

# Linking Positive Affect and Positive Self-beliefs in Daily Life

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**Abstract** This study investigated the reciprocal relations between positive self-beliefs (POS) and positive affect (PA) using week-long diaries kept by 268 undergraduate Italian psychology students. An autoregressive latent trajectory analysis was found to be the best statistical model explaining the links between POS and PA. POS and PA levels remained stable over 7 days and they were positively correlated suggesting positive associations between stability in PA and POS across the 7 days. Interestingly, the analysis of cross-lagged paths revealed that the state-like deviations in POS levels significantly predicted later levels of PA, whereas the state-like deviations in PA levels did not predict later levels of POS at all time points. Theoretical and practical implications of these results were discussed.

**Keywords** Positive affect · Positive self-beliefs · Positivity · Positive orientation · ALT model

## 1 Introduction

The recurrent experience of positive affect (PA), defined as “the extent to which a person feels enthusiastic, active, and alert” (see Watson et al. 1988, p. 1063), is at the core of contemporaneous research on happiness (Kanheman et al. 1999). Whereas people can experience intense positive affect at one time or another, only people who are successful at sustaining positive affect are more likely to live a happy life (Diener et al. 1991; Fredrickson and Cohn 2008). The recurrent experience of positive emotions leads human being

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to function well in life, to be socially well-adjusted and productive (Diener 2000; Judge and Bono 2001; Sallquist et al. 2012). Findings from clinical and non clinical samples different empirical studies and samples have shown how recurrent PA counteracts the pernicious effect of negative affect and depression by promoting a state of perceived health and well-being (Davis et al. 2004; Reich and Zautra 2002). Additionally, PA fluctuations have been posited at the core of psychological disorder such as borderline personality disorder (Koenigsberg et al. 2002) and post-traumatic stress disorder (Litz et al. 2000). Over the life course, the recurrent experience of PA has been associated with many positive healthy outcomes through its effects on social relationships (Neyer and Asendorpf 2001), cognition (Fredrickson and Branigan 2005; Rowe et al. 2007), coping (McCrae and Costa 1986), and resiliency (Fredrickson et al. 2003). In addition, PA has been associated with indexes of positive physiological functioning (e.g., cardiovascular, endocrine, and immune systems; Pressman and Cohen 2005) and health (Mroczek and Spiro 2005). All in all, empirical studies attest that people experiencing PA evaluate themselves and others positively, behave in a more confident, optimistic, and generous ways in interpersonal situations (Forgas 2002; Sedikides 1995), and construe experiences and life events in a more favorable light (Lyubomirsky and Ross 1999; Lyubomirsky and Tucker 1998) than unhappy people.

Despite the fact that there is a large body of research on the relations between positive self-beliefs (e.g., feelings of agency, life satisfaction) and PA (see Fredrickson and Cohn 2008), most of this literature has primarily relied on experimental studies analyzing the specific flow of influences between those variables rather than examining their reciprocal relations during the course of individual daily life. Although experimental studies can offer rigorous explanations in terms of causality between positive self-beliefs and PA (e.g., Sheldon and Lyubomirsky 2006), the complex and reciprocal dynamic linking of cognition and PA can be further deepened by longitudinal studies that take into account their mutual influence over time (although longitudinal studies cannot always establish the direction of causality). The present study was designed to fill this gap in the literature. In particular, we examined the reciprocal influence that positive self-beliefs and PA can have on each other during a week of individual's everyday life.

### 1.1 Personal Determinants of PA

Viewing people as agents endowed with the capacities for self-awareness, self-reflection, and self-regulation leads one to connect emotions, including PA, with cognitions (Bandura 1997). As feelings and emotions largely derive from the meanings people assign to events, one would speculate that the daily PA probably reflects more than people's life experiences or the enduring consequences of basic temperament. As it stands, negative and positive schemata have been often invoked to explain the within-individuals recurrence of affective states. For example, cognitive models of depression (Beck 1967) suggest that individuals holding negative cognitions in terms of a negative view of one's self, one's life, and one's future are prone to negative affect and ultimately to depression (Lewinsohn et al. 1981).

