Journal of Research in Personality 69 (2017) 13–21

Contents lists available at ScienceDirect

Journal of Research in Personality

journal homepage: www.elsevier.com/locate/jrp

Intra-individual variability and psychological flexibility: Affect and health in a National US sample

Jaime Hardy *, Suzanne C. Segerstrom

Department of Psychology, 125 Kastle Hall, University of Kentucky, Lexington, KY 40506, United States

ARTICLE INFO

Article history:
Received 15 September 2015
Revised 26 February 2016
Accepted 19 April 2016
Available online 22 April 2016

Keywords:
Within-person variability
Intra-individual variability
Psychological flexibility
Positive affect
Negative affect
Health
MIDUS

ABSTRACT

Intra-individual variability (IIV) and psychological flexibility (PF) in affect both describe affective change over time (i.e., within-person variability). However, IIV and PF might differ from each other and predict different psychological and physical health outcomes. A large sample of adults (n = 793) completed two assessments of daily stress, daily affect, and health over a 10-year interval in The National Study of Daily Experiences (an 8-day daily diary portion of the Midlife Development in the United States study). IIV and PF in affect were modestly reliable within and between assessments. IIV, operationalized as total variability, predicted worse psychological and physical health concurrently and prospectively. PF, operationalized as changes in dimensionality, predicted better psychological and physical health concurrently and prospectively. Other operationalizations of PF were not consistently related to health. Within-person variability in affect could therefore be adaptive or maladaptive depending on how it was defined.

1. Introduction

Short-term changes that are more or less reversible and that may differ across individuals comprise within-person variability or intra-individual variability (IIV) (Nesselroade, 2001). However, IIV is only one way of characterizing within-person variability. There is a growing interest in psychological flexibility (PF), a construct that appears to hold promise for understanding resilience and vulnerability to psychological distress (Kashdan & Rottenberg, 2010). Operationally defining PF can be difficult, as can distinguishing between PF and IIV (Kashdan & Rottenberg, 2010). Empirical studies appear to disagree about the adaptiveness of within-person variability: IIV has been associated with poorer psychological and physical outcomes, whereas PF may be related to better psychological and physical health outcomes (Kashdan & Rottenberg, 2010; Röcke & Brose, 2013).

There is some evidence that both IIV and PF are stable over time and may represent persistent individual differences that could affect long-term health outcomes. IIV (total variability) in affect had test-retest correlations of 0.46–0.90 over periods of up to 2 months (Eid & Diener, 1999; Penner, Shiffman, Paty, & Fritzsche, 1994). One study of flexibility in affect regulation reported a test-retest correlation of 0.45 over 3 years (Westphal, Seivert, & Bonanno, 2010). However, further assessment of the reliability and validity of IIV and PF would advance our understanding of how these constructs relate to each other and to psychological and physical health and whether they constitute stable individual differences.

IIV has been operationalized in a number of ways, most commonly as the individual's standard deviation (iSD) (see Ram & Gerstorf, 2009; Röcke & Brose, 2013 for excellent reviews of IIV methodology). IIV operationalized in this way is distinct from the mean level of the response; it specifically refers to variability around the means. It is important to note that assessment of IIV does not require characterization of the situation or pairing of response and situation. Thus, IIV represents the range or frequency of a response, uncharacterized by situational change. IIV in affect is therefore the range of emotional experience over time, typically operationalized as the iSD of the individual's affect (Eid & Diener, 1999).

PF is more complex than IIV in both its definition and operationalization. One of the more common ways of defining PF is the ability to vary one's responses in a contextually dependent manner in order to appropriately meet situational demands (Bonanno, Papa, Lalande, Westphal, & Coifman, 2004; Cheng, 2001; Fujimura & Okanoya, 2012; Tracey, 2005; Westphal et al., 2010). PF differs from IIV in that PF refers to within-person variability where the response is dependent on the situation and is

* Corresponding author at: Department of Psychology, University of Kentucky, 125 Kastle Hall, Lexington, KY 40506-0044, United States.
E-mail address: jaimekhardy@gmail.com (J. Hardy).

http://dx.doi.org/10.1016/j.jrp.2016.04.002
0092-6566/

patterned and predictable. PF in affect therefore refers to the ability to match one's emotional experience appropriately to situational cues (Fujimura & Okanoya, 2012; Waugh, Thompson, & Gotlib, 2011).

Operationalizing PF in affect therefore requires a theory that defines what the "appropriate" emotional experience is and calculation of the difference between an individual's affect in different situations and the "appropriate" affect as defined by the model. Mathematically, when the response being measured can be plotted on Cartesian coordinates, the Euclidean distance between "appropriate" and actual responses can be calculated; the smaller the mean distance across assessments, the better the fit (e.g., Cheng, 2001; Tracey, 2005). PF with regard to affect regulation has been defined as the ability to modulate affective expression in accordance with situational demands or to enhance or suppress affective expression when prompted. In one study, PF in affect was operationalized as the difference in emotional expression during positive and negative stimuli, where those with more differentiation between positive and negative expressions were considered to have greater flexibility (Waugh et al., 2011). In another, PF was calculated as the difference between emotional expression in the control condition and emotional expression when instructed to enhance or suppress expression, summed to get an overall index of flexibility (Bonanno et al., 2004).

In sum, operationalizing PF requires a theory from which one can derive an index of fit by comparing observed responses with theoretically adaptive responses across different situations. Therefore, PF concerns the covariation of response and situation and, importantly, compares this covariation with a theoretical standard.

There are a number of theories that provide a possible standard for positive affect (PA) and negative affect (NA) in situational context. Most of them imply relationships between NA and PA in the situation. First, NA and PA may be inversely correlated, such that increases in NA imply decreases in PA and vice versa (Feldman Barrett & Russell, 1998; Russell & Carroll, 1999). Second, NA and PA may be orthogonal, such that changes in one do not imply changes in the other (Cacioppo & Berntson, 1994; Watson & Clark, 1997; Watson & Tellegen, 1985). Third, the relationship between NA and PA may itself vary, switching between a bipolar relationship and an orthogonal relationship, depending on the situation (Davis, Zautra, & Smith, 2004).

The Emotional Congruency Model (*Congruent*) theory predicts that it is most adaptive to experience emotions congruent with the situation. That is, "appropriate" responses comprise increased PA and decreased NA in positive situations; decreased PA and increased NA in negative situations; and the ability to switch between these profiles. In one study (Waugh et al., 2011) affect was rated using a dial, with negative at 0 degrees and positive at 180 degrees. This measurement strategy implies an inverse or bipolar relationship between NA and PA. Situation was defined as exposure to a positive or negative image. People whose affect rating more consistently matched the situation (affect closer to the positive pole when viewing a positive image, and affect closer to the negative pole when viewing a negative image) had higher trait resilience scores. The authors defined affective flexibility in this study as the ability to "switch responses when the emotional valence of the event change, and maintain responses with the emotional valence when the events do not change." In another study (Fujimura & Okanoya, 2012) affect was measured using a grid with valence and arousal dimensions. Participants indicated their current affect by checking one area on the grid. This measurement strategy also implies inverse or bipolar NA and PA, with arousal being a separate dimension. Situation was defined as exposure to positive, negative, or neutral images, with the arousal properties of the images consistent in all of the tasks. People whose affect ratings more closely matched the image valence also had higher HRV, which has been linked to successful self-regulation (Segerstrom, Hardy, Evans, & Winters, 2011). Higher affective flexibility, as match between affect and situation, was therefore suggestive of better self-regulatory ability. These studies reflect the Emotional Congruency Model, where NA and PA are inversely correlated, and affect and the valence of the situation match.

