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Assessing Stability and Change in a Second-Order Confirmatory Factor Model of Meaning in Life

Neal Krause and

Department of Health Behavior and Health Education, School of Public Health, University of Michigan, 1415 Washington Heights, Ann Arbor, MI 48109-2029, USA

R. David Hayward

Department of Health Behavior and Health Education, School of Public Health, University of Michigan, 1415 Washington Heights, Ann Arbor, MI 48109-2029, USA

Neal Krause: nkrause@umich.edu

Abstract

Research indicates that meaning in life is an important correlate of health and well-being. However, relatively little is known about the way a sense of meaning may change over time. The purpose of this study is to explore two ways of assessing change in meaning within a second-order confirmatory factor analysis framework. First, tests are conducted to see if the first and second-order factor loadings and measurement error terms are invariant over time. Second, a largely overlooked technique is used to assess change and stability in meaning at the second-order level. Findings from a nationwide survey reveal that the first and second-order factor loadings are invariant of time. Moreover, the second-order measurement error terms, but not the first-order measurement error terms, are invariant, as well. The results further reveal that standard ways of assessing stability mask significant change in meaning that is due largely to regression to the mean.

Keywords

Meaning in life; Measurement; Stability

1 Introduction

Scholars from a wide range of disciplines have argued for decades that finding a sense of meaning is one of the most important goals in life. For example, Frankl (1946/1984), a widely-cited psychiatrist, maintained that, “Man’s search for meaning is the primary motivation in his life...” (p. 121). The same notion is evident in the work of sociologist Berger (1967) who argued that there is “... a human craving for meaning that appears to have the force of instinct” (p. 22). And Maslow (1968) captured the essence of this perspective when he observed that, “The human needs a framework of values, a philosophy of life... in about the same sense that he needs sunlight, calcium, and love” (p. 206).

In the analyses that follow, we work with data that were provided by a nationwide sample of older people. Focusing on individuals who are at this point in the life course is important because some researchers believe that deriving a strong sense of meaning takes on added significance as people grow older. Evidence of this may be found, for example, in Erikson's (1959) widely cited theory of human development. He divided the life span into eight stages. Erikson (1959) proposed that a unique developmental challenge or crisis must be resolved as people move through each stage. The final stage, which is typically reached at the end of life, is characterized by the crisis of integrity versus despair. This is a time of deep introspection when people try to weave the stories of their lives into a more coherent whole. Ultimately, the goal of this process is to imbue life with a deeper sense of meaning and significance.

Tornstam (2005) also provides evidence for the increasing importance of meaning with advancing age. His theory of gerotranscendence specifies that as people grow older they experience a major shift in the way they view the world. This shift is characterized by a move away from a materialistic and pragmatic view of the world to more transcendent and cosmic concerns. This cosmic dimension involves an exploration of one's own inner space and, consistent with the work of Erikson (1959), a search for greater integrity. The process of gerotranscendence also involves a desire for maintaining fewer, but more meaningful, social relationships as well as a greater preference for, and appreciation of, solitude. Although Tornstam (2005) did not cast his theory explicitly in terms of meaning in life, issues involving the search for meaning clearly lie behind his discussion of introspection, integrity, and cosmic concerns.

Even though a sense of meaning may be especially important for older people, relatively little research with meaning has been done with individuals who are at this point in the life course. As a result, a number of fundamental issues remain unexamined. One is especially important for the purposes of the current study: researchers need to know more about how meaning may change over the course of late life. There are conflicting views on this issue in the literature.

According to the basic tenets of continuity theory, older people show considerable consistency over time in a wide range of beliefs, attitudes, values, self-conceptions, and lifestyles (Atchley 1999). Atchley (1999) maintains that there is a straightforward reason for the high degree of stability in world views over the course of late life: "In making life choices and adapting to change, people are motivated to maintain the inner mental constructs that represent a lifetime of selective investment. Ongoing consistency of psychological patterns is viewed by individuals as an important prerequisite for psychological security" (p. 9). Although Atchley (1999) does not discuss the consistency of meaning in life specifically, the numerous references to things like "inner mental constructs", beliefs, and values clearly suggest that meaning falls within the purview of his conceptual framework.

In contrast to the views of Atchley (1999) other investigators argue that there is substantial change in meaning over the entire life course. For example, Dittman-Kolhi and Westerhof (2000) maintain that, "We see the PMS (personal meaning system) as a dynamic structure

that is consistently developed and adapted in the course of one's life In the course of one's life, biological, psychological, social, and material aspects of one's life conditions may change, resulting in new experiences that call for an adaptation of the PMS" (p. 108).

Viewed broadly, these conflicting views highlight a largely unanswered issue involving the basic nature of meaning during late life. Do people embrace a stable sense of meaning in an effort to find security in old age or do the vicissitudes of life require continual changes in meaning in order to successfully adapt?

The purpose of the current study is to assess stability and change in meaning in life among older adults. There is some research on the stability of meaning in life over time, but there are limitations in the work that has been done so far. For example, Steger (2007) used ordinary least square multiple regression analysis (OLS) to estimate the stability of summary meaning in life scores with data that were gathered at two points in time. Although this study makes an important contribution to the literature, there are four ways to build on his findings.

First, rather than working with overall summary scores, we examine change and stability in meaning of life within a second-order confirmatory factor analytic framework. Researchers have known for some time that meaning in life is a complex phenomenon that is comprised of multiple dimensions, such as having goals, values, and a sense of purpose (Debats 1998). Each of these dimensions is typically assessed with multiple indicators. We estimate a second-order confirmatory factor model in which the observed indicators reflect multiple first-order dimensions of meaning (e.g., values, a sense of purpose), and these first-order dimensions are, in turn, driven by a more abstract second-order factor representing an overall sense of meaning in life. Approaching the study of stability and change in meaning from this perspective is important because it allows us see if it is appropriate to assessing change in summary or global measures of meaning in life in the first place. Moreover, approaching the study of change in meaning with from a higher-order confirmatory factor analytic approach makes it possible to address the other limitations that follow.

