Within-Person Dynamics of Affect, Meaning in Life, and Perceived Stress

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Abstract

While the relationship between meaning in life and affect has been examined extensively in inter-individual and experimental studies, we know little about the within-individual dynamics of the naturally occurring relationships between these constructs. We examined meaning in life, positive/negative affect, and perceived stress across 13 weekly assessments in a group of 226 50-90 year-olds. Overall, within-individual analyses showed a qualitatively similar, yet in most cases, quantitatively weaker pattern of relationships between-individual and within-individual analyses, with unique relationships between positive affect and meaning in life, as well as between positive affect, negative affect, meaning in life, and perceived stress. Moreover, cross-lagged panel analyses confirmed that positive affect, but not negative affect, may have a causal and unidirectional effect on meaning in life, and that positive affect, negative affect, and meaning in life all have unique lagged, week-to-week effects on perceived stress. These results suggest that each of these related constructs plays a unique functional role in an individual’s mental health and well-being.
The Within-Person Dynamics of Affect, Meaning in Life, and Perceived Stress

Do we need a sense of meaning in life to feel good, or does being in a good mood by itself induce a sense of meaning? And to what degree do either positive affect and meaning in life independently protect from experiencing stress? Questions like these are about the dynamic, within-individual interrelationships between key aspects of mental health and wellbeing. This person-specific level is also most relevant when it comes to considering mental-health related interventions (Fisher, Medaglia, & Jeronimus, 2018; Molenaar & Campbell, 2009; Voelkle, Brose, Schmiedek, & Lindenberger, 2014). Yet, most existing research in this area is either cross-sectional in nature or at best, is based on very limited information about within-individual and cause-effect relationships. Also, most of the relevant research focuses on specific relationships between pairs of constructs and therefore provides no information about specific relationships (i.e., convergent and divergent validity). In the current study, we look at affect, meaning in life, and experienced stress in an integrative manner. More importantly, we assessed these constructs across up to 13 timepoints per individual, thus allowing for the first time a detailed characterization of within-individual, dynamic relationships.

The Relationship between Affect and Meaning in Life

High positive affective (PA) reflects states of high energy, concentration, and engagement (Watson, Clark, & Tellegen, 1988). It can be regarded both as a reflection of successful goal pursuit (Carver & Scheier, 1990) and as setting the stage for further success-oriented thought and action (Lyubomirsky, King, & Diener, 2005).

Experiencing one’s day-to-day events and pursuits as meaningful is often considered as a critical element of a “good life” (Frankl, 1984; King & Napa, 1998). Also empirically, meaning in life, usually assessed via a short questionnaire (MIL, Steger, Frazier, Oishi, & Kaler, 2006), has emerged as one of the strongest predictors of wellbeing (Zika & Chamberlain, 1987).

Regarding the functional relationship between affect and MIL, King and colleagues (e.g., King, Hicks, Krull, & Del Gaiso, 2006) have focused on a potential causal effect of PA on MIL.
These authors argue that PA facilitates a cognitive style that facilitates the discovery of “hidden” meaning (Fredrickson & Branigan, 2005). In addition, PA may serve as a feedback signal about progress towards current goals (Carver & Scheier, 1990), which in turn should translate into a greater sense of meaning in life. Indeed, there is a robust positive relationship between PA and MIL across individuals (King et al., 2006, Study 3; McGregor & Little, 1998). More importantly, there is also strong evidence that PA is a short-term, causal factor behind the experience of MIL. This evidence comes mainly from experimental work suggesting that manipulations of PA have immediate effects on subsequent ratings of MIL (Hicks, Cicero, Trent, Burton, & King, 2010; King et al., 2006; Ward & King, 2016).