The Maintenance of Emotional Complexity Model (*Complex*) predicts that the ability to experience positive affect during a stressor may buffer against development of depressive symptoms (Fredrickson, Tugade, Waugh, & Larkin, 2003), as well as shortening the cardiovascular recovery time following negative events (Tugade & Fredrickson, 2004). In the first study (Fredrickson et al., 2003), PA and NA were rated using a modified Differential Emotions Scale (DES), and separate subscales were created for PA and NA. This operationalization of PA and NA as discrete scales reflects a model of PA and NA as separate dimensions (Watson & Tellegen, 1985). Those with higher PA during a stressful event also had higher ratings of resilience and lower incidence of depressive symptoms. In the second study (Tugade & Fredrickson, 2004), a modified version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was used to construct separate PA and NA subscales. Again, those with higher PA during a stressful task also had higher resilience and a faster physiological recovery from a stressful task. In these studies, emotional flexibility was the ability to maintain positive affect in the face of negative events. Therefore, in contrast to *Congruent*, the *Complex* theory implies that although NA may increase in negative situations, PA should be maintained. That is, levels of PA should be resilient to the influence of negative events and should not be inversely correlated with NA, which may be reactive to negative events. In this model, NA should depend on the situation, whereas the level of PA should remain stable across situations, resulting in dissociation between NA and PA.

The Dynamic Model of Affect (*Dynamic*) theory specifies that the *relationship* between PA and NA depends on the presence of negative events (Zautra, Smith, Affleck, & Tennen, 2001). Under non-stressful conditions, it is thought that people receive the most benefit from independence between PA and NA. Independence yields the maximum amount of information about situations, because emotional responses on one affective dimension are not limited by experience or lack of experience on the other dimension (i.e., there is higher emotional complexity). However, the added information of greater emotional complexity results in higher cognitive demand. The *Dynamic* theory states that emotional complexity is therefore adaptive in low-stress situations but maladaptive in high-stress situations, in which cognitive resources are scarce. In stressful situations, adopting a simpler representation of one's affective experience reduces cognitive load, freeing up resources for managing the situation. In addition, as affect becomes more unidimensional, more PA during a stressful situation would be related to less NA. The *Dynamic* theory suggests that positive experiences also have the potential to decrease NA under stress. In this study, NA and PA were measured using the PANAS, and separate subscales for PA and NA were calculated. Hierarchical Linear Modeling was used to examine the relationship between NA, PA, and increased stress due to physical pain. The relationship between NA and PA changed under stress: NA and PA became more inversely correlated as pain increased. In this model, therefore, the inverse relationship between PA and NA is stronger during stressful situations and weaker during non-stressful situations, and the ability to switch between modes (NA and PA are bipolar during high stress; NA and PA are orthogonal during low stress) adaptively uses cognitive resources and provides an additional means of decreasing NA under stress, to wit, PA.

Carefully distinguishing among IIV and the *Congruent, Complex,* and *Dynamic* theories of PF in affect allows one to determine which

theory is the best predictor of psychological and physical health. If IIV and PF are distinct, then they ought to predict different outcomes. Higher IIV in affect has been related to higher distress, depression, and neuroticism and lower agreeableness and extraversion (Eid & Diener, 1999; Gruber, Kogan, Quoidbach, & Mauss, 2013; Kuppens, Van Mechelen, Nezlek, Dossche, & Timmermans, 2007; Timmermans, Van Mechelen, & Kuppens, 2010). This relationship appeared whether the response was measured multiple times within an experiment, multiple times a day, or daily over a period of days or years. However, when affective IIV is confined to a specific, limited time period, such as immediately after a stressful event, greater affective IIV may signal adaptive coping with the stressor (Röcke & Brose, 2013). Therefore, situational context may be crucial to understanding the effects of IIV on outcomes.

There are fewer studies examining health effects of affective PF. However, those studies indicate that higher PF is related to better psychological and physical health: higher resilience, higher heart rate variability (HRV), less systemic inflammation, and less distress (Bonanno et al., 2004; Fujimura & Okanoya, 2012; Sin, Graham-Engeland, Ong, & Almeida, 2015; Waugh et al., 2011; Westphal et al., 2010). Therefore, the extant literature suggests that IIV is associated with worse health, whereas PF is associated with better health. However, no study has compared them directly, using the same outcomes in the same sample.

The current study addressed this need by assessing IIV and PF (as defined by the *Congruent*, *Complex*, and *Dynamic* theories) as well as health, longitudinally, in a large sample of US adults. The study had the following 2 aims:

Aim 1: Provide evidence for reliability and stability of IIV and the three operationalizations of PF in affect, as well as the relationships within and between constructs.

Aim 2: Test the hypothesis that less IIV and more PF in affect predicts better psychological and physical health.

2. Materials and methods

2.1. Participants

Data for this study came from the National Study of Daily Experiences (NSDE) Waves 1 and 2, an 8-day daily diary portion of the Midlife Development in the United States (MIDUS I) and MIDUS II surveys. Participants (N = 793) completed both waves of MIDUS and the NDSE. NSDE Wave 2 was completed approximately 10 years after Wave 1.

The final study sample had mean age 46.7 years (SD = 12.5; range 24–74); was 55.9% women; and was 92.6% Caucasian, 3.5% African American, and 3.3% other. Education level was 33.5% high school diploma or less, 30.1% at least some college, and 36.1% bachelor's degree or post-graduate education. Sample means on all study variables at Wave 1 and 2 are found in the Supplemental Online Material.

2.2. Procedure

MIDUS I: Respondents (N = 3032) were drawn from a random-digit-dial sample of English-speaking adults aged 25–74 and completed a telephone interview and mail questionnaire.

NSDE Wave 1: Participants (N = 1500) were asked about their daily experiences over the previous 24 h in 8 consecutive nightly telephone interviews (Almeida, Wethington, & Kessler, 2002). Participants completed an average of 7.2 interviews. Forty separate flights of interviews were conducted, with approximately 33 participants in each flight. The first interview day for each interview flight was staggered across the day of the week to control for possible confound between study day and day of week. Participants were given $25 for their participation. The initial wave of NSDE data collection was conducted from 1996 to 1997.

MIDUS II: The longitudinal component of the MIDUS II study included only those participants that had also completed the first MIDUS study (N = 1803). Respondents completed a telephone interview and mail questionnaire.

NSDE Wave 2: Study design was similar to NSDE Wave 1, with 8 consecutive nightly interviews. Interview flights consisted of approximately 20 participants per flight. Participants (N = 793) were given $25 for their participation. The second wave of NSDE data collection was conducted from 2004 to 2009.

2.3. Measures

2.3.1. MIDUS I and II

General Mental Health: Participants rated their mental or emotional health in general (1 = excellent, 5 = poor).

Depression: Participants indicated whether or not (yes/no) they had experienced 7 symptoms (e.g., lose interest in most things; lose your appetite; feel down on yourself, no good, or worthless) over a two-week period in the past 12 months (Wang, Berglund, & Kessler, 2000). The total number of "yes" responses was the depression score. Cronbach's alpha for the current study was 0.51.