Second, assessing stability and change in meaning with OLS procedures is based on the assumption that the observed indicators have been measured without error. However, a number of studies have shown that this assumption is not tenable (e.g., Krause 2004). When constructs are measured with error, estimates of the substantive relationships between them are suspect. This means that if we attempt to measure the stability of meaning over time with indicators that contain measurement error, then the resulting stability estimates are likely to be biased. Cast in more substantive terms, if measurement error is not taken into account, we may inaccurately conclude that the perspective developed by Atchley (1999) is more valid than the views of Dittman-Kolhi and Westerhof (2000), or vice versa. Fortunately this will not be a problem with our study because our second-order factor model explicitly takes measurement error into account.

Third, because the error in measures of meaning is explicitly estimated within a confirmatory factor analytic framework, it is possible to address another issue that has direct bearing on the size of the stability coefficient. More specifically, when working with data

that have been gathered at more than one point in time it is possible to see if the error terms that are associated with identical indicators of meaning are correlated over time. If these error terms are correlated, but this correlation is not explicitly taken into account, then the effects of the correlated error will be rolled into the stability estimate of the latent construct. And if the sign of correlation among the error terms is positive, as is often the case, then the size of the stability coefficient will be overestimated. Simply put, under these circumstances, meaning will appear to be more stable over time than it is in reality. Under these circumstances, we might inaccurately conclude that the position taken by Atchley (1999) is more valid and that older people cling tightly to previously derived views of meaning over time. We are able to avoid this problem because we work with a second-order factor model that makes it possible to test for correlations among the error terms at the first as well as the second-order levels.

Fourth, stability is typically viewed as the lack of change. Researchers often assume that the coefficient that is derived by regressing a follow-up measure on a baseline measure of the same construct adequately captures this presumed lack of change. However, as Kessler and Greenberg (1981) demonstrated some time ago, this coefficient actually contains not one, but two potential sources of influence. First, meaning in life at Time 1 can be associated with meaning in life at Time 2 because no change has taken place. If this proves to be the case, then the theoretical perspective derived by Atchley (1999) would be more valid. Second, meaning in life at Time 1 can be associated with meaning in life at Time 2 because the baseline measure determines or predicts the follow-up measure. Put another way, meaning at Time 1 can predict systematic or structured change in meaning at Time 2. If this turns out to be true then Dittman-Kolhi and Westerhof (2000) may be correct in arguing that meaning changes continually over the course of late life as people attempt to grapple with the inevitable gains and losses they encounter. In the analyses that follow, we use the statistical approach developed by Kessler and Greenberg (1981) to decompose the relationship between identical measures of meaning over time into these two key components. We have not been able to find any studies that use this approach to estimate the stability of meaning in life.

2 A Second-Order Confirmatory Factor Model of Meaning in Life

Although there is no agreed-upon definition of meaning in life, the one proposed by Reker (1997) provides a useful point of departure. He maintains that meaning involves having a sense of purpose, order, and direction in life, as well as the belief that there is a reason for one's existence. Consistent with this definition, a measurement model of meaning was developed for the current study. This model is presented in Fig. 1. As shown in this figure, meaning in life is comprised of five first-order dimensions that assess having values, a sense of purpose, and goals, as well as being able to reconcile the past and feeling that life makes sense. Each of these dimensions is discussed in greater detail below.

2.1 Values

Values provide the basis for behavioral guidance. When the utility and worthiness of specific thoughts or actions are unclear, values help an individual select from different

options thereby giving the assurance that personal choices are, in the words of Baumeister (1991), ‘right, good, and justifiable.’

2.2 A Sense of Purpose

Although clearly linked to values, a sense of purpose is nevertheless conceptually distinct. It has to do with believing that one’s actions have a set place in the larger order of things, and that one’s behavior fits appropriately into the larger social whole. Values are codes or standards that define the thoughts and actions that are desirable, whereas a sense of purpose carries evaluative and affective connotations that arise from the successful implementation of actions that comply with underlying values. Put another way, a sense of purpose cannot arise without action or effort because these affirm the underlying worth of the held values.

2.3 Goals

A sense of meaning also involves expectations for the future or goals for which to strive. Goals help people organize their current activities and provide a conduit for focusing and implementing energies, efforts, and ambitions. But even though goals are oriented toward the future, they also provide immediate rewards by giving a sense of hope and contentment. Cooley (1927) captured the essence of this perspective some time ago in his discussion of plans: “Able men plan and strive not as being discontented now but because they need to continue that hope and sense of achievement they already have. They bring the future into the scene to animate the present... Our plans are our working hopes and among our chief treasures” (p. 205).

2.4 Reconciling the Past

This dimension of meaning is especially important in studies of older people. Returning to the work of Erikson (1959) helps show why this is so. Recall that the final stage in his theoretical scheme involved the crisis of integrity versus despair. Erikson (1959) argued that integrity is attained by reconciling the inevitable gap that arises between what a person set out to do in life with what he or she was actually able to accomplish. Simply put, Erikson (1959) proposed that older adults derive a sense of meaning by reflecting upon the past so they can make peace with the way their lives have unfolded.