Although the short-term, directional relationship from PA to MIL has received considerable attention, we know little about the more general, within-individual dynamics between affect and MIL. For example, to gauge the mental-health relevance of this relationship, it would be important to assess to what degree the PA-to-MIL link replicates in a natural setting and across meaningful time spans. Also, it seems plausible to assume not only a relationship from PA to later MIL, but also the reverse, namely that a greater sense of meaning enhances later PA (King et al., 2006). The existence of bidirectional, time-lagged relationships would establish a positive feedback loop (i.e., PA promotes MIL, which in turn promotes PA, and so forth), with potentially important implications for mental health and wellbeing. One previous study that looked at the dynamics between affect and MIL in a design with two measurement points (King et al., 2006, Study 3) found strong concurrent, but no time-lagged effects in either direction, as well as stronger relationships with MIL for PA than NA. However, that study was limited, both because with only two measurement points, it did not allow adequate separation of between- and within-subject effects (Hamaker, Kuiper, & Grasman, 2015), and because of the rather long, two-year interval between measurement points. Other studies looked at within-individual relationships between PA and MIL using more than two timepoints have reported, or found, only concurrent effects (Chu, Fung, & Chu, 2020; King et al., 2006, Study 3). Thus at this
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point, very little direct evidence exists about the natural occurring directionality of the PA/MIL relationship.

Another important aspect is the assessment of convergent and divergent validity among the related constructs. Cross-sectional results indicate that PA and negative affect (NA) are often inversely related, as are NA and MIL, just less strongly so than the above reviewed, positive relationship between PA and MIL (King et al., 2006). However, to fully address the questions about the temporal dynamics, directionality, and specificity of affect-MIL dynamics, one would need to assess both concurrent and time-lagged relationships between PA, NA, and MIL within individuals and across a sufficient number of timepoints.

*Do Affect and Meaning in Life have Unique Protective Effects on Stress?*

Both PA and MIL have been proposed as potential buffers against stress. For example, greater positive mood (but not a decrease in negative mood) is thought to lead to an increase in coping resources by expanding one’s cognitive focus (Catalino & Fredrickson, 2011), something that is not achieved by a mere decrease in negative mood. Consistent with this hypothesis, positive mood has been shown to be negatively related to physiological markers of stress within individuals (Steptoe, Wardle, & Marmot, 2005). In addition, experimental induction of positive mood appears to reduce psychological and physiological responses to acute stressors (Speer & Delgado, 2017).

Regarding potential effects of MIL, while unpredictable events lead to a perceived loss of control that is experienced as threatening and stressful, the ability to create a sense of meaning can be an antidote to an experienced loss of control and therefore might act as a buffer against unpredictable events. Consistent with this hypothesis, Park and Baumeister (2017) provided evidence from a cross-sectional study that individuals with greater sense of meaning report less stress. These authors also report that short-term, experimental manipulations of experienced meaning have immediate alleviating effects on stress responses. However, because only imagined events were used it is not clear to what degree this finding would generalize to natural
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situations. Krause (2007) reported that individuals with a strong sense of meaning exhibited reduced depressive responses to naturally occurring negative events, a relationship that is also confirmed longitudinally through a 2-phase, cross-lagged panel analysis. However, as the author himself states, with just two measurement points this study design provides only weak evidence for the critical, within-individual relationship (Hamaker et al., 2015).

In theory, PA and MIL’s potential protective effects operate through different mechanisms. However as reviewed earlier, empirically PA and MIL share considerable variance both between and within individuals (King et al., 2006). Currently there is no strong empirical evidence regarding the degree to which these two factors exhibit independent, stress-reducing effects. Therefore, it would be important to demonstrate that affective variables (PA and NA) as well as MIL have independent and directional (i.e., time-lagged) effects on perceived stress, within individual subjects.

Does Adult Age Modulate the Relationship between Affect and Meaning in Life?