Anxiety: Participants indicated how often (1 = most days, 4 = never) they experienced 10 symptoms (e.g., irritable because of your worry; had trouble remembering things because of your worry; had sore or aching muscles because of tension) over the past 12 months (Wang et al., 2000). The sum of responses was the anxiety score. Cronbach's alpha for the current study was 0.88.

Psychological Well-Being: The psychological well-being scale was composed of six 7-item subscales: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance (Ryff, 1989). Participants indicated how much in general how much the items described them (1 = strongly agree, 7 = strongly disagree). The average of the subscales was the total well-being score. Cronbach's alpha for the current study was 0.71.

General Health: Participants rated their physical health in general on a 5-point scale (1 = excellent, 5 = poor).

Chronic conditions: Participants indicated the chronic health conditions (e.g., hypertension, diabetes, autoimmune disorders) they had experienced in the past 12 months. The total number of conditions endorsed was used as the chronic conditions score.

Activity of Daily Living Scale: Participants rated how much (1 = a lot, 4 = not at all) their health limited them in doing activities of daily living (ADL; e.g., bending, kneeling, or stooping; walking several blocks; moderate activities; vacuuming). The mean of the items was the ADL score. Cronbach's alpha for the current study was 0.92.

Prescription Medications: Participants reported the number of medications taken over the past 30 days. The total number of medications was the medication score.

2.3.2. NSDE Waves 1 and 2

Daily Events: The number of negative events was reported for each diary day (Almeida et al., 2002).

Positive and Negative Affect: PA and NA scales were developed using items derived from a number of validated measures of affect and were assessed separately based on the Watson and Tellegen's (1985) theory that PA and NA represent distinct dimensions (Mroczek & Kolarz, 1998). Cronbach's alphas for PA and NA in the MIDUS were 0.91 and 0.87 respectively. PA was measured using 1 item in NSDE Wave 1 and 6 items in NSDE Wave 2.

Participants rated (0 = none of the time, 4 = all of the time) their daily NA (restless or fidgety, nervous, worthless, so sad nothing

could cheer you up, everything was an effort, hopeless) and PA (in good spirits [both waves], cheerful, extremely happy, calm and peaceful, satisfied, full of life [Wave 2 only]). The average rating across all 6 NA items was used as the NA score. The Wave 2 PA score was calculated using both the 1-item (i.e., as at Wave 1) and 6-item PA, and all analyses were conducted with both measures. There were no significant differences in the results; therefore, results reported are those using the 1-item PA measure at both waves.

2.4. Construction of variables

IIV was calculated as the individual's standard deviation (iSD) for positive affect (PA) and negative affect (NA) across the 8 days at each NSDE wave. In each model, PF was calculated as the difference between the individual's PA and/or NA on stressor vs. non-stressor days and the theoretically ideal change as specified by the model. Details of the calculations can be found in the Supplemental Online Material.

In the *Congruent* model, when stressors occur, NA should increase and PA should decrease (see Fig. 1). Using multilevel models with days at Level 1 and people at Level 2, the within-person change in PA or NA on stressor days was calculated, and the difference between that change and the maximum possible change, summed across PA and NA, was taken as the measure of *Congruent* PF.

In the *Complex* model, when stressors occur, NA should increase, as in the *Congruent* model. In contrast with the *Congruent* model, when stressors occur, PA should not change (i.e., PA should be resilient to stress). Therefore, this model assumes that PA remains unaffected by levels of stress (Fig. 2). Using multilevel models with days at Level 1 and people at Level 2, the within-person change in PA or NA on stressor days was calculated, and the difference between those changes and the minimum possible decrease in PA and the maximum possible increase in NA, summed across PA and NA, was taken as the measure of *Complex* PF.

In the *Dynamic* model, the inverse relationship between NA and PA should be stronger on stressor days and weaker on no-stressor days (Fig. 3). Using multilevel models with days at Level 1 and people at Level 2, the within-person relationship between PA or NA on stressor and non-stressor days was calculated, and the difference between those slopes and the maximum possible difference was taken as the measure of *Dynamic* PF.

In order to reduce the number of analyses, composite outcome scores were created for psychological and physical health. The psychological distress composite comprised general mental health, depression, anxiety and psychological well-being. The physical ill health composite comprised general health, chronic conditions, activities of daily living, and medications. All scales were re-scored if necessary so that higher scores indicated higher physical ill health or psychological distress. Scales were standardized and averaged: psychological distress, $\alpha = 0.59$ ($N = 753$) and $\alpha = 0.66$ ($N = 714$) for Waves 1 and 2, respectively; physical health, $\alpha = 0.74$ ($N = 777$) and $\alpha = 0.78$ ($N = 693$).

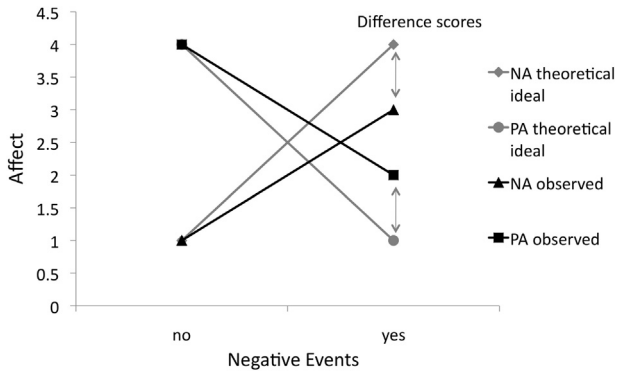

Fig. 1. *Congruent* model of affective PF.

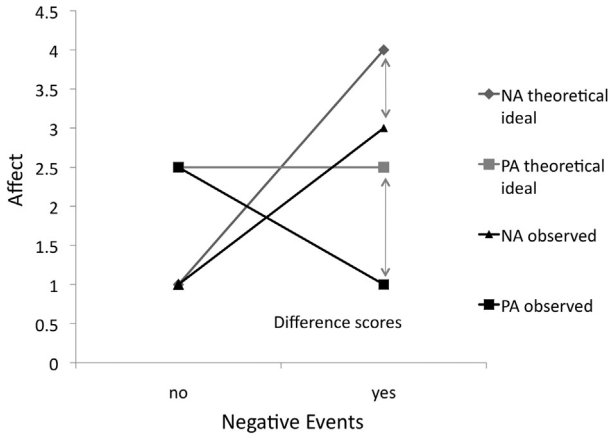

Fig. 2. Complex model of affective PF.

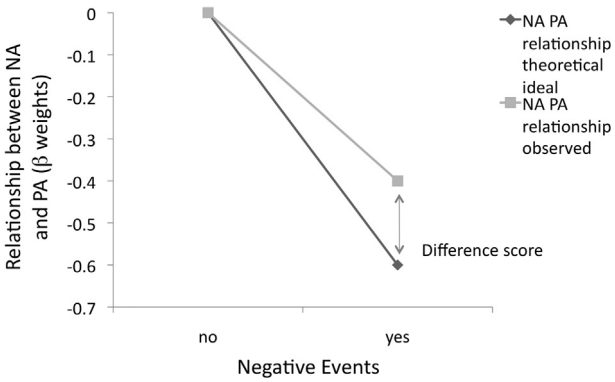

Fig. 3. Dynamic model of affective PF.