From a similar perspective, positive self-referent evaluations that predispose individuals to assign affective value to their life are expected to promote and stabilize their general well-being (Tomy and Cummins 2011). In this regard, some scholars have recently highlighted the role of positive orientation (POS), a stable personality trait leading individuals to view oneself, one's life, and one's future under a positive outlook (Caprara et al. 2010a, c). Empirically, POS is reflected by high levels of self-esteem, life-satisfaction, and optimism, three well-studied constructs in the psychological literature. POS influences the

enduring knowledge structures about oneself and the world and significantly affects one's feelings and actions, shapes the present, and predisposes one's future experiences (Caprara et al. 2009). Like PA, POS has a large genetic core (Caprara et al. 2009), wide generality across languages and cultures (Caprara et al. 2012), and predictive power over and above its constituent constructs, such as self-esteem, life satisfaction, and optimism (Alessandri et al. 2012a, c). The basic tenet of POS theory is that viewing oneself, life, and the future under a positive outlook helps people in coping with life, despite adversities, failures, and loss (Caprara et al. 2009).

Whereas recurrent PA represents a dimension of the affective experience that includes pleasant feelings like happiness, joy, excitement, enthusiasm, or contentment (Watson et al. 1988), POS concerns pervasive and stable judgments about one's self, life, and the future (Caprara et al. 2009). From a theoretical point of view, a general POS has a fundamental adaptive function because most people would have difficulty facing the experiences of coping with the adversities of life if not equipped with the basic beliefs that they are worthy of regard, that life is worth living, and that the future is promising (Caprara et al. 2009; Cummins and Nistico 2002). Similar to the conceptualization that the lack of POS makes people vulnerable to depression (Beck 1967), a very high level of POS may be associated with being overly optimistic (Colvin et al. 1995). Thus both extremes may expose people to greater risks. A moderate level of POS, instead, likely enhances progress and well-being (see Caprara et al. 2012; Tonym and Cummins 2011).

## 1.2 The Present Study

In the present research, we investigated the relations between recurrent PA and positive cognitions as they unfolded during an entire week. Past empirical studies (see, for example, Alessandri et al. b) demonstrated that PA and POS are characterized both by substantive degrees of trait (long-term fluctuations) and state (short-term fluctuations variance). We used a daily diary method to capture people's emotional experiences and cognitions in order to unravel their meaningful long-term and short-term fluctuations and connections within everyday life. At the end of each of day, participants were asked to reflect upon the current day, and to fill out a brief series of psychological instruments that captured their feelings and thinking during that day. After creating a series of daily records, the availability of repeated measures allowed us to study the flow of daily relations between the two constructs. Whereas daily fluctuations capture the intra-individual oscillation on the subjective level of POS and PA from 1 day to another, overall fluctuations refers to the instability of POS and PA observed on the entire sample during the week of interest. We expected a significant degree of stability between POS and PA from 1 day to another (e.g., PA assessed on Monday will significantly predict PA assessed on Tuesday, and so on), and a significant association between PA and POS (e.g., Lyubomirsky 2001; Ryan and Deci 2001).

Our primary hypothesis was that fluctuations in POS would predict fluctuation in PA on a day-to-day basis. By examining the relations between PA and POS across 7 weekdays we hope to contribute to build a more refined theory of the relations between cognition and emotions from the individuals perspective. Whether PA is a cause or a consequence of POS is a relevant question. Indeed, if PA predicted POS (and not vice versa), the positive life perspective reflected by positively oriented individuals could simply be considered a result of the experience of positive emotions, or, stated more simply, a landmark of the state of pleasantness denoting happiness. Thus, if POS rests on PA, it could be considered as a cognitive epiphenomenon generated by happiness. In contrast, if POS predicted PA,

increasing POS would have a beneficial effect on the quality of an individual's emotional life as experienced day by day. Ultimately, increasing POS would likely enhance the experienced level of individual's well being. In the present research we investigated these alternative hypotheses with multiple-wave longitudinal data, which are recommended to derive hints of causality from non-experimental data (Cole and Maxwell 2003).

## 2 Method

### 2.1 Participants

Participants were 271 undergraduates enrolled in two introductory psychology classes attending a university in Rome Italy. The average age of participants was 20.85 years ( $SD = 3.15$ ). Students received partial course credit for participating. Of the 271 participants who began the study, 3 participants were excluded due to failure to complete daily measures for at least 3 days. Analyses were conducted using the 268 remaining participants (mostly female, 79 %). Two hundred and thirty-seven participants provided daily measures for all 7 days, whereas 36 participants missed 1 day and 5 participants missed 2 days.