2.5 Life Makes Sense

As shown in Fig. 1, meaning also involves being able to see that life makes sense. In order to function at an optimal level, an individual must be able to explain the events that arise in life, he or she must be able to understand the behavior of others, and they must have a reasonable degree of insight into their own actions. Although no one can consistently attain this level of understanding, striving to reach it and achieving even a modicum of success is essential. Otherwise, life would appear to be little more than a series of random events and the reasons for the behavior of one’s self and others would be incomprehensible.

According to our conceptual scheme, having values, a purpose, and goals as well as being able to reconcile the past and make sense of life are lower-order manifestations of a higher-order and more abstract construct, which is an overall sense of meaning in life. Empirically assessing the relationships between the observed indicators and the five first-order factors,

as well as the relationships between the first-order factors and the higher-order notion of meaning provides a more comprehensive vantage point for gauging the extent to which meaning can appropriately be viewed as a coherent and unified conceptual domain.

But, as noted earlier, the model in Fig. 1 was designed to move beyond this goal to assess change in meaning over time. And change will be evaluated in two ways. The first involves change in the factor loadings and measurement error terms over time. It is important to evaluate this issue because change in the measurement structure provides some evidence that the way people think about meaning in their lives has shifted over time. If this proves to be the case, then researchers are faced with the challenge of deriving sound theoretical explanations for this phenomenon and care must be taken when predicting change in meaning with other substantive variables. Assessing change in the factor loadings and measurement error terms is known in the literature as testing for factorial invariance (Bollen 1989).

Recall that change can also occur in the level or strength of meaning independently of the change in its factor structure. This means that some people may experience a decline in meaning, others may find a deeper sense of meaning as time passes, while the level of meaning remains the same for yet other study participants. Research indicates that change in meaning may be brought about by a number of factors, including stressful life events (Krause 2004), lifetime trauma (Krause 2005), and change in the amount of social support that is provided by social network members (Krause 2007). As shown in Fig. 1, we aim to contribute to the literature by examining the stability of meaning in life at the second-order factor level.

3 Methods

3.1 Sample

The data for this study come from a nationwide longitudinal survey of older adults. Altogether, six waves of interviews were conducted. The study population was defined as all household residents who were non-institutionalized, English-speaking, 65 years of age or older, and retired (i.e., not working for pay). In addition, residents of Alaska and Hawaii were excluded from the study population.

The sampling frame consisted of all eligible persons contained in the beneficiary list maintained by the Centers for Medicare and Medicaid Services (CMS). Study participants were selected at random from the CMS files. All interviews were conducted face-to-face in the homes of the respondents by interviewers from Harris Interactive (New York). The first three waves of data were collected between 1992 and 1999. A total of 1,103 interviews were completed at the baseline in 1992–1993. The response rate was 69 %. Following this, 605 of the Wave 1 study participants were re-interviewed in 1996–1997. Then, a third wave of interviews was conducted in 1998–1999. A total of 530 older people who participated in earlier rounds of interviews were successively re-interviewed at Wave 3.

In 2002–2003, a fourth wave of interviews was conducted. However, the sampling strategy for the Wave 4 survey was complex. Two groups of older people were interviewed at this

time. All survivors from Waves 1–3 were interviewed first ($N = 269$). This group was then supplemented with a sample of study participants who had not been interviewed previously. This supplementary sample was also selected at random from the CMS files. However, in this case, an effort was made to select the sample so that there would be approximately equal numbers of older people in the following age groups: Young-old (ages 65–74, $N = 491$); old-old (ages 75–84; $N = 515$); and the oldest-old (ages 85 and older; $N = 509$). This sampling strategy was implemented to insure there would be sufficient variance for the study of change that occurs over the course of late life. Altogether, the Wave 4 sample consisted of 1,518 older adults. The overall response rate for the Wave 4 survey was 54 %.

A fifth wave of interviews was completed in 2005. A total of 1,166 study participants were successfully re-interviewed. Not counting those who had moved to a nursing home or those who died, the re-interview rate for the Wave 5 survey was 83.9 %.

Wave 6 was completed in 2007. A total of 1,011 older people were re-interviewed at this time. Not counting older adults who had moved to a nursing home or older people who died, the re-interview rate for Wave 6 was 76.9 %.

The analyses that are provided below are based on data from the Wave 5 and Wave 6 interviews. These interviews were selected because questions on all five first-order dimensions of meaning were not administered until Wave 5.

The full information maximum likelihood (FIML) procedure was used to deal with item non-response (Enders 2010). Simulation studies reveal that the FIML procedure provides estimates that are comparable to those that are derived with more time consuming techniques, such as multiple imputation (Newman 2003).

Preliminary analysis reveals that the average age of the participants in this study at Wave 5 is 79.1 years ($SD = 7.4$), 37 percent were older men, and the study participants completed, on average, 12.3 years of schooling ($SD = 3.4$ years).

3.2 Measures

Table 1 contains the items that were used to measure the five first-order dimensions of meaning. These indicators were taken from a number of studies (i.e., Battista and Almond 1973; Wong 1998; Krause 2004). Identical measures were administered during the Wave 5 and Wave 6 surveys. The procedures that were used to code these indicators are provided in the table footnote. A high score on these items denotes a greater sense of meaning in life. The means, standard deviations, and the range (i.e., minimum and maximum values) of the composites that were created for each first-order dimension of meaning are also provided in Table 1.

3.3 Data Analysis Strategy

3.3.1 Change in the Factor Structure of Meaning—As discussed earlier, it is important to first conduct standard tests for factorial invariance in the measurement models of meaning in life before we address issues involving the stability of the higher-order meaning in life construct (Bollen 1989). These tests involve assessing whether the factor

loadings and the measurement error terms are invariant over time. This is accomplished in a two step process for each component. In the first step, the factor loadings are permitted to vary freely over time. This produces a χ^2 goodness-of-fit estimate. Then in step two, the factor loadings are constrained to be equal over time. This produces a second χ^2 value. The difference between the two χ^2 estimates (with the appropriate degrees of freedom) is used to determine whether the fit of the model to the data changes significantly when the equivalence constraints are imposed. The same procedure is then repeated to see if the measurement error terms are also invariant over time.