2.5. Data analysis

Psychological distress and physical ill health were regressed on affective IIV and PF concurrently (Waves 1 and 2) as well as longitudinally (change from Wave 1 to Wave 2), controlling for mean levels of affect and proportion of stressor days. First, separate models included each individual measure of affective IIV or PF. Second, a model included all affective IIV and PF measures together in order to determine if one measure predicted health over and above the others.

3. Results

3.1. Between- and within-wave stability of IIV and PF

Means, standard deviations, ranges, stability, and test-retest correlations for each IIV and PF variable can be found in Table 1. Bootstrapping was used to obtain estimates of within-wave stability. A randomly selected subset of 4 days of data was used to calculate IIV and PF variables and was correlated with scores calculated on the other 4 days of data. Random sampling with replacement was used to obtain 1000 resamples of the data and provide within-wave stability estimates and confidence intervals (CI) for

Table 1
Means, standard deviations, ranges, and stabilities for IIV and PF.

	Wave 1			Wave 2			Test-retest *r*
	Mean (SD)	Range	Within-wave stability (95% CI)	Mean (SD)	Range	Within-wave stability (95% CI)	
NA IIV	0.16 (0.16)	0–1.07	0.58 (0.49–0.67)	0.16 (0.13)	0–0.99	0.56 (0.49–0.64)	0.37*
PA IIV	0.46 (0.35)	0–2.00	0.39 (0.29–0.48)	0.48 (0.33)	0–1.81	0.37 (0.30–0.44)	0.19*
Congruent PF	7.77 (0.40)	4.42–8.40	0.66 (0.56–0.76)	7.95 (0.42)	4.67–9.02	0.36 (0.25–0.46)	0.28*
Complex PF	4.45 (0.30)	1.75–5.03	0.56 (0.41–0.66)	4.38 (0.33)	1.72–5.46	0.20 (0.06–0.33)	0.30*
Dynamic PF	0.29 (0.28)	−1.83 to 0.60	0.61 (0.47–0.71)	0.40 (0.31)	−3.71 to 0.78	0.50 (0.39–0.58)	0.38*

Note: NA = Negative Affect, PA = Positive Affect, IIV = Intra-Individual Variability, PF = Psychological Flexibility.
* $p < 0.01$.

the observed data (Ram, Conroy, Pincus, Hyde, & Molloy, 2013; Yung & Chang, 1999). NA IIV and *Dynamic* PF had the highest within-wave stabilities at both waves (Wave 1: 0.58 and 0.61; and Wave 2: 0.56 and 0.50, respectively). Due to the low within-wave stability estimates of PA IIV, *Congruent* PF, and especially *Complex* PF at Wave 2, the results involving these variables from Wave 2 should be interpreted with caution. Across waves, NA IIV and *Dynamic* PF had the highest stability across a ten-year period.

3.2. Correlations among IIV and PF

NA IIV, PA IIV, *Congruent* PF, and *Complex* PF were correlated with each other and were inversely correlated with *Dynamic* PF at both waves (see Table 2). People with higher mean NA and lower mean PA also had higher NA IIV, PA IIV, *Congruent* PF, and *Complex* PF and lower *Dynamic* PF at both waves.

3.3. Relationships with health

As hypothesized, higher NA IIV, controlling for mean NA and proportion of stressor days, was associated at both waves with higher psychological distress, $\beta = 0.20$, $p < 0.001$ and $\beta = 0.14$, $p = 0.004$, respectively (see Fig. 4), and higher physical ill health, $\beta = 0.21$, $p < 0.001$ and $\beta = 0.15$, $p = 0.015$, respectively (see Fig. 5). Similarly, higher PA IIV, controlling for mean PA and number of stressor days, was associated at both waves with higher psychological distress, $\beta = 0.08$, $p = 0.021$ and $\beta = 0.09$, $p = 0.022$, respectively (see Fig. 4), and higher physical ill health, $\beta = 0.09$, $p = 0.016$ and $\beta = 0.10$, $p = 0.012$, respectively (see Fig. 5).

Higher *Congruent* PF and *Complex* PF, controlling for mean affect (PA and NA) and proportion of stressor days, were related to higher psychological distress at Wave 1, $\beta = 0.25$, $p < 0.001$ and $\beta = 0.14$, $p = 0.009$, respectively, but not at Wave 2. There were no statistically significant relationships between *Congruent* or *Complex* PF and physical ill health at either wave. Higher *Dynamic* PF, controlling for mean PA and NA and proportion of stressor days, was related to less psychological distress at Wave 1 but not Wave 2, $\beta = -0.11$, $p = 0.026$ and $\beta = 0.09$, $p = 0.204$, respectively, and to less physical ill health at Wave 1 but not at Wave 2, $\beta = -0.24$, $p < 0.001$ and $\beta = 0.04$, $p = 0.627$, respectively. Figs. 4 and 5 illustrate these relationships.

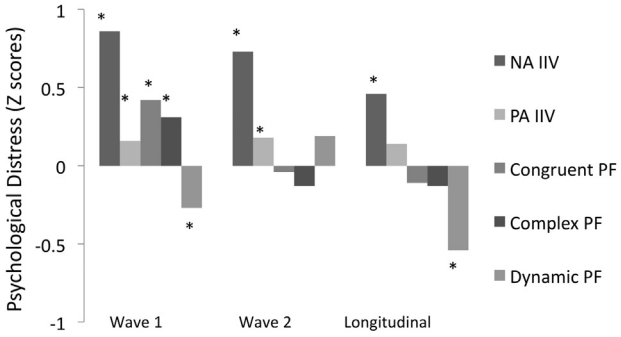

Fig. 4. Concurrent and prospective relationships between IIV or PF and psychological distress. *Note:* NA = Negative Affect, PA = Positive Affect, IIV = Intra-Individual Variability, PF = Psychological Flexibility. Psychological distress scores were plotted using the unstandardized beta weight values for each construct.

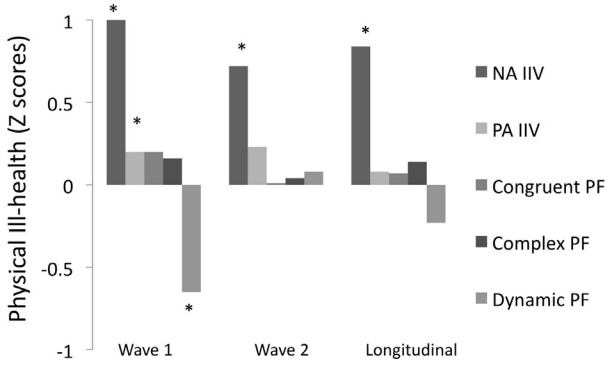

Fig. 5. Concurrent and prospective relationships between IIV or PF and physical ill health. *Note:* NA = Negative Affect, PA = Positive Affect, IIV = Intra-Individual Variability, PF = Psychological Flexibility. Physical ill health distress scores were plotted using the unstandardized beta weight values for each construct.

Table 2
Correlations among mean affect, IIV, and PF at Wave 1 (below diagonal) and Wave 2 (above diagonal).