### 2.2 Procedure

Along with other measures not relevant to the present study, participants' basic socio-demographic characteristics were collected 2 weeks before the beginning of the diary. Participants completed a daily version of the POS scale (P-scale, Caprara et al. 2012) and the frequency version of the positive affect scale of the PANAS (Watson et al. 1988) online at 24-h intervals (from 8:00 to 12:00 p.m.) for 7 consecutive days (i.e., from Monday to Sunday). To enhance study participation, participants received an e-mail reminder at 7:55 p.m. each day with a link to a website to complete the daily scales. This approach prevented participants from completing more than a single report in a day, an advantage of web-based diary studies over most paper and pencil diary studies.

#### 2.2.1 Daily Positive Orientation

Following the general procedure outlined by Mehl et al. (2012) for measuring psychological constructs on a daily basis, participants were asked to complete a modified version of the P-scale each day. The P-Scale has been recently introduced as a short reliable instrument to directly assess POS. Across five studies Caprara et al. (2012) demonstrated good convergent validity with the latent construct of POS, temporal stability, and cross-cultural invariance of the instrument. The P-Scale (Caprara et al. 2012) was modified so that participants were instructed to give the response that best reflected how they felt at the moment they completed the measure. Examples of items were: "I have great faith in the future", and "I feel I have many things to be proud of". Participants responded using scales that ranged from 1 (strongly disagree) to 5 (strongly agree). Alpha coefficients (see Table 1) varied from .81 (Friday) to .86 (Thursday).

**Table 1** Descriptive statistics and correlations for the study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Sex	F(1,271)		
	Mean	SD																
1. PA1	.81															3.26	.67	3.37
2. PA2	.34**	.80														3.09	.73	3.23
3. PA3	.42**	.54**	.79													3.13	.76	3.86
4. PA4	.25**	.38**	.45**	.80												3.05	.81	2.90
5. PA5	.34**	.26**	.33**	.46**	.80											3.15	.75	.74
6. PA6	.27**	.30**	.33**	.24**	.44**	.82										3.01	.77	2.92
7. PA7	.42**	.27**	.26**	.41**	.46**	.40**	.81									3.13	.84	.31
8. POS1	.50**	.25**	.23**	.16**	.15**	.15**	.28**	.83								3.60	.69	.36
9. POS2	.33**	.46**	.30**	.18**	.16**	.12	.29**	.60**	.85							3.60	.67	.09
10. POS3	.32**	.36**	.47**	.18**	.15*	.18**	.23**	.59**	.66**	.84						3.66	.68	.01
11. POS4	.37**	.33**	.33**	.42**	.26**	.12	.33**	.54**	.58**	.61**	.86					3.66	.72	.07
12. POS5	.33**	.14*	.15*	.17**	.35**	.25**	.31**	.52**	.49**	.52**	.64**	.81				3.72	.75	.12
13. POS6	.23**	.22**	.23**	.10	.19**	.41**	.47**	.42**	.43**	.46**	.51**	.59**	.80			3.63	.74	.08
14. POS7	.24**	.17**	.05	.35**	.25**	.09	.40**	.43**	.39**	.29**	.44**	.59**	.51**	.85		3.60	.69	.18

\*\*  $p < .01$ ; \*  $p < .05$ ; Alpha coefficients are on the main diagonal; PA = Positive affect; POS = Positive orientation. Sex = main effect of sex; F = ANOVA Fischer's Ratio. Degrees of freedom are in brackets. 1 = Monday; 2 = Tuesday; 3 = Wednesday; 4 = Thursday; 5 = Friday; 6 = Saturday; Sunday

### 2.2.2 Positive Affect

Subjects' positive affect was measured with the daily form of the Positive and Negative Affect Schedule (PANAS; Watson et al. 1988). For the present study we used only the 10-items "positive affect" section of the PANAS including terms such as "active" and "attentive". Participants were asked to indicate the extent to which they had experienced a range of positive emotions throughout the day by using a 5-point scale that ranged from 1 (*very slightly or not at all*) to 5 (*extremely*). Alpha coefficients across the week (Table 1) varied from .79 (Wednesday) to .82 (Saturday).