As noted earlier, one advantage of working with a second-order factor model arises from the fact that factorial invariance over time can be assessed at the first and second-order levels. In the analyses that follow, we assess factorial invariance at the lower-order first, followed by factorial invariance at the second-order factor level.

Although the procedure that is used to test for factorial invariance is used widely in the literature, there is a well-known shortcoming with this strategy. More specifically, χ^2 values are sensitive to the size of a sample and as a result, this statistic tends to underestimate the fit of the model to the data when samples are large, like the one in the current study. In order to take this problem into account, we use the .01 level of significance rather than the .05 level of significance to determine whether the elements of the measurement model are invariant over time.

After testing for factorial invariance, we conduct an additional test to see if the measurement error terms for identical measures of meaning are correlated significantly over time. This is accomplished by assessing the change in χ^2 values for models in which error terms for identical items are constrained to be equal and then subsequently permitted to correlate freely over time.

3.3.2 Assessing the Stability of Meaning in Life—As discussed earlier, the relationship between meaning at Wave 5 and meaning at Wave 6 contains of two components: the first reflects the stability of meaning and the second arises from the fact that meaning scores at Wave 5 can predict systematic or structural change in meaning at Wave 6. These components of change are expressed in the following equation that was adapted from the work of Kessler and Greenberg (1981):

$$M_{i6} = M_{i5} + \Delta M_i \quad (1)$$

In this equation meaning at Wave 6 (M_{i6}) is expressed as the sum of an initial score at Wave 5 (M_{i5}) and the sum of change in meaning over time (ΔM_i). By summing across individuals and dividing by the number of cases, this formula can be re-expressed as the covariance between the initial and follow-up scores:

$$\text{cov}(M_5, M_6) = S_{M_5}^2 + S_{M_5} \Delta_M \quad (2)$$

The first component in Eq. 2 (S_{M5}^2) is the variance of meaning at Wave 5 and the second component is the covariance of meaning at Wave 5 with change in meaning over time ($S_{M5 \Delta M}$).

A key issue involves finding an estimate of ΔM . This is accomplished with a series of formulas that are provided by Kessler and Greenberg (1981). They begin with the familiar equation in which meaning at Wave 6 is regressed on meaning at Wave 5:

$$M_6 = a + b_5 M_5 + e \quad (3)$$

Subtracting M_5 from both sides of the equation yields an expression for the regression of change in M on meaning at Wave 5 (M_5):

$$\Delta M = M_6 - M_5 = a + (b_5 - 1)M_5 + e = a + b_5^* M_5 + e \quad (4)$$

Here b_5^* is the regression of ΔM on M_5 . Equation 4 can be re-expressed in terms of the parameter b_5^* :

$$M_6 = a + (b_5^* + 1) M_5 + e \quad (5)$$

The influence of M_5 on M_6 that is due to the stability of meaning (i.e., lack of change in meaning) is given by the addition of the constant $1 - b_5^*$. In fact, if there were no change at all in meaning only the constant 1 would remain. Therefore, in order to obtain the effect of M_5 on ΔM , 1 is subtracted from the regression coefficient representing the effect of M_5 on M_6 :

$$\Delta M = (b_{M_6 M_5} - 1) M_5 \quad (6)$$

A standardized estimate of ΔM can be obtained by multiplying this coefficient by the ratio of standard deviations of the predictor and change score:

$$\beta_{\Delta M, M_5} = (b_{M_6 M_5} - 1)(S_5 / S_{\Delta M}) \quad (7)$$

The standard deviation of the change component ($S_{\Delta M}$) is obtained by taking the square root of the following formula:

$$S_{\Delta M}^2 = S_5^2 + S_6^2 - 2S_{M_5 M_6} \quad (8)$$

Finally, standardized estimates for the relationship between meaning at Wave 5 and meaning at Wave 6 (net of change in meaning), as well as the relationship between change in meaning and meaning at Wave 6 (net of meaning at Wave 5) can be derived with the following formulas:

$$\beta_{M6M5} \Delta_M = b_{M6M5} \Delta_M (S_{M5}/S_{M6}) = S_{M5}/S_{M6} \quad (9)$$

$$\beta_{M6} \Delta_{M \cdot M5} = b_{M6} \Delta_{M \cdot M5} (S \Delta_M / S_{M6}) = S \Delta_M / S_{M6} \quad (10)$$

4 Results

The findings from this study are presented below in five sections. A preliminary model estimation issue is discussed in section one. Following this, findings from the tests of factorial invariance over time are provided in section two. Section three contains the results from the analyses that were designed to see if the measurement terms for identical measures in the first and second-order factor levels are correlated over time. Reliability estimates for the study measures are presented in section four. Finally, the results from the analysis of stability and change in meaning are provided in section five.

4.1 Preliminary Model Estimation Issues

The model that is depicted in Fig. 1 was evaluated with the maximum likelihood estimator in Version 8.80 of the LISREL statistical software program (du Toit and du Toit 2001). Use of this estimator is based on the assumption that the observed indicators have a multivariate normal distribution. Preliminary tests (not shown here) revealed that this assumption had been violated. Although there are a number of ways to deal with departures from multivariate normality, the straightforward approach that is discussed by du Toit and du Toit (2001) was followed here. These investigators report that departures from multivariate normality can be handled by converting the raw scores of the observed indicators to normal scores prior to estimating the model (du Toit and du Toit 2001, p. 143). Based on these insights, the analyses presented below are conducted with observed indicators that have been normalized.