	1	2	3	4	5	6	7
1. NA mean	–	−0.50*	0.71*	0.26*	0.64*	0.60*	−0.81*
2. PA mean	−0.66*	–	−0.48*	−0.38*	−0.44*	−0.28*	0.23*
3. NA IIV	0.80*	−0.51*	–	0.37*	0.74*	0.66*	−0.56*
4. PA IIV	0.25*	−0.34*	0.39*	–	0.35*	0.13*	−0.13*
5. *Congruent* PF	0.81*	−0.58*	0.78*	0.30*	–	0.73*	−0.33*
6. *Complex* PF	0.74*	−0.30*	0.72*	0.15*	0.85*	–	−0.34*
7. *Dynamic* PF	−0.68*	0.17*	−0.58*	−0.13*	−0.41*	−0.47*	–

Note: NA = Negative Affect, PA = Positive Affect, IIV = Intra-Individual Variability, PF = Psychological Flexibility.
* $p < 0.01$.

Table 3
Concurrent models of psychological distress and physical ill health with all within-person variability predictors.

	Wave 1			Wave 2		
	β	*t*	*p*	*β*	*t*	*p*
Psychological distress						
Wave 1: Model R = 0.52, df = 751						
Wave 2: Model R = 0.47, df = 763						
NA Mean	0.39	9.30	<0.001	0.28	7.15	<0.001
PA Mean	−0.12	2.89	0.004	−0.22	5.63	<0.001
Negative events mean	−0.09	2.70	0.007	−0.04	1.11	0.268
NA IIV	0.08	1.26	0.209	0.25	3.95	<0.001
PA IIV	0.02	0.41	0.685	0.01	0.33	0.745
Congruent PF	0.31	3.69	<0.001	0.14	2.28	0.022
Complex PF	0.08	1.03	0.302	0.16	2.89	0.004
Dynamic PF	−0.16	3.03	0.003	−0.28	3.56	<0.001
Physical ill health						
Wave 1: Model R = 0.10, df = 751						
Wave 2: Model R = 0.31, df = 763						
NA Mean	0.25	5.33	<0.001	0.24	5.70	<0.001
PA Mean	0.04	0.74	0.460	−0.06	1.54	0.123
Negative events mean	−0.10	2.73	0.007	−0.10	2.57	0.010
NA IIV	0.12	1.77	0.077	0.15	2.20	0.028
PA IIV	0.04	0.93	0.352	0.06	1.48	0.138
Congruent PF	0.12	1.27	0.202	0.14	2.10	0.036
Complex PF	0.01	0.06	0.951	0.02	0.32	0.751
Dynamic PF	−0.24	4.11	<0.001	−0.14	1.73	0.084

Note: NA = Negative Affect, PA = Positive Affect, IIV = Intra-Individual Variability, PF = Psychological Flexibility.

Table 4
Prospective models of psychological distress and physical ill health with all within-person variability predictors.

	β	*t*	*p*
Psychological distress			
Model R = 0.52, df = 750			
NA Mean	0.22	4.79	<0.001
PA Mean	−0.16	−3.61	<0.001
Negative events mean	−0.07	1.90	0.057
Psychological distress at Wave 1	0.40	11.01	<0.001
NA IIV	0.12	1.90	0.058
PA IIV	0.02	0.44	0.658
Congruent PF	0.02	0.28	0.777
Complex PF	0.06	0.74	0.457
Dynamic PF	−0.18	3.43	0.001
Physical ill health			
Model R = 0.63, df = 750			
NA Mean	0.26	5.54	<0.001
PA Mean	0.03	0.61	0.542
Negative events mean	0.08	1.98	0.047
Physical ill health at Wave 1	0.59	20.00	<0.001
NA IIV	0.17	3.16	0.002
PA IIV	−0.01	−0.26	0.794
Congruent PF	0.00	0.00	0.999
Complex PF	0.03	0.39	0.698
Dynamic PF	−0.06	1.17	0.244

Note: NA = Negative Affect, PA = Positive Affect, IIV = Intra-Individual Variability, PF = Psychological Flexibility.

Prospective analyses regressed health at Wave 2 on IIV or PF, mean affect and proportion of stressor days, and health at Wave 1. Higher NA IIV at Wave 1 predicted increases in psychological distress and physical ill health 10 years later, $\beta = 0.10$, $p = 0.049$ and $\beta = 0.16$, $p < 0.001$, respectively (See Figs. 4 and 5). PA IIV at Wave 1 was not significantly related to changes in psychological distress or physical ill health, $\beta = 0.09$, $p = 0.109$ and $\beta = -0.01$, $p = 0.239$, respectively.

Neither *Congruent* PF nor *Complex* PF at Wave 1 were significantly related to changes in psychological distress, $\beta = -0.07$, $p = 0.249$ and $\beta = -0.05$, $p = 0.316$, respectively, or physical ill health, $\beta = 0.03$, $p = 0.508$ and $\beta = 0.05$, $p = 0.279$, respectively. Higher *Dynamic* PF at Wave 1 was statistically significantly related to decreased psychological distress, $\beta = -0.21$, $p < 0.001$, but was only marginally related to decreased ill health, $\beta = -0.08$, $p = 0.085$.

Finally, all IIV and PF variables were entered into a single regression model to test whether any of them predicted health above and beyond the others. Results of the concurrent models are shown in Table 3. *Dynamic* PF was a unique predictor of psychological distress at both waves and also the best unique predictor of physical ill health at Wave 1, and marginally so at Wave 2 ($p = 0.08$). NA IIV was a unique predictor of psychological distress at Wave 2, but not Wave 1, and a unique predictor of ill health at Wave 2, and marginally so at Wave 1 ($p = 0.08$). Finally, *Congruent* PF was a unique predictor of psychological distress at both waves and of ill health at Wave 2. In the prospective model, *Dynamic* PF was the only statistically significant unique predictor of psychological distress 10 years later, with higher *Dynamic* PF predicting lower distress over time. NA IIV was the only statistically significant unique predictor of physical ill health 10 years later; NA IIV was a marginal predictor of psychological distress 10 years later ($p = 0.06$). NA IIV predicted worse psychological and physical health over time (see Table 4).

4. Discussion

As evidenced by the present issue of *Journal of Research in Personality*, within-person variability is an area of growing attention both in theoretical models and in empirical investigations. The present investigation focused on four constructs of within-person variability in affect, including IIV, in which all variability is of importance; and three versions of PF, in which only theoretically adaptive variability is of importance: *Congruent* PF (ideally, NA and PA should change in concert, albeit in opposite directions, in response to stressors); *Complex* PF (ideally, NA should change in response to stressors, but PA should not be affected); and *Dynamic* PF (ideally, the relationship between NA and PA should become more unidimensional in response to stressors).

NA IIV and *Dynamic* PF had the best psychometric properties in terms of within- and between-wave reliability. PA IIV had the worst psychometric properties, and *Congruent* and *Complex* PF fell in between. With the exception of PA IIV, most constructs at least approached acceptable reliability (0.60) at one or both waves. The difference between the psychometric properties of NA and PA IIV is of interest; the larger range of PA IIV might suggest less restriction of range and better potential for within- and between-wave correlations, but the opposite appeared to be true. One speculation is that changes in NA are more likely to be due to qualities of the person (e.g., neuroticism; Eid & Diener, 1999, whereas changes in PA are more likely to be due to idiosyncratic events. Future studies that "drill down" into the causes and correlates of IIV in NA and PA could explain differences between them in their psychometric properties.