### 2.3 Data Analytic Strategy

To investigate our research question, we employed an integrative Autoregressive-Latent-Trajectory (ALT) model. The ALT model was introduced by Bollen and Curran (2004) as a way to combine two otherwise exclusive statistical models: autoregressive (Cole and Maxwell 2003) and latent growth models (Meredith and Tisak 1990). Both models have advantages and disadvantages because each approach considers the analysis of repeated measure from a different perspective. Autoregressive models (AR) use cross-lagged regression paths to unravel the likely direction of influence among processes occurring at the same time (Cole and Maxwell 2003). Autoregressive paths link a variable assessed at different time points. Latent growth models (LGMs) have been introduced as an extension of structural equation models to explain intra-individual changes observed at the mean level. As such, LGMs include an intercept (i.e., the initial level) and a slope (i.e., the change over time). The comprehensive ALT model combines the advantages of AR and LGM (Bollen and Curran 2004) and allows one to simultaneously study overall constructs trajectories and their inter-relationships, and the time-specific influences between repeated measures. Whereas the interpretation of the LGM is straightforward, as noticed by Morin et al. (2011) "the AR structures take another meaning in ALTs, being based on the state-like residuals of the LGM part, and thus do not directly reflect inter-individual rank order stability" (p. 9). Instead, it should be interpreted as "reflecting the impact of individual state-like deviations from the overall trajectories on the remaining time points" (p. 9). More detail about the implementation and the steps involved in testing the model are offered in "Appendix".

### 2.4 Model Evaluation

To investigate the fit of our model, Structural Equation Modeling (SEM) was used as the general modeling framework. Parameters were estimated by Maximum Likelihood using *Mplus* 7.1 (Muthén and Muthén 2012). Missing data were handled using Full Information Maximum Likelihood, which draws on all available data to estimate model parameters without imputing missing values (Kline 2010). The following criteria were used to evaluate the goodness of fit:  $\chi^2$  likelihood ratio statistic, Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA) with associated confidence intervals, and the Root Mean Square Residuals Standardized (SRMR). We accepted CFI values  $>.95$ , RMSEA values  $<.08$ , and SRMR  $<.08$  (Kline, 2010).

### 3 Results

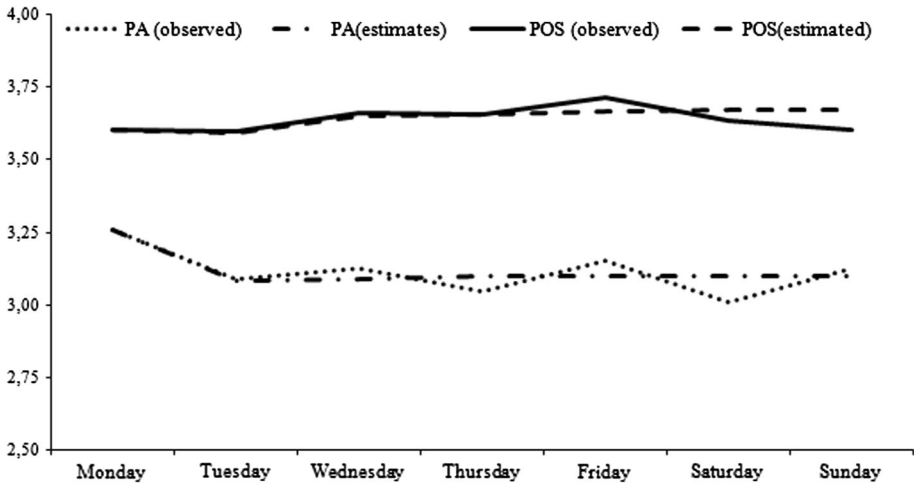
Whereas POS and PA are different constructs, it is nonetheless informative to investigate the degree of empirical overlapping among measures of both constructs. To this aim, a principal factor analysis with Promax rotation was performed at each assessment time. According to the scree-plots, the four analyses yielded a two-factor structure corresponding to the hypothesized two domains of positivity, and to positive affect at each assessment time. The actual item loadings on the intended factors ranged from .44 to .90 ( $M = .50$ ;  $SD = .18$ ) across the seven assessment times, whereas the secondary loading varied from .01 to .14 ( $M = .10$ ;  $SD = .08$ ) across the seven assessment times. Factor correlations ranged from .29 to .42 across the two assessments. These analyses supported (1) the factorial validity of the two measures, (2) the empirical separateness of POS and PA, and (3) the lack of empirical overlapping among items measuring POS and PA, as revealed by the low secondary loadings.

The descriptive statistics and correlations of all variables are reported in Table 1. These results show that, across the 7 days, PA and POS were moderately related to one another and quite stable over time. Furthermore, individual scores on PA and on PO were not statistically different for males and females (Fig. 3).