4.2 Factorial Invariance Over Time

Because the FIML procedure was used to deal with item non-response, only two goodness-of-fit measures are provided for each model that is estimated. The first is the χ^2 value and the second is the root mean square error of approximation (RMSEA). The χ^2 value for the baseline model (i.e., the model with no equivalency constraints) is 2804.475 ($df = 583$; $p < .001$). The RMSEA value for the baseline model is .061. As Kelloway (1998) suggests, values below .05 indicate a very good fit of the model to the data while values below .10 denote a good fit to the data.

The first test involved seeing if the first-order factor loadings for the five dimensions of meaning in life are invariant over time. The findings reveal that these parameter estimates do not change significantly over time. More specifically, the change in χ^2 (25.167 with 13 df) is not significant at the .01 level. Moreover, there was a slight decline in RMSEA values from .061 to .060. The same findings emerge from the test of invariance in the second-order factor loadings that link the five first-order factors to the higher-order meaning in life construct. The data indicate that the change in χ^2 values (13.154 with 4 df) is not significant

at the .01 level. In addition, the RMSEA value remains unchanged (i.e., it is .060 in both cases). Based on these results, the equivalency constraints on the first and second-order factor loadings are left in place.

A somewhat different picture emerges from the tests of invariance over time in the measurement error terms. The findings indicate that the fit of the model to the data deteriorated significantly when the first-order factor loadings were constrained to be equivalent over time ($\chi^2 = 51.74$; $df = 18$; $p < .001$; RMSEA = .060). In contrast, the test for invariance over time in the second-order measurement error terms indicates that the fit of the model to the data remains virtually unchanged when these estimates are constrained to be equivalent ($\chi^2 = 10.436$; $df = 5$; $n.s.$; RMSEA = .060). Based on these results, the equivalency constraints on the second-order, but not the first-order, measurement error terms are left in place.

Taken as a whole, the data provided in this section suggest that the first and second-order factor loadings are invariant over time, but the same is not true for the measurement error terms. Although the magnitude of the second-order measurement error terms does not change significantly over time, the same cannot be said for the first-order measurement error terms. Although it would have been preferable to find that all of the elements in the first-order measurement model are invariant, Reise et al. (1993) argue that achieving even partial invariance is acceptable, and that meaningful interpretations can be made when examining the substantive relationship between constructs like meaning at Wave 5 and meaning at Wave 6.

4.3 Correlated Measurement Error Over Time

The next set of tests were conducted to see if the measurement error terms for identical measures of meaning at the first and second-order factor levels are correlated over time. The data indicate that allowing the first-order measurement terms for identical indicators of meaning to correlate freely over time significantly improved the fit of the model to the data ($\chi^2 = 2680$; $df = 587$; $\chi^2 = 172.504$; $df = 18$; $p < .001$; RMSEA = .059). This constraint was left in place when the test for invariance in the second-order measurement error terms was conducted. This test suggests that the second-order measurement error terms are invariant over time, as well ($\chi^2 = 2602.198$; $df = 582$; $\chi^2 = 78.53$; $df = 5$; $p < .001$; RMSEA = .058). Because the second-order error terms are also correlated significantly over time, this model serves as the final model in the remainder of the analyses that are presented below. As the RMSEA estimate for this model (.058) indicates, the fit of the model to the data is acceptable.

4.4 Reliability Estimates

Table 2 contains the factor loadings and measurement error terms that were derived from estimating the study model. These coefficients provide information about the reliability of the study measures. Although researchers have yet to reach a consensus, there is some evidence that items with standardized factor loadings in excess of .600 tend to have a reasonable level of reliability (Kline 1995). As the data in Table 2 indicate, the first-order standardized factor loadings range from .579 to .919. Only one of thirty-six estimates falls

below .600, and the difference between this coefficient (.579) and the .600 target is trivial. The findings in Table 2 further indicate that the second-order factor loadings are all above .817.

The factor loadings and measurement error terms provide useful information about the reliability of each item or first-order construct. However, it would also be helpful to know something about the reliability for the multiple item first-order scales as a whole as well as the reliability of the higher-order meaning in life latent construct. Fortunately, it is possible to compute these estimates with a formula provided by DeShon (1998). This procedure is based on the factor loadings and measurement error terms in Table 2. Applying this formula to these data yields the following reliability estimates for the constructs in Fig. 1: values (Wave 5) = .812; values (Wave 6) = .801; purpose (Wave 5) = .886; purpose (Wave 6) = .892; goals (Wave 5) = .909; goals (Wave 6) = .909; reconciling the past (Wave 5) = .830; reconciling the past (Wave 6) = .838; life makes sense (Wave 5) = .817; life makes sense (Wave 6) = .813. The computations further reveal that the reliability of the higher-order meaning in life construct is .938 at Wave 5 and .976 at Wave 6. Taken as a whole, these data suggest that the latent constructs in Fig. 1 have an acceptable level of reliability.

4.5 Assessing Stability and Change in Meaning

Estimation of the model depicted in Fig. 1 indicates that the correlation between the Wave 5 and Wave 6 s-order meaning constructs is .484 (the LISREL software program does not provide tests of significance for these estimates). Taken at face value, this coefficient would appear to suggest that there is a considerable amount of change in meaning in our data. More specifically, squaring the correlation coefficient reveals that meaning at Wave 5 explains about 23.4 % of the variance in meaning at Wave 6. Although this would appear to support the views of Dittman-Kolhi and Westerhof (2000), a different conclusion is reached when the procedures devised by Kessler and Greenberg (1981) are implemented. The findings from their decomposition procedure are provided in Fig. 2. Only standardized estimates are given in this figure.