There were significant interrelationships among constructs at both waves. Most notable was the difference between *Congruent* and *Complex* PF and *Dynamic* PF. At both waves, the former two were positively correlated with each other ($rs = 0.73$–0.85) and IIV (especially NA IIV, $rs = 0.66$–0.78), but both of them and NA IIV were substantially negatively correlated with *Dynamic* PF ($rs = -0.33$ to -0.58). Furthermore, when associations emerged, both of them and IIV were associated with worse health, particularly psychological health, whereas *Dynamic* PF was consistently associated with better health. Adaptive forms of affective PF may be more complex than a congruency between affect and situation. These findings suggest that adaptive affective PF represents a relationship *between* PA and NA that changes with the situation.

The relationship between higher NA IIV and higher psychological distress and physical ill health both concurrently and prospectively is consistent with previous findings (Eid & Diener, 1999; Kuppens et al., 2007; Ram, Gerstorf, Lindenberger, & Smith, 2011). NA IIV appears to be a stable individual difference not just over a couple of months (Eid & Diener, 1999; Röcke, Li, & Smith, 2009) but over a 10 year interval, and it may therefore represent a long-term risk factor for poor health. PA IIV was related to higher psychological distress and ill health concurrently but not prospectively, also consistent with previous findings (Gruber et al., 2013). In general, these findings support the idea that total variability in affective experience indexes maladaptive affective lability, a feature of some forms of psychopathology.

Note that the findings for PA IIV, as well as *Congruent* and *Complex* PF at Wave 2, should be interpreted with caution given their poor reliabilities. Some results may be due to low reliability and stability (e.g., the smaller relationship between *Congruent* PF at Wave 2 compared with Wave 1). One strength of the present study was the ability to compare results of concurrent analyses across two waves: Findings that were robust across waves merit more confidence. These include a negative effect of NA IIV on physical health, a negative effect of *Congruent* PF on psychological health, and a positive effect of *Dynamic* PF on psychological health.

Dynamic PF was one of the strongest predictors of psychological and physical health. In other investigations, affect regulation flexibility moderated the relationship between cumulative life stress and positive psychological adjustment (Westphal et al., 2010), and the ability to both suppress and enhance expression of affect predicted less distress 2 years later (Bonanno et al., 2004). In these laboratory experiments, participants expressed PA and NA in response to positive and negative stimuli within a short period of time under low stress conditions (i.e., watching images). This laboratory task may parallel *Dynamic* PF, in which the ability to experience both PA and NA when stress is low is considered adaptive. Understanding the time course in the relationship between affective experience and stressors is an important next consideration in studies of PF. Furthermore, only one other prospective study has examined the effects of affective PF on distress (Bonanno et al., 2004). The present study adds to this finding, suggesting that PF may be a stable individual difference with long-ranging benefit for health.

Health-enhancing effects of PF may pique interest in possible underlying mechanics of this trait. First, because regulatory flexibility is characterized as a response to the changing needs of a situation (Bonanno & Burton, 2013), context sensitivity is a crucial component of flexibility. The ability to make subtle discriminations among the features of a situation allows for better regulation of responses (Shoda, Mischel, & Wright, 1993). Second, a repertoire of skills allows for different approaches to different situations. Third, after responding, people must evaluate their status with reference to their goal and implement changes to reduce any difference (a discrepancy-reducing feedback loop; Carver & Scheier, 2002). This constellation of sensitivity to the situation, repertoire, and evaluation should, with experience, result in an internal representation or schema that in turn guides adaptive future behavior (Bonanno & Burton, 2013). For example, people with cognitive representations of interpersonal interactions that more closely matched the normative interpersonal circle had more flexible behavior, higher well-being, and higher complementarity in their interpersonal interactions (Tracey & Rohlfing, 2010).

However, people may have adaptive cognitive representations but not the self-regulatory ability to implement the appropriate response. People may know what they would want to do in a particular situation, but they may not act in accordance with what they know is the best response in the actual situation (Erickson, Newman, & Pincus, 2009). Self-regulatory ability may underlie PF, as the ability to attend to a situation and switch responses appropriately is inherently a self-regulatory task. Self-regulatory ability is reflected in resting levels of HRV (Segerstrom & Solberg Nes, 2007), and people with higher HRV showed better congruence between image valence and startle reflex magnitude (an indirect measure of affect) or self-reported affect, suggesting better-regulated emotional responses (Fujimura & Okanoya, 2012; Ruiz-Padial, Sollers, Vila, & Thayer, 2003). Either enhancing or suppressing affective expression resulted in subsequent memory deficits (Bonanno et al., 2004), consistent with a model in which that self-regulation relies on fatigable regulatory resources, and engaging in self-regulation impairs function on a subsequent self-regulatory challenge (Hagger, Wood, Stiff, & Chatzisarantis, 2010; Schmeichel, 2007).

4.1. Limitations and future directions

There were some methodological limitations to this study mostly that were inherent to the NSDE. First, there were a limited number of days assessed at each wave, which limited the options for analyzing reliability. Ideally, Latent State-Trait (LST) analysis would examine the reliability of these constructs (Eid & Diener, 1999). However, LST requires a minimum of at least 12 days for analysis and would be even more effective with more data points. Affective IIV studies have employed a large range of time points, ranging from 5 to upward of 50, with a majority of studies assessing affect at 5–14 time points (Eid & Diener, 1999; Kuppens et al., 2007; Ram et al., 2011). Establishing the minimum number of time points necessary to ensure reliable measurement of IIV and PF comprises an important future direction for research on within-person variability (Estabrook, Grimm, & Bowles, 2012).

Second, affect and negative events were reported once daily. However, affect may vary widely over the course of the day, as may the experience of negative events, and assessment throughout the day may reveal moment-to-moment changes that reflect IIV, PF, or both. Real-time experience sampling to track changes in affect and situation would provide a more refined view of the relationship between the two (Sherman, Rauthmann, Brown, Serfass, & Jones, in press).

Third, only negative events were available at both waves of the NDSE. Inclusion of other kinds of events, such as positive events, in theoretical development and empirical investigations of PF is another future direction. Additionally, features of situations may be more salient than broader categorizations of situations (de Raad, 2004; Edwards & Templeton, 2005; Rauthmann et al., 2014). Using situation feature descriptors, the within-person variation in experiences of situations was larger than between-person variation, suggesting that people experience a wide range of situation features over the course of a day (Sherman et al., in press).

Fourth, an inherent limitation of constructed variables is that components of the variable or statistical artifacts may potentially influence results. As such, we controlled for PA, NA, and situation in the analyses in order to show the effect of PF over and above these components. Although most of the effects of PF persisted after controlling for the individual effects of affect and situation, there is the possibility that some other unidentified artifact affected the flexibility indices.

Fifth, the present study focused only on IIV and PF in affect. Although evidence from studies of IIV suggests that variable people are variable across domains (Timmermans et al., 2010), it is possible that people who have high PF in one domain (e.g., affect) may not be as flexible in other domains (e.g., interpersonal interactions, or coping skills).