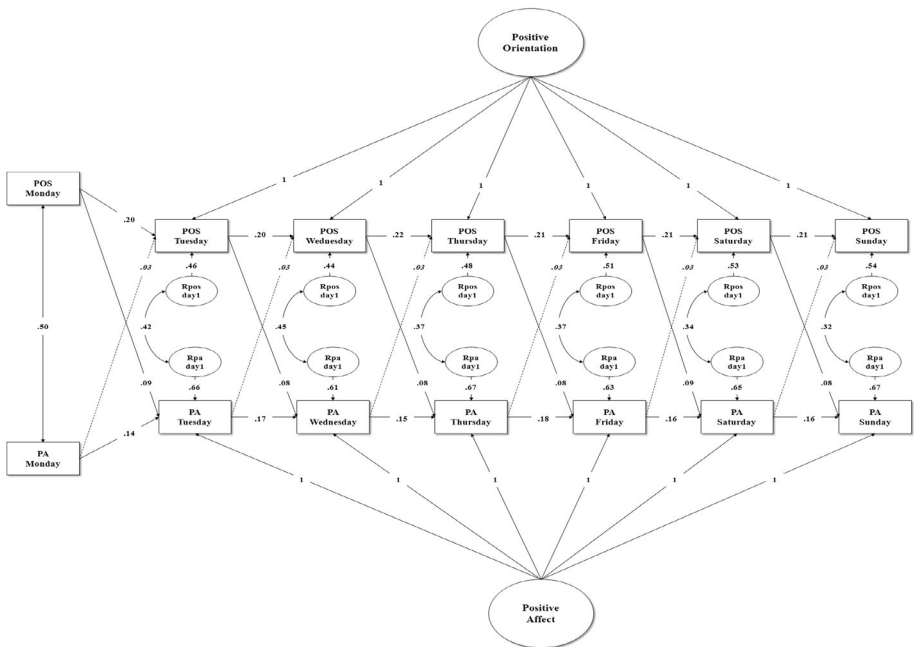
The trajectory of POS and PA over the 7-days are presented in Fig. 1 and showed a substantial stability. The ALT model provided an adequate fit to the data and was preferable to Multivariate AR and LGM models (see “Appendix”). As depicted in Fig. 1, this model consist of only two latent factors, or the intercepts factors explaining the observed covariation among the seven indicators of POS and the seven indicators of PA. Thus, individuals’ scores on PO and PA were highly stable across the week. Respectively, the latent intercepts represent the individual average levels of POS or PA as observed across the week. This relatively high level of stability was fully expected, in light of the brief time lag from an assessment to the other. We also observed a significant degree of inter-individual variability (see Table 2 presented below in Appendix, Models 5–8) along with an absolute degree of intra-individual stability over time (except for a random error). A close inspection of Fig. 1 reveal differences between the estimated intercept factor and the first measurement point for both PA (3.26 vs. 2.24) and POS (3.60 vs. 2.79). These discrepancies reflect the fact that in ALTs, the intercept represents the portion of the Time-2 variable remaining unexplained by the Time-1 variable. Intercepts for both PA and POS were moderately and significantly correlated ( $\phi = .33$ ,  $t = 2.82$ ), suggesting associations between stability in PA and POS across the 7 days. PA at T1 was significantly correlated to PA intercept ( $\phi = .52$ ,  $t = 8.04$ ), and POS intercept ( $\phi = .42$ ,  $t = 6.78$ ). Likewise, POS at T1 was significantly correlated to POS intercept ( $\phi = .73$ ,  $t = 18.96$ ) and PA intercept ( $\phi = .23$ ,  $t = 2.62$ ).<sup>1</sup> Furthermore, the results revealed that time-specific covariances between the uniquenesses of both constructs, which represents the individual specific state on POS or PA on that specific day of the week, were significant and moderate in size. All in all, these results indicate a moderate level of covariation between experiences of PA and POS states within each day that remain stable over time.

Finally, the analysis of autoregressive and cross-lagged effects revealed that the association of state-like deviations in PA levels with later levels of PA and state-like deviations in POS with later levels of POS were small but significant and stable over time. Importantly, at all time points, state-like deviations in PA levels did not

<sup>1</sup> We use the Greek letter of  $\phi$  to refer to covariances. These parameters are represented by double headed arrows in Fig. 2.



