being is contoured by people's life experiences and their location in the social structure as well as how its neurobiological underpinnings impacts their health over time. For those tasks, we will use the six theory-guided dimensions of PWB.

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