Finally, the MIDUS study, while more representative of the US adult population than many others, has limited diversity in both race and education level and may not generalize to specific

subgroups or to other nationalities. On the other hand, focusing on within-person variability on select populations may be revealing. For example, if self-regulation is integral to PF, adult development and life changes could affect PF. Aging, changes in executive function, illness, and chronic pain may all impact self-regulatory capacity (Scheier, Carver, & Armstrong, 2012; Solberg Nes, Carlson, Crofford, de Leeuw, & Segerstrom, 2010; Solberg Nes, Roach, Segerstrom, & Nes, 2009; Von Hippel & Henry, 2011). In the present study, NA IIV was lower with older age ($r = -0.15$), consistent with previous findings (Röcke et al., 2009), whereas *Dynamic* PF was marginally higher with older age ($r = 0.10$). Those experiencing psychological distress, that is, people facing significant emotion regulation challenges, comprise another population of interest.

5. Conclusion

Within-person variability has multiple manifestations with different implications for psychological and physical health. In general, more total variability in affect (IIV) appears to capture emotional lability and is associated with poorer psychological and physiological outcomes. However, PF – within-person variability comprising a patterned, predictable response – represents increased emotional control and is related to better psychological and physical outcomes. Therefore, whether affective within-person variability is found to be adaptive or maladaptive depends on how it is defined.

The substantial literature on IIV will be enhanced by future studies that differentiate between variability that is or is not patterned across situations. Future studies should also draw on theoretical models to predict who benefits from variability, in which situations, and at what points in the life span. Such work will increase our understanding of the dynamic processes of personality and their effects on psychological and physical well-being.

Acknowledgements

This research was supported by the National Institute on Aging – United States Grants K02-AG033629, P01-AG020166, P01-AG0210166-02, and R01-AG19239 and the John D. and Catherine T. MacArthur Foundation Research Network. The authors thank Nilam Ram, Charles Carlson, Thomas Widiger, and Deborah Danner for their helpful suggestions on a previous version of this work.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jrp.2016.04.002.

References

Almeida, D. M., Wethington, E., & Kessler, R. C. (2002). The daily inventory of stressful events an interview-based approach for measuring daily stressors. *Assessment, 9*(1), 41–55. http://dx.doi.org/10.1177/1073191102091006.

Bonanno, G. A., & Burton, C. L. (2013). Regulatory flexibility: An individual differences perspective on coping and emotion regulation. *Perspectives on Psychological Science, 8*, 591–612. http://dx.doi.org/10.1177/1745691613504116.

Bonanno, G., Papa, A., Lalande, K., Westphal, M., & Coifman, K. (2004). The importance of being flexible: The ability to both enhance and suppress emotional expression predicts long-term adjustment. *Psychological Science, 15*(7), 482–487. http://dx.doi.org/10.1111/j.0956-7976.2004.00705.x.

Cacioppo, J. T., & Berntson, G. G. (1994). Relationship between attitudes and evaluative space: A critical review, with emphasis on the separability of positive and negative substrates. *Psychological Bulletin, 115*(3), 401. http://dx.doi.org/10.1037/0033-2909.115.3.401.

Carver, C. S., & Scheier, M. F. (2002). Control processes and self-organization as complementary principles underlying behavior. *Personality and Social Psychology Review, 6*, 304–315. http://dx.doi.org/10.1207/S15327957PSPR0604_05.

Cheng, C. (2001). Assessing coping flexibility in real-life and laboratory settings: A multimethod approach. *Journal of Personality and Social Psychology, 80*(5), 814–833. http://dx.doi.org/10.1037//0022-3514.80.5.814.

Davis, M. C., Zautra, A. J., & Smith, B. W. (2004). Chronic pain, stress, and the dynamics of affective differentiation. *Journal of Personality, 72*, 1133–1159. http://dx.doi.org/10.1111/j.1467-6494.2004.00293.x.

de Raad, B. (2004). Situations that matter to personality. In A. Eliasz, S. E. Hampson, & B. de Raad (Eds.). *Advances in personality psychology* (Vol. 2, pp. 179–204). Hove, United Kingdom: Routledge.

Edwards, J. A., & Templeton, A. (2005). The structure of perceived qualities of situations. *European Journal of Social Psychology, 35*(6), 705–723. http://dx.doi.org/10.1002/ejsp.271.

Eid, M., & Diener, E. (1999). Intraindividual variability in affect: Reliability, validity, and personality correlates. *Journal of Personality and Social Psychology, 76*, 662–676. http://dx.doi.org/10.1037/0022-3514.76.4.662.

Erickson, T. M., Newman, M. G., & Pincus, A. L. (2009). Predicting unpredictability: Do measures of interpersonal rigidity/flexibility and distress predict intraindividual variability in social perceptions and behavior? *Journal of Personality and Social Psychology, 97*(5), 893–912. http://dx.doi.org/10.1037/a0016515.

Estabrook, R., Grimm, K. J., & Bowles, R. P. (2012). A Monte Carlo simulation study of the reliability of intraindividual variability. *Psychology and Aging, 27*, 560–576. http://dx.doi.org/10.1037/a0026669.

Feldman Barrett, L., & Russell, J. A. (1998). Independence and bipolarity in the structure of current affect. *Journal of Personality and Social Psychology, 74*(4), 967. http://dx.doi.org/10.1037/0022-3514.74.4.967.

Fredrickson, B. L., Tugade, M. M., Waugh, C. E., & Larkin, G. R. (2003). What good are positive emotions in crisis? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. *Journal of Personality and Social Psychology, 84*(2), 365–376. http://dx.doi.org/10.1037/0022-3514.84.2.365.

Fujimura, T., & Okanoya, K. (2012). Heart rate variability predicts emotional flexibility in response to positive stimuli. *Psychology, 3*(8), 578–582. http://dx.doi.org/10.4236/psych.2012.38086.

Gruber, J., Kogan, A., Quoidbach, J., & Mauss, I. B. (2013). Happiness is best kept stable: Positive emotion variability is associated with poorer psychological health. *Emotion, 13*(1), 1–6. http://dx.doi.org/10.1037/a0030262.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin, 136*(4), 495–525. http://dx.doi.org/10.1037/a0019486.

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review, 30*(7), 865–878. http://dx.doi.org/10.1016/j.cpr.2010.03.001.

Kuppens, P., Van Mechelen, I., Nezlek, J. B., Dossche, D., & Timmermans, T. (2007). Individual differences in core affect variability and their relationship to personality and psychological adjustment. *Emotion, 7*(2), 262–274. http://dx.doi.org/10.1037/1528-3542.7.2.262.

Mroczek, D. K., & Kolarz, C. M. (1998). The effect of age on positive and negative affect: A developmental perspective on happiness. *Journal of Personality and Social Psychology, 75*(5), 1333. http://dx.doi.org/10.1037/0022-3514.75.5.1333.

Nesselroade, J. R. (2001). Intraindividual variability in development within and between individuals. *European Psychologist, 6*(3), 187–193. http://dx.doi.org/10.1027//1016-9040.6.3.187.

Penner, L. A., Shiffman, S., Paty, J. A., & Fritzsche, B. A. (1994). Individual differences in intraperson variability in mood. *Journal of Personality and Social Psychology, 66*, 712–721. http://dx.doi.org/10.1037/0022-3514.66.4.712.

Ram, N., Conroy, D., Pincus, A., Hyde, A., & Molloy, L. (2013). Tethering theory to method: Using measures of intraindividual variability to operationalize individuals' dynamic characteristics. In J. R. Harring & G. R. Hancock (Eds.), *Advances in longitudinal methods in the social and behavioral sciences* (pp. 81–110). Charlotte, NC: Information Age Publishing.