There are reasons to assume that the role of affect on the construal of meaning changes across the life span. Specifically, social-emotional selectivity theory (Carstensen, Fung, & Charles, 2003) posits an increased focus on emotions as an individual’s remaining life-time horizon shrinks. This may imply that for older adults, PA becomes a more important source of information for creating a sense of meaning in life. In fact, Hicks, Trent, Davis, and King (2012) reported that individual differences relationships between PA and MIL were more robust for older than for young adults and that also short-term positive mood manipulations affected older adult’s MIL more strongly than those of young adults. The substantial age range in our sample, from middle-aged to very old age, allowed us to replicate and generalize the predicted aging pattern for naturally occurring, within-individual PA-to-MIL relationships.

This Study

The current research is part of a larger project that was initiated at the beginning of the COVID pandemic to track daily activities, affective functioning, and other aspects related to
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stress and well-being on a weekly basis, in a convenience sample of 50-90 year-olds. During a phase of 13 consecutive weeks, we measured MIL, positive/negative affect, and perceived stress. These data allowed us to address the following key questions using multi-level, within-individual analyses:

1) We aimed to replicate earlier findings about a positive, concurrent, and specific (i.e., independent of NA) relationship between PA and MIL?
2) We tested the hypothesis of a cross-lagged, specific relationship from PA at timepoint \( n-1 \) to MIL at timepoint \( n \), consistent with the previous reported results about PA being a causal factor for MIL?
3) In explorative analyses, we examined to what degree there is also a reverse, specific relationship from MIL at timepoint \( n-1 \) to PA at timepoint \( n \).
4) In further explorative analyses, we examined whether or not PA and MIL have independent, concurring and/or time-lagged effects on perceived stress?
5) We also tried to replicate on the within-individual level previous findings of a stronger PA-MIL relationship for older than for younger adults?

While our main focus is on within-individual dynamics, our design also allows us to consider the degree of ergodicity, that is the congruence between interindividual and intraindividual analyses.

**Methods**

This study was part of a larger investigation of older adults’ response to the COVID-19 virus. The Positive and Negative Affect Schedule and Perceived Stress Scale were included in the survey at all timepoints (weeks 1-35). The Meaning in Life Questionnaire was added to the original survey before week 23, and remained in all subsequent surveys (i.e., weeks 23-35).

**Participants and Procedure**

The study began in April of 2020, soon after the COVID-19 virus was announced as a pandemic. Participant recruitment focused on individuals who were at least 50 years old, and
was largely conducted through email invitations to past participants in our lab, individuals on a listserv for University of Oregon’s Osher Lifelong Learning Institute, and individuals who expressed interest after hearing about our study through word of mouth. All participants completed an online consent form. Following this, they were sent a link to the Qualtrics intake survey, in which demographic information was collected, along with various personality measures. Participants who completed the intake survey were then emailed weekly links to the Qualtrics follow-up surveys. Data collection concluded after 35 weeks, in December 2020. PANAS and PSS were included across all 35 weeks. The MLQ-P was added to the survey at week 23, and was included in all subsequent surveys (weeks 23-35); the current study focuses only on these 13 weeks (i.e., September–December 2020). Each survey could be completed in 10-15 minutes. Participation was voluntary and no monetary compensation was provided. All procedures were approved by the University of Oregon’s Institutional Review Board.

After removing data from participants under the age of 50, there were a total of 373 subjects in the larger study. Of these, 259 participants had provided information during the here critical study period, answering an average of 9.87 surveys (see Table 1). Participants’ age ranged from 50 to 95 years ($M$=70.56, $SD$= 8.39); 73% were female and 27% were male (Note: other gender options were provided, but none were selected). The majority of participants were non-Hispanic white (95%; 1% were Hispanic; 1% were mixed race, 1% were Asian, and 2% chose not to respond) and retired (73%; 11% were employed full time, 8% were employed part-time, 3% were disabled, and less than 5% were unemployed). Finally, 55% were married, 22% were divorced, 12% were widowed, 9% were never married, and 1% were separated.