Three important conclusions emerge from these results. First, the standardized coefficient linking meaning at Wave 5 with change in meaning (ΔM) is fairly large and it has a negative sign ($\beta = -.479$) (see Eq. 7). This coefficient indicates that older people with an especially strong sense of meaning at Wave 5 tend to experience a greater decline in meaning than older adults with an initially weaker sense of meaning in life. Viewed in a more general way, this estimate reveals that there is fairly substantial regression to the mean. We turned to the raw data to illustrate this phenomenon more clearly. We found that 69.6 % of older people whose Wave 5 meaning in life score was one standard deviation above the mean experienced a decline in meaning over time.

The second important finding in Fig. 2 has to do with the relationship between meaning at Wave 5 and meaning at Wave 6 net of regression to the mean. As the data in Fig. 2 reveal, the magnitude of this relationship is substantial ($\beta = .963$) (see Eq. 9), suggesting that once regression to the mean is taken into account, the sense of meaning in life among older people is quite stable over the 2 year between-round study interval. Viewed in a more general way, this coefficient is consistent with the views of Atchley (1999).

The third finding from the analysis of change and stability in meaning has to do with a nice property of the Kessler and Greenberg (1981) procedure. As reported above, the correlation between the second-order meaning in life estimate at Wave 5 and the corresponding estimate at Wave 6 is .484. This coefficient can be reproduced from the data in Fig. 2. More specifically, summing the direct effect of meaning at Wave 5 on meaning at Wave 6 and the indirect effect that operates through change in meaning reproduces (with allowance for rounding) the initial .484 estimate: $.963 + (-.479 \times .997) = .485$.

5 Discussion

Research indicates that a strong sense of meaning in life is associated with a wide range of health outcomes, including better physical health (Sherman et al. 2010), better mental health (Westhof et al. 2010), the avoidance of undesirable health behaviors (Thege et al. 2009), and a lower mortality risk (Krause 2009). These results hold out the promise of finding new ways to improve the nation's health. A necessary first-step in reaching this goal involves deriving a better understanding of the nature and measurement of meaning in life. The goal of the current study was to contribute to this venture.

We simultaneously estimated two second-order confirmatory factor models of meaning in life in order to gain insight into three fundamental issues. First, using this more sophisticated approach to the assessment of a multidimensional meaning scale provides evidence that there is an overarching more abstract phenomenon representing an overall sense of meaning in life that can be measured globally. However, in the process of doing so, it is important to keep an important issue in mind. As Alwin (1988) notes, justification for using measures that are based on high-order factor models rests on a two-step estimation strategy. Cast within the context of the current study, this means that the relationship between the global measure of meaning and some outcome, such as health, should be estimated first. Then, following this, the relationships between each of the first-order dimensions of meaning and health should be evaluated. If the lower-order dimensions of meaning have the same impact on health as the higher-order meaning measure, then use of the global measure of meaning is justified. But if some lower-order dimensions exert a greater influence on health than others, then it is best to work with the scale in its disaggregated first-order form. Doing so may provide greater insight into the ways in which meaning may be associated with constructs such as health.

The second issue that was examined in the current study had to do with invariance in the first and second-order measurement models of meaning over time. It is important to address this issue because significant change in the measurement structure of meaning over time provides some indication that the way in which study participants view meaning in life has changed. This adds a new dimension to the views posed by Atchley (1999) and Dittman-Kolhi and Westerhof (2000). These investigators discuss issues that involve change and stability in summary measures of meaning over time. But the way in which older people construe the underlying nature of meaning in the first place may change or remain stable, as well. And the way they construe the nature of meaning is reflected in the stability or change that takes place in the factor loadings (and to a lesser extent the measurement error terms) that are associated with measures of meaning over time. The findings from the current study

suggest that the first and second-order factor loadings are invariant over time. Moreover, the data indicate that the second-order measurement error terms are invariant, as well. But the same is not true of the first-order measurement terms. Even so, based on the guidance that is provided by Reise et al. (1993), we find greater support for this aspect of the views of Atchley (1999): the way older people construe the underlying nature of meaning in life tends to remain relatively stable over time.

The third issue we addressed involved assessing the stability of the higher-order meaning in life construct over time. Using procedures that move beyond standard ways of addressing this issue, we found that change in meaning is more complex than it may appear initially. The data reveal that even though meaning in life is quite stable over time, a fairly sizable amount of structured change (i.e., regression to the mean) takes place, as well. It is possible to draw two useful conclusions about the findings regarding regression to the mean. First, rather than reflecting change that is due to the influence of substantively meaningful factors per se, regression to the mean is widely regarded as a statistical artifact (Kessler and Greenberg 1981). So if significant regression to the mean takes place, researchers may incorrectly conclude that meaning changes over the course of late life. Second, conventional thinking proposes that regression to the mean is very prevalent in a wide range of study measures (Hsu 1989). To the extent that this is true, researchers would be well advised to use statistical procedures that take the effects of regression to the mean into account.

Viewed in more conceptual terms, finding high stability of meaning in life during old age provides support for the continuity perspective that was developed by Atchley (1999). Rather than changing to accommodate the inevitable gains and losses that are encountered in late life, it appears as though older people are more likely to view a strong sense of meaning in life as a bastion of security that helps them deal more effectively with changes that confront them in late life.