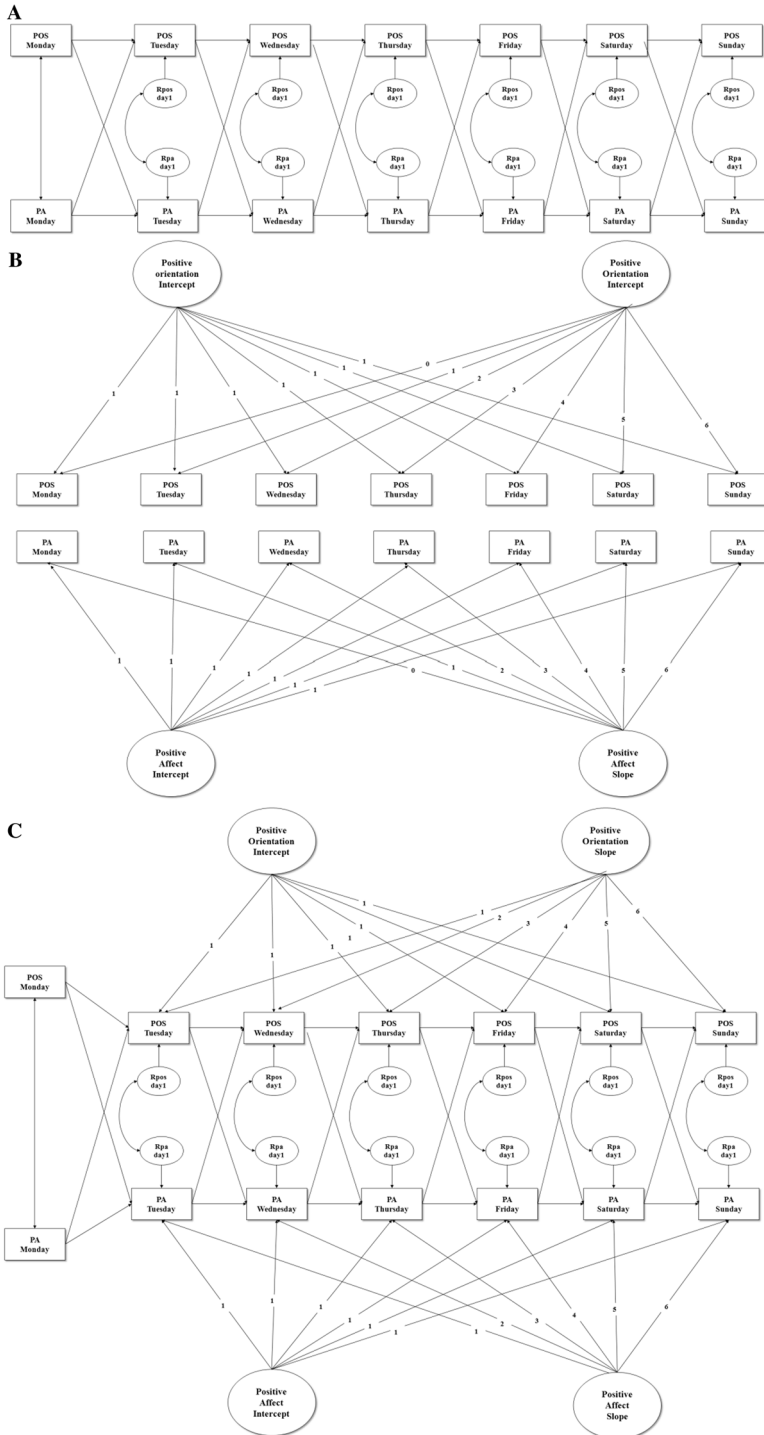
**Fig. 1** Observed and estimated means for positive affect and positive orientation across the 7-days



**Fig. 2** The final model with standardized parameter estimates. *Note* All parameters were significant ( $p < .05$ ) except those in italics. *Solid lines* represent significant paths, and *dotted lines* represent nonsignificant paths. Parameters for intercepts were unstandardized. The correlations between the first time points, intercepts and slope of both processes are excluded from the figure and reported in the text. *PA* positive affect, *POS* positive orientation

significantly predict later levels of POS. In contrast, the ability of state-like deviations in POS levels to predict later levels of PA resulted in small but significant effects stemming from POS to PA over time. These findings suggest that the presence of





**Fig. 3** Diagrammatical representations of the autoregressive model (a) latent growth model (b), and of the autoregressive-latent-growth model (c). *PA* positive affect, *POS* positive orientation

unidirectional relations between POS and PA from a day to the next, but the reverse was not true.

#### 4 Discussion

In this study, we investigated the role of one's own positive self-beliefs in promoting positive affective states. We found that PA and POS were not completely trait-like constructs (i.e., constructs changing slowly and in the long run) nor were they simple correlated states (i.e., constructs fluctuating on a day to day basis). Similar to the majority of other psychological constructs, PA and POS have both trait and state components, which, in our analyses were respectively captured by the LGM (i.e., the intercept) and the AR models. Of interest, both trait and state components of PA and POS were positively and significantly correlated, although the meaning of these correlations was different. Indeed, at the trait level (i.e., the latent intercepts' level), our results implied that individuals experiencing recurrent PA were mostly positive individuals, although there was no way to reliably disentangle the likely direction of influence. At the state level (i.e., the observed scores' level), our results suggested that PA states were common in days in which individuals perceived themselves more positively.