Measures

The following self-report questionnaires administered during the weekly online surveys were relevant for the current study:

*The Meaning in Life Questionnaire*. For this study, MIL was measured using the Meaning in Life Questionnaire (MLQ; Steger et al., 2006). The full MLQ has 10 items and
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consists of two subscales: “search for meaning in life” and “presence of meaning in life.” The present study only utilized the five items from the “presence of meaning in the life” subscale (MLQ-P) because only these were relevant to our hypothesis. The MLQ-P contains items such as “I understand my life’s meaning”. Participants responded on a Likert scale from one to seven, with one meaning “absolutely untrue” and seven meaning “absolutely true”.

The Positive and Negative Affect Schedule. To measure PA and NA, we adapted the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). Participants rated how often they felt certain affect/mood adjectives described their state over the last week. The questionnaire included 20 adjectives that were either positive (e.g., “enthusiastic”) or negative (e.g., “nervous”). There were 10 positive and 10 negative adjectives, and participants answered on a Likert scale from one to five, with one indicating “never” and five indicating “often”.

Perceived Stress. We measured stress using the 10-item perceived stress scale (PSS; Cohen, Kamarck, & Mermelstein, 1994), which assesses whether participants are feeling a lack of control or resources to cope with their current situation. We adapted the questionnaire to refer to the preceding week, specifically. A typical item is “During the last week, how often have you felt that you were unable to control the important things in your life?”. Participants again answered on a one-to-seven Likert scale (“absolutely untrue” to “absolutely true”).

Results

Descriptive Results and Individual Differences

Descriptive results about average values across all measurements points and individuals for the critical variables, as well as for age, are presented in Table 1, along with the intercorrelations between variables. Consistent with the literature, our correlations showed a substantial positive relationship between PA and MIL, and a negative relationship between NA and MIL. Further, the relationship between PA and NA was moderately negative. PA/NA relationships reported the literature vary between zero and moderately negative correlations, but tend to be more negative when the judged time window is shorter and during highly emotional
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times (Diener & Emmons, 1984), such as during a global pandemic. In a between-subject regression analyses, PA, NA, age, PA x age, and NA x age were included as predictors of MIL, to assess to what degree PA and NA uniquely predicted MIL and whether or not age modulated these relationships (Table 2, Model 2). As apparent, PA and NA each had independent effects on MIL. Different form one previous reports (Hicks et al., 2012), we found no reliable age-by-affect interactions, even though there was a weak tendency towards a stronger positive PA-MIL relationship and a reduced negative NA-MIL relationship as a function of age.

Also, PA, NA, and MIL each had moderate to strong relationships in the appropriate direction with perceived stress (Table 1). Further, a multiple regression analysis with perceived stress as criterion variable confirmed that each variable’s relationships with perceived stress were mutually independent (Table 2, Model 3).

Concurrent Within-Subject Relationships between Affect and Meaning in Life

We next focused on replicating previous findings of a concurrent relationship between positive affect and MIL, within subjects (e.g., King et al., 2006). For this purpose, we used a linear multilevel model with MIL as criterion variable and PA as fixed-effect predictor. The model also included a random intercept and random slopes across individuals, and random intercepts across measurement points to absorb potential history effects that are common across individuals and timepoints. In other words, the fixed effects represent relationships between each variable’s deviations from both a participant’s average level and the across-individual common deviation from the average level for a particular measurement point (Hamaker et al., 2015). All variables were centered and standardized, including the criterion variable, resulting in beta coefficients that can be interpreted as effect sizes.

The results of Model 1 in Table 2 show that PA and MIL are highly interrelated across timepoints within individuals (King et al., 2006). Note, that despite the fact that we designated MIL as criterion and PA as predictor, no claims about directionality of the influence can be made from this analysis.
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In Model 2, we added NA, age, and the interactions between age and both PA and NA. The only additional significant predictor that emerged was NA; the effect of PA remained significant. Thus, both PA and NA exhibited independent relationships with MIL over time. Consistent with the individual differences results, but again inconsistent with previous results, age did not reliably modulate the affect-MIL relationships.

Is there a Cross-lagged Relationship from PA to MIL?