As with any study, there are limitations in the work we have done. Three shortcomings should be noted here. First, it is likely that there are other first-order dimensions of meaning that were not included in our model. For example, there is growing evidence that a religiously-oriented sense of meaning in life may differ in substantive ways from the dimensions of meaning that were evaluated above (Steffen 2012). Consequently, measures of religious meaning should be included in our model, as well. Second, a dimension of meaning that deals with reconciling the past was included in the study model because developmental theory suggests it may be an especially important component to include when assessing meaning among older people. But this raises the possibility that other dimensions of meaning might be more appropriate when studying individuals who are at different points in the life course, such as adolescents or younger adults. Third, we examined change in meaning over a 2 year period. Although this made it possible to address several important issues, studies are needed that assess change in meaning over longer periods of time.

Victor Frankl (1946/1984) argued that, “There is nothing in the world, I venture to say, that would so effectively help one to survive even the worst conditions as the knowledge that there is meaning in one’s life” (p. 126). Although there are limitations in the work that we

have done, we hope the approach we implemented, and the findings that emerged from it, encourage other investigators to delve more deeply into the measurement of a construct that plays such a central role in life.

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References

- Alwin, DF. Structural equation modeling in research on human development and aging. In: Schaie, KW.; Campbell, RT.; Meredith, W.; Rawlings, SC., editors. *Methodological issues in aging research*. New York: Springer; 1988. p. 71-170.
- Atchley, RC. *Continuity and adaptation in aging: Creating positive experiences*. Baltimore: Johns Hopkins University Press; 1999.
- Battista J, Almond R. The development of meaning in life. *Psychiatry*. 1973; 36:409–427. [PubMed: 4756415]
- Baumeister, RF. *Meanings in life*. New York: Guilford; 1991.
- Berger, PL. *The sacred canopy: Elements of a sociological theory*. New York: Doubleday; 1967.
- Bollen, KA. *Structural equations with latent variables*. New York: Wiley; 1989.
- Cooley, CH. *Life and the student*. New York: Alfred A. Knopf; 1927.
- Debats, DL. Measurement of personal meaning: The psychometric properties of the Life Regard Index. In: Wong, PTP.; Fry, PS., editors. *The human quest for meaning*. Mahwah, NJ: Lawrence Erlbaum; 1998. p. 237-259.
- DeShon RP. A cautionary note on measurement error correlations in structural equation models. *Psychological Methods*. 1998; 3:412–423.
- Dittman-Kolhi, F.; Westerhof, GJ. The personal meaning system in a life-span perspective. In: Reker, GT.; Chamberlain, K., editors. *Exploring existential meaning: Optimizing human development across the life span*. Thousand Oaks, CA: Sage; 2000. p. 107-122.
- du Toit, M.; du Toit, S. *Interactive LISREL: User's guide*. Lincolnwood, IL: Scientific Software International; 2001.
- Enders, CK. *Applied missing data analysis*. New York: Guilford; 2010.
- Erikson, E. *Identity and the life cycle*. New York: International University Press; 1959.
- Frankl, VE. *Man's search for meaning*. New York: Washington Square Press; 1946/1984.
- Hsu LM. Reliable changes in psychotherapy: Taking into account regression toward the mean. *Behavioral Assessment*. 1989; 11:459–467.
- Kelloway, EK. *Using LISREL for structural equation modeling*. Thousand Oaks, CA: Sage; 1998.
- Kessler, RC.; Greenberg, D. *Linear panel analysis: Models of quantitative change*. New York: Academic Press; 1981.
- Kline, RB. *Principles and practice of structural equation modeling*. New York: Guilford; 1995.
- Krause N. Stressors in highly valued roles, meaning in life, and the physical health status of older adults. *Journal of Gerontology: Social Sciences*. 2004; 59B:S287–S297.
- Krause N. Traumatic events and meaning in life: Exploring variations in three age cohorts. *Ageing and Society*. 2005; 25:501–524.
- Krause N. A longitudinal study of social support and meaning in life. *Psychology and Aging*. 2007; 22:456–469. [PubMed: 17874947]
- Krause N. Meaning in life and mortality. *Journal of Gerontology: Social Sciences*. 2009; 64B:517–527.
- Maslow, AH. *Toward a psychology of being*. New York: Van Nostrand; 1968.

- Newman DA. Longitudinal modeling with randomly and systematically missing data: A simulation of ad hoc, maximum likelihood, and multiple imputation techniques. *Organizational Research Methods*. 2003; 6:328–362.
- Reise SP, Widaman KF, Pugh RH. Confirmatory factor analysis and item response theory: Two approaches for exploring measurement invariance. *Psychological Bulletin*. 1993; 114:552–566. [PubMed: 8272470]
- Reker GT. Personal meaning, optimism, and choice: Existential predictors of depression in community and institutional elderly. *The Gerontologist*. 1997; 37:709–716. [PubMed: 9432987]
- Sherman AC, Simonton S, Latif U, Bracy L. Effects of global meaning and illness-specific meaning on health outcomes among breast cancer patients. *Journal of Behavioral Medicine*. 2010; 33:364–377. [PubMed: 20502953]
- Steffen PR. Approaching religiosity/spirituality and health from an Eudaimonic perspective. *Social and Personality Psychology Compass*. 2012; 6:70–82.
- Steger MF. Stability and specificity of meaning in life and life satisfaction over one year. *Journal of Happiness Studies*. 2007; 8:161–179.
- Thege BK, Machner YG, Kushnir T, Kopp MS. Relationship between meaning in life and smoking status: Results from a nationally representative sample. *Addictive Behaviors*. 2009; 34:117–120. [PubMed: 18842347]
- Tornstam, L. *Gerotranscendence: A developmental theory of positive aging*. New York: Springer; 2005.
- Westhof GJ, Bohlmeijer ET, van Belijouw IM, Pot AM. Improvement in personal meaning mediates the effects of a life review intervention on depressive symptoms in a randomized controlled trial. *The Gerontologist*. 2010; 50:541–549. [PubMed: 20045873]
- Wong, PT. Implicit theories of meaningful life and development of the Personal Meaning Profile (PMP). In: Wong, PT.; Fry, PS., editors. *The human quest for meaning: A handbook of psychological research and clinical applications*. Mahwah, NJ: Erlbaum; 1998. p. 111-140.