Ram, N., & Gerstorf, D. (2009). Time-structured and net intraindividual variability: Tools for examining the development of dynamic characteristics and processes. *Psychology and Aging, 24*(4), 778–791. http://dx.doi.org/10.1037/a0017915.

Ram, N., Gerstorf, D., Lindenberger, U., & Smith, J. (2011). Developmental change and intraindividual variability: Relating cognitive aging to cognitive plasticity, cardiovascular lability, and emotional diversity. *Psychology and Aging, 26*(2), 363–371. http://dx.doi.org/10.1037/a0021500.

Rauthmann, J. F., Gallardo-Pujol, D., Guillaume, E. M., Todd, E., Nave, C. S., Sherman, R. A., & Funder, D. C. (2014). The situational eight DIAMONDS: A taxonomy of major dimensions of situation characteristics. *Journal of Personality and Social Psychology, 107*, 677–718. http://dx.doi.org/10.1037/a0037250.

Röcke, C., & Brose, A. (2013). Intraindividual variability and stability of affect and well-being. *GeroPsych: The Journal of Gerontopsychology and Geriatric Psychiatry, 26*(3), 185–199. http://dx.doi.org/10.1024/1662-9647/a000094.

Röcke, C., Li, S. C., & Smith, J. (2009). Intraindividual variability in positive and negative affect over 45 days: Do older adults fluctuate less than young adults? *Psychology and Aging, 24*(4), 863. http://dx.doi.org/10.1037/a0016276.

Ruiz-Padial, E., Sollers, J. J., Vila, J., & Thayer, J. F. (2003). The rhythm of the heart in the blink of an eye: Emotion-modulated startle magnitude covaries with heart rate variability. *Psychophysiology, 40*, 306–313. http://dx.doi.org/10.1111/1469-8986.00032.

Russell, J. A., & Carroll, J. M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin, 125*(1), 3. http://dx.doi.org/10.1037/0033-2909.125.1.3.

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*(6), 1069. http://dx.doi.org/10.1037/0022-3514.57.6.1069.

Scheier, M., Carver, C., & Armstrong, G. (2012). Behavioral self-regulation, health and illness. In A. Baum, T. Revenson, & J. Singer (Eds.), *Handbook of health psychology* (2nd ed., pp. 79–97). New York, NY: Psychology Press.

Schmeichel, B. J. (2007). Attention control, memory updating, and emotion regulation temporarily reduce the capacity for executive control. *Journal of Experimental Psychology, 136*(2), 241–255. http://dx.doi.org/10.1037/0096-3445.136.2.241.

Segerstrom, S. C., Hardy, J. K., Evans, D. R., & Winters, N. F. (2011). "Pause and plan": Self-regulation and the heart. In G. Gendolla & R. Wright (Eds.), *How motivation affects cardiovascular response: Mechanisms and applications*. Washington, DC: American Psychological Association Press.

Segerstrom, S. C., & Solberg Nes, L. (2007). Heart rate variability reflects self-regulatory strength, effort, and fatigue. *Psychological Science, 18*(3), 275–281. http://dx.doi.org/10.1111/j.1467-9280.2007.01888.x.

Sherman, R. A., Rauthmann, J. F., Brown, N. A., Serfass, D. G., & Jones, A. B. (in press). The independent effects of personality and situations on real-time expressions of behavior and emotion. *Journal of Personality and Social Psychology*. http://dx.doi.org/10.1037/pspp0000036 (in press).

Shoda, Y., Mischel, W., & Wright, J. (1993). The role of situational demands and cognitive competencies in behavior organization and personality coherence. *Journal of Personality and Social Psychology, 65*(5), 1023–1035. http://dx.doi.org/10.1037/0022-3514.65.5.1023.

Sin, N. L., Graham-Engeland, J. E., Ong, A. D., & Almeida, D. M. (2015). Affective reactivity to daily stressors is associated with elevated inflammation. *Health Psychology, 34*(12), 1154–1165.

Solberg Nes, L., Carlson, C. R., Crofford, L. J., de Leeuw, R., & Segerstrom, S. C. (2010). Self-regulatory deficits in fibromyalgia and temporomandibular disorders. *Pain, 151*(1), 37–44. http://dx.doi.org/10.1016/j.pain.2010.05.009.

Solberg Nes, L., Roach, A. R., Segerstrom, S. C., & Nes, L. S. (2009). Executive functions, self-regulation, and chronic pain: A review. *Annals of Behavioral Medicine, 37*(2), 173–183. http://dx.doi.org/10.1007/s12160-009-9096-5.

Timmermans, T., Van Mechelen, I., & Kuppens, P. (2010). The relationship between individual differences in intraindividual variability in core affect and interpersonal behaviour. *European Journal of Personality, 24*, 623–638. http://dx.doi.org/10.1002/per.756.

Tracey, T. (2005). Interpersonal rigidity and complementarity. *Journal of Research in Personality, 39*, 592–614. http://dx.doi.org/10.1016/j.jrp.2004.12.001.

Tracey, T., & Rohlfing, J. (2010). Variations in the understanding of interpersonal behavior: Adherence to the interpersonal circle as a moderator of the rigidity-psychological well-being relation. *Journal of Personality, 78*(2), 711–746. http://dx.doi.org/10.1111/j.1467-6494.2010.00631.x.

Tugade, M. M., & Fredrickson, B. L. (2004). Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology, 86*(2), 320–333. http://dx.doi.org/10.1037/0022-3514.86.2.320.

Von Hippel, W., & Henry, J. (2011). Aging and self-regulation. In K. Vohs & R. Baumeister (Eds.), *Handbook of self-regulation: Research, theory and applications* (2nd ed., pp. 321–335). New York, NY.

Wang, P. S., Berglund, P., & Kessler, R. C. (2000). Recent care of common mental disorders in the United States. *Journal of General Internal Medicine, 15*(5), 284–292. http://dx.doi.org/10.1046/j.1525-1497.2000.9908044.x.

Watson, D., & Clark, L. A. (1997). Measurement and mismeasurement of mood: Recurrent and emergent issues. *Journal of Personality Assessment, 68*(2), 267–296. http://dx.doi.org/10.1207/s15327752jpa6802_4.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063.

Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin, 98*(2), 219.

Waugh, C. E., Thompson, R. J., & Gotlib, I. H. (2011). Flexible emotional responsiveness in trait resilience. *Emotion, 11*(5), 1059–1067. http://dx.doi.org/10.1037/a0021786.

Westphal, M., Seivert, N. H., & Bonanno, G. (2010). Expressive flexibility. *Emotion, 10*(1), 92–100. http://dx.doi.org/10.1037/a0018420.

Yung, Y. F., & Chang, W. (1999). Statistical analyses using bootstrapping: Concepts and implementation. In R. H. Hoyle (Ed.), *Statistical strategies for small sample research* (pp. 81–105). Thousand Oaks, CA: Sage.

Zautra, A. J., Smith, B. W., Affleck, G., & Tennen, H. (2001). Examinations of chronic pain and affect relationships: Applications of a dynamic model of affect. *Journal of Consulting and Clinical Psychology, 69*(5), 786–795. http://dx.doi.org/10.1037/0022-006X.69.5.786.