Our main theoretical questions are about the week-to-week, time-lagged relationships between affect and meaning in life. First, we attempted to demonstrate within our naturalistic setting the relationship from earlier PA to later MIL, while also controlling for earlier MIL. For this purpose, we entered n-1 PA and n-1 MIL into a multilevel model as fixed-effect predictors of MIL, while again allowing random slopes and intercepts across individuals and random slopes for measurement points (see Figure 1). As shown in Table 3 (Model 1), there was indeed a robust cross-lagged relationship from PA at week n-1 to MIL at week n, over and above the strong week-to-week autocorrelation for MIL. After adding the entire set of exploratory variables (n-1 NA, age, and affect-by-age interactions), these effects remained robust and no additional reliable effects emerged (Model 2 in Table 3).

Is there a Cross-lagged Relationship from MIL to PA?

Next, we analyzed the reverse relationship, with week n-1 MIL (and n-1 PA) predicting week n PA. We did not find a significant effect (Table 3, Model 3), suggesting that a greater sense of meaning in life does not have unique, downstream effects on PA. Again, we also expanded our model to include the exploratory variables (Table 3, Model 4). In this analysis, the effect of n-1 MIL on week n PA was again not reliable as a main effect, but did show a modulation through age. Specifically, a positive relationship between current MIL and future PA emerged for older participants.

Within-Subject Effect of MIL and Affect on Perceived Stress
We examined to what degree there are unique, relationships between affect, MIL, and perceived stress, such as those found in the between-subject analyses. Again, we first examined and confirmed concurrent relationships for PA, NA, and MIL with perceived stress (Model 3 in Table 2). More importantly, we also found specific predictive relationships from week n-1 PA, NA, and MIL to week n PS, over and above week n-1 PS effects (Table 3, Model 5). These results indicate that despite the strong relationship between affect and MIL, these constructs also have unique and potentially causal, stress-buffering effects.

Discussion

To our knowledge, this is the first study to investigate the within-individual relationships between affect, meaning in life, and stress across an extended series of measurement points. Such a design is necessary to assess (a) the degree to which the meaning-in-life/affect relationships that are well-documented as individual differences relationships, also play out within individuals, and (b) to probe potential causal relationships within a natural setting.

The inter-individual relationships we observed within our sample (Tables 1-2) were fully in line with the broader literature (e.g., King et al., 2006). Both positive and negative affect (PA and NA) had robust and opposing relationships with meaning in life (with the PA-MIL correlation stronger than the NA-MIL correlation), and PA, NA, and MIL each affected perceived stress uniquely.

Importantly, the set of relationships involving affect and MIL showed considerable “qualitative” ergodicity, with similar patterns emerging for the between-individual and the within-individual relationships. For the concurrent coupling, PA and MIL showed strong positive whereas NA and MIL showed, somewhat weaker, negative relationships. Each of these three variables was also uniquely related to perceived stress and to remarkably similar degrees in the intraindividual and the interindividual analyses (see Table 2).

Even more critically, the cross-lagged panel analyses yielded the hypothesized relationship between week n-1 PA and week n MIL, while controlling for n-1 MIL. This result is
consistent with the experimental evidence suggesting a causal link between PA and MIL. Further, it demonstrates that this link can be obtained in a natural setting, with a non-trivial, one-week time lag between measurement points. The observed directional relationship was unique to PA and was not obtained for NA, which is in line with previous experimental findings that only PA, but not NA, causally affects MIL. The cross-lagged panel analysis also showed that the lagged PA/MIL relationship was asymmetric: A greater sense of meaning on week n did not generally lead to more positive affect on week n+1. This pattern is consistent with the idea that there is a specific functional role of PA in the construal of MIL, such as PA serving as a global indicator of goal-progress (King et al., 2006).