Fig 1.

Second-order confirmatory factor models of meaning in life over time

Fig 2.

Findings from a decomposition of change in meaning in life over time

Table 1**Meaning in life measures Wave 5 and Wave 6**

Values—Wave 5 ($M = 10.282$; $SD = 1.314$; minimum = 5; maximum = 12) Wave 6 ($M = 10.752$; $SD = 1.379$; minimum = 4; maximum = 12) ^a
I have a system of values and beliefs that guide my daily activities
I have a philosophy of life that helps me understand who I am
I have really come to terms with what is important in life
Purpose—Wave 5 ($M = 13.464$; $SD = 2.414$; minimum = 4; maximum = 16) Wave 6 ($M = 13.249$; $SD = 2.669$; minimum = 4; maximum = 16)
In terms of my life, I see a reason for being here
I feel like I am living fully
I feel like I have found a really significant meaning in my life
I have discovered a satisfying life purpose
Goals—Wave 5 ($M = 10.159$; $SD = 1.819$; minimum = 3; maximum = 12) Wave 6 ($M = 9.916$; $SD = 2.100$; minimum = 3; maximum = 12)
In my life, I have clear goals and aims
I have a sense of direction and purpose in life
I have a good sense of what I am trying to accomplish in the rest of my life
Reconciling the Past—Wave 5 ($M = 13.866$; $SD = 1.986$; minimum = 6; maximum = 16) Wave 6 ($M = 13.897$; $SD = 2.000$; minimum = 6; maximum = 16)
I feel good when I think about what I have done in the past
I find it satisfying to think about what I have accomplished in life
I am able to make sense of the unpleasant things that have happened in the past
I am at peace with my past
Life Makes Sense—Wave 5 ($M = 13.401$; $SD = 2.087$; minimum = 6; maximum = 16) Wave 6 ($M = 13.267$; $SD = 2.129$; minimum = 5; maximum = 16)
I'm able to understand myself fairly well
I'm usually able to understand why other people do the things they do
Most of the things that happen in life happen for a reason
I'm able to make sense of most of most of the things that happen in my life

Identical measures of each dimension of meaning were administered in the Wave 5 and Wave 6 surveys

^a All the meaning items were scored in the following way (coding in parenthesis): disagree strongly (1), disagree somewhat (2), agree somewhat (3), agree strongly (4)

Table 2

Factor loadings and measurement error terms from higher-order factor model (N = 1,011)

Construct	Factor loading ^a	Measurement error ^b
<i>Lower-order coefficients</i>		
Values—Wave 5		
System of values ^c	.792 ^d	.372
Philosophy of life	.814	.337
Come to terms with what's important	.695	.517
Purpose—Wave 5		
See reason for being here	.740	.453
I am living fully	.761	.421
Found significant meaning	.870	.242
Discovered satisfying purpose	.872	.239
Goals—Wave 5		
Have clear goals and aims	.867	.248
Have sense of direction	.919	.156
Good sense of what I will accomplish	.844	.288
Reconciling the Past—Wave 5		
Feel good about what I have done	.784	.386
Satisfied with accomplishments	.784	.385
Make sense of unpleasant things	.644	.585
I am at peace with my past	.749	.439
Life makes sense—Wave 5		
Understand self fairly well	.757	.428
Understand others well	.604	.635
Things happen for a reason	.692	.521
Make sense of things that happen	.815	.335
Values—Wave 6		
System of values	.745	.444
Philosophy of life	.811	.342
Come to terms with what's important	.712	.493
Purpose—Wave 6		
See reason for being here	.737	.456
I am living fully	.749	.439
Found significant meaning	.889	.210
Discovered satisfying purpose	.896	.197
Goals—Wave 6		
Have clear goals and aims	.877	.231
Have a sense of direction	.906	.179
Good sense of what I can accomplish	.849	.280
Reconciling the Past—Wave 6		
Feel good about what I have done	.786	.382

Construct	Factor loading ^a	Measurement error ^b
Satisfied with accomplishments	.817	.332
Make sense of unpleasant things	.640	.591
I am at peace with my past	.754	.431
Life Makes Sense—Wave 6		
Understand self fairly well	.761	.421
Understand others well	.579	.665
Things happen for a reason	.727	.471
Make sense of things that happen	.807	.349
<i>Higher-order coefficients</i>		
Meaning in life—Wave 5		
Values	.817 ^e	.333 ^f
Purpose	.930	.135
Goals	.895	.200
Reconciling the past	.822	.325
Life makes sense	.865	.252
Meaning in life—Wave 6		
Values	.827	.316
Purpose	.935	.126
Goals	.902	.187
Reconciling the past	.832	.308
Life makes sense	.874	.237

^aThe first and second-order factor loadings are from the completely standardized solution. The first-listed item for each latent construct was fixed to 1.0 in the unstandardized solution

^bThe first and second-order measurement error terms are from the completely standardized solution. All factor loadings and measurement error terms are significant at the .001 level

^cItem is paraphrased. See Table 1 for the complete text of each item

^dThe unstandardized first-order factor loadings for identical items were constrained to be equivalent over time

^eThe unstandardized second-order factor loadings for identical dimensions of meaning were constrained to be equivalent over time

^fThe unstandardized second-order measurement terms were constrained to be equivalent over time