Where our model becomes informative about the way in which PA and POS promote each other over time is in the cross-lagged part of the model. Despite the fact that AR are currently thought to be rigorous ways to investigate direction of influence among variables over time (Cole and Maxwell 2003), longitudinal data do not permit strong causal inferences. However, the strong and consistent directional pattern of associations supports the existence of a positive flow of influences stemming from POS to PA, and not vice versa. These effects were small, but nonetheless significant when we controlled for the autoregressive effect and for mean-level changes. Although the POS effects were small, they may accumulate to meaningful differences over prolonged prod of time, such as weeks or months. The selected 1-day timeframe can be thus considered a very strong test-bench to investigate the relations between POS and PA. It is likely that is the accumulation of effects rather than their apparent size to make the difference in the present case.

These results have implications for theories positing positive emotions, and PA in particular, as major determinants of adjustment and health (Lyubomirsky et al. 2005). In particular, our results further sustain those theoretical views claiming that promoting and sustaining positive self-beliefs is an effective way to enhance individual's general states of health and well-being (e.g., Taylor and Brown 1988). It seems likely from our data that PA rests, at least in part, on POS. Of interest, our results further confirm previous insight from cognitive models that posit that diminished positive attitude toward the self, the life, and the surrounding world, instead, has been deemed as typical of mildly depressed individuals (Beck 1967; Lewinsohn et al. 1981). Our results further point out that holding positive self-beliefs has productive effects, promoting positive affective feelings, rather than only being limited to preserve one's psychological health. Thus, it seems that positive self-beliefs may be involved in the early phases of the upward spirals leading to emotional adjustment and well being (Fredrickson and Joiner, 2002). Of course, more replication studies and more data are necessary to further strengthen this conclusion.

Cummins and Nistico (2002) have argued that that well-being homeostasis is controlled by positive cognitive biases pertaining to the self, the future, and the degree of perceived control over the world. According to this view, people facing with a negative event are inclined to resort to their positive cognitive lens to reinterpret the event, thereby

**Table 2** Model fitting results

	$\chi^2$	Df	CFI	RMSEA	CI	CM	$\Delta\chi^2$	Adf	P
M1—Autoregressive, full model	269.87	60	.848	.112	.098–.125	–	–	–	–
M2—LGM, full model	322.62	89	.84	.097	.085–.108	–	–	–	–
M3—ALT, full model	74.81	50	.983	.041	.019–.016	–	–	–	–
M4—ALT, nested LCM model	186.33	87	.928	.064	.051–.076	M4vsM3	111.52	37	<.01
M5—ALT, no slope variance on POS	78.01	51	.979	.045	.024–.063	M5vsM3	3.2	1	.07
M6—ALT, no slope on POS	81.732	57	.982	.039	.017–.057	M6vsM5	2.012	6	.92
M7—ALT-6 + no slope variance on PA	83.999	58	.981	.04	.018–.058	M7vsM6	2.267	1	.13
M8—ALT-6 + no slope on PA	87.495	63	.982	.037	.015–.055	M8vsM6	5.763	6	.45
M9—ALT-7 + no time-specific uniquenesses correlations	237.621	69	.878	.093	.080–.106	M9vsM7	153.622	11	<.01
M10—ALT-7 + fixed time-specific uniquenesses correlations	103.132	69	.974	.043	.026–.059	M10vsM7	19.133	11	.06
M11—ALT-10 + fixed autoregressions for POS	113.774	74	.971	.044	.027–.061	M11vsM10	1.642	5	.06
M12—ALT-10 + fixed autoregressions for PA	120.86	79	.968	.044	.028–.059	M12vsM10	17.73	10	.06
M13—ALT-12 + fixed POS → PA regressions	130.58	84	.965	.045	.030–.060	M13vsM12	9.72	5	.08
M14—ALT-13 + fixed PA → POS regressions	131.75	89	.963	.045	.031–.059	M14vsM13	1.17	5	.07

maintaining well being. In a similar vein, Baumeister (1989) proposed that optimal psychological functioning is associated with a “slight to moderate” degree of distortion in one’s perception of the self and the world. We believe that most of the positive distortions with which people face the world rest upon the basic predisposition of POS. Indeed, previous studies attest to significant association between POS and well known self-serving positive evaluations, such as the better than average effect (Caprara et al. 2013). It seems likely that POS operates as an adaptive protective device that allows individuals to face the challenges of everyday life by leading individuals to indulge on the positive side of life when called to interpret everyday events.