Another noteworthy result regards the implications for perceived stress. Both MIL and positive mood have been proposed as buffers against the experience and the negative health implications of stress (Krause, 2007; Steptoe et al., 2005). However, to our knowledge, the unique effects of each have not been assessed within individuals. Given the strong inter-individual and intra-individual coupling of PA and MIL, a common buffering pathway for affect and MIL variables would not be surprising. However, our results showed unique predictive power of PA, NA, and MIL for PS across three sets of analyses: The inter-individual correlations, the concurrent relationships, and the cross-lagged analyses (while controlling for last-week’s stress). The latter results are particularly important, as they indicate distinct causal roles for PA, NA, and MIL in the experience of stress.

Finally, our sample also allowed us to look at the role of adult age. Previous work has suggested that, in line with social-emotional selectivity theory (REF), the link between PA and MIL becomes stronger as an individual’s life-horizon shrinks. We were not able to replicate this pattern, neither in the between- nor the within-individual analyses. One potential reason for this non-replication is the limited age range in our sample (i.e., 50-90 years). Yet, despite the limited range, we did find the typical positivity effect (e.g., more PA and less NA with older age), which is often taken as an expression of the motivational changes predicted by social-emotional
selectivity theory (see Table 1). Another reason for why we may not have found the predicted pattern is suggested by recent results (Chu et al., 2020), indicating that the age-related increase of the connection between positive affect and MIL may only hold for low-arousal PA (e.g., feeling calm), but not for high-arousal PA (e.g., feeling enthusiastic). With the use of the PANAS, our assessment of positive affect was tilted towards high-arousal positive affect, potentially making it more difficult to detect the expected age-related changes.

We did find one unexpected age-related result, namely that while there was no general effect of previous-week MIL on current-week PA, this relationship was modulated by age in a manner that potentially suggests an increased MIL-PA relationship with increased age (see Table 3). However, given that this result was not predicted, it requires replication.

A unique aspect of the current study is that it allowed us to track affect and MIL across 13 weeks and with relatively high measurement density. An important qualification is that the results are based on a convenience sample of mostly Caucasian, well-educated individuals. The fact that the observed inter-individual differences relationships between all critical variables matched remarkably well with those reported in the literature (e.g., King et al., 2006) increases the confidence that also the within-individual results would generalize more broadly. However, it is important to examine the dynamics observed here in a context that is more representative of the general population.

To conclude, our results indicate qualitative similar patterns of relationships between the affect/MIL/stress relationships across and within individuals. Moreover, we found a unique, asymmetric, and potentially causal relationship between PA and MIL (but not the reverse effect from MIL to PA), a result that is generally consistent with a specific functional role for PA in promoting processes that strengthen MIL. Finally, PA, NA, and MIL have unique and, as suggested by the lagged-relationships, possibly causal effects on perceived stress. This finding suggests that in a therapeutic context, affect and meaning in life could serve as independent targets for mental health interventions (Breitbart et al., 2015; Speer & Delgado, 2017)
References


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Table 1. Descriptive statistics and correlations for all critical variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>Range</th>
<th>Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>PA</td>
<td>2.93 (0.83)</td>
<td>1-5</td>
<td>-.45</td>
</tr>
<tr>
<td>NA</td>
<td>1.77 (0.62)</td>
<td>1-5</td>
<td>-.38</td>
</tr>
<tr>
<td>MIL</td>
<td>25.65 (6.64)</td>
<td>1-35</td>
<td>-</td>
</tr>
<tr>
<td>PS</td>
<td>1.26 (0.74)</td>
<td>0-4</td>
<td>-</td>
</tr>
<tr>
<td>Age</td>
<td>70.56 (8.39)</td>
<td>50-95</td>
<td>-</td>
</tr>
<tr>
<td>Surveys</td>
<td>9.87 (4.09)</td>
<td>1-13</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. PA = positive affect, NA = negative affect, MIL = meaning in life, PS = perceived stress, Surveys = number of surveys completed in weeks 23-35; correlations of $r \geq .13$ are significant at $p < .05$ (shown in bold). N = 259.
Table 2. Between- and within-subject relationships between affect, meaning in life, and stress.