As it stands, experiences of PA are significantly related to states of POS, but POS states increases the likelihood of experiencing PA states. Assigning POS a crucial role in promoting and enhancing PA opens new avenues to both research and practice concerned with promoting human potentials and strengths. Whereas recent findings suggest that POS, although stable, is malleable to change (Caprara et al. 2010b), there is a limited understanding of the specific mechanisms leading positive individuals to experience more positive emotions. For example, positive individuals may be characterized by a higher ability to savor the little things in life (Bryant 2003), may avoid encoding negative aspects of events (Seidnitz and Diener 1993), or ruminate less on one’s deficiencies and problems (Lyubomirsky et al. 1998). By using one or more of these mechanisms, these individuals may be better able to maintain, or even to augment, their positive experiences.

We acknowledge some limitations of the present research. Although POS and PA rest on a set of subjective evaluations that are not easily accessible other than through self-reports, other methods such as implicit measures, clinical interviews, and reports from other informants would be useful complements to the use of self report data. In addition, our sample was slanted toward including well-educated participants and more females than males. Moreover, future studies should replicate our results when daily life-events and other variables able to affect cognition like personality traits are taken into account. Finally, to assess PA, we used the PANAS measure, that did not contain adjective assessing deactivated PA. Notwithstanding these limitations, we believe that our study contributes to the understanding of the relation between POS and recurrent PA as they unfold during daily lives. The study also illustrates the advantages of a new statistical technique (i.e., ALT) in order to fully capture the intra-individual and inter-individual fluctuations over an entire week and offers interesting practical implications in order to improve subjective well-being by enhancing one’s own positive cognitions.

## Appendix

Usually, the ALT model is identified by assuming (similar to a conventional AR model) that the variable at the first measurement point is an exogenous variable not influenced by the estimated trajectory factors or the other measurement points. However, this variable can be correlated with the latent intercept and slope parameters. Furthermore, rules of implementation require several steps (Bollen and Curran 2004): (1) multivariate AR (Fig. 3a), (2) LGMs (Fig. 3b), and (3) ALT (Fig. 3c) models. Although AR, LGM and ALT model were not nested, we compared the fit of the ALT model with that of a more parsimonious model in which the autoregressive and cross-lagged parameters were fixed to zero (Morin et al. 2011). This model allowed us to test the plausibility for the autoregressive and cross-lagged structure of the state-like deviations of both constructs (Bollen and Curran 2004). Then, following procedures recommended by Bollen and Curran (2004)

we proceeded with fixing sequentially for each construct at a time by (1) zeroing the variance of the slope and (2) removing the slope. Once done, we proceed to (3) exclude correlated within time residuals, (4) constrain within-time residuals to equality, (5) constrain autoregressive paths to equality, (6) include lagged paths, and (7) constrain cross-lagged paths to equality. Tests 1–3 investigate the relevance of specific part of the model, and thus the worthiness to include them in the model. Finally, constraining cross-lagged paths to equality allowed us to identify if the reciprocal relations among the state-like deviations of both constructs remain the same over the 7-days or if they change at specific time point (e.g., during the week-end, Ryan et al. 2010).

To investigate the fit of different alternative models we followed procedures already presented in the paragraph “Model evaluation”. The results from the various multivariate models are reported in Table 2. The ALT model provided an adequate fit to the data and was preferable to simpler Multivariate AR and LGM models. This model can be further refined by taking out the slope factors from both PA and POS without significantly changing the overall fit of the model. Results also revealed that the inclusion of within-time residuals and autoregressive paths was necessary and that all regression parameters could be constrained to equality without worsening the fit of the model (Table 2, see results Models 9–14). Of importance, all parameters in the model may be constrained to be equal over time without significantly degrading the fit of the model (model 14).

### Advantages of the ALT Model Over Classical ANOVA and Multiple Regression

The ALT model have a number of advantages over the standard repeated measures ANOVA or multiple regression designs. Moreover, it can be shown, under certain circumstances, that these latter design is a special case of the ALT model. In particular, although individual differences may be present in the ANOVA or multiple regression, change occurs at the group level; that is, if there is change, everyone is impacted in the same fashion. Moreover, trait and state effects are not represented in the classical ANOVA and multiple regression models. Furthermore