<table>
<thead>
<tr>
<th>DV</th>
<th>IV</th>
<th>Between-Subjects</th>
<th>Within-Subjects (Concurrent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>b</td>
<td>SE</td>
</tr>
<tr>
<td>M1:</td>
<td>MIL</td>
<td>PA</td>
<td>.55</td>
</tr>
<tr>
<td></td>
<td>MIL</td>
<td>NA</td>
<td>-.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PA*Age</td>
<td>.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NA*Age</td>
<td>.10</td>
</tr>
<tr>
<td>M2:</td>
<td>MIL</td>
<td>PA</td>
<td>.46</td>
</tr>
<tr>
<td></td>
<td>MIL</td>
<td>NA</td>
<td>-.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PA*Age</td>
<td>.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NA*Age</td>
<td>.10</td>
</tr>
<tr>
<td>M3:</td>
<td>PS</td>
<td>PA</td>
<td>-.26</td>
</tr>
<tr>
<td></td>
<td>PS</td>
<td>NA</td>
<td>.67</td>
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<tr>
<td></td>
<td>PS</td>
<td>MIL</td>
<td>-.08</td>
</tr>
</tbody>
</table>

Note. For the within-subject analyses, only fixed effects are shown. The models are numbered using labels M1-3. Coefficients with effects significant at p<.05 are shown in bold.
Table 3. Cross-lagged relationships between affect, meaning in life, and stress.

<table>
<thead>
<tr>
<th>DV</th>
<th>IV</th>
<th>b</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1: MIL</td>
<td>PA_{n-1}</td>
<td>.06</td>
<td>.02</td>
<td>2.27</td>
<td>.025</td>
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<tr>
<td></td>
<td>MIL_{n-1}</td>
<td>.20</td>
<td>.03</td>
<td>7.69</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>M2: MIL</td>
<td>PA_{n-1}</td>
<td>.05</td>
<td>.02</td>
<td>2.06</td>
<td>.042</td>
</tr>
<tr>
<td></td>
<td>NA_{n-1}</td>
<td>-.02</td>
<td>.02</td>
<td>-.79</td>
<td>.431</td>
</tr>
<tr>
<td></td>
<td>MIL_{n-1}</td>
<td>.20</td>
<td>.03</td>
<td>7.46</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>.04</td>
<td>.05</td>
<td>0.97</td>
<td>.332</td>
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<tr>
<td></td>
<td>PA_{n-1}*Age</td>
<td>.03</td>
<td>.02</td>
<td>1.15</td>
<td>.253</td>
</tr>
<tr>
<td></td>
<td>NA_{n-1}*Age</td>
<td>.01</td>
<td>.02</td>
<td>0.41</td>
<td>.681</td>
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<td>M3: PA</td>
<td>PA_{n-1}</td>
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<td>.02</td>
<td>7.46</td>
<td>&lt;.001</td>
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<td>.02</td>
<td>-.03</td>
<td>.978</td>
</tr>
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<td>M4: PA</td>
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Note. For the within-subject analyses, only fixed effects are shown. The models are numbered using labels M1-3. Coefficients with effects significant at p<.05 are shown in bold.
Affect, Meaning in Life, and Perceived Stress

a)

Level 1:

\[ DV_{ij} = b_{0j} + b_{1j}(n - 1 PA)_{ij} + b_{2j}(n - 1 MIL)_{ij} + e_{ij} \]

Level 2:

\[ b_{0j} = g_{00} + g_{01}Subject_j + g_{02}Survey_j + u_{0j} \]
\[ b_{1j} = g_{10} + g_{11}Subject_j + u_{1j} \]
\[ b_{2j} = g_{20} + g_{21}Subject_j + u_{2j} \]

b)

Figure 1. a) Cross-lagged multilevel model equations for PA and MIL as predictors (i.e., Models 1 and 3 in Table 3). b) Graphic representation of the fixed-effect cross-lagged structure and results (beta coefficients: *<.05, **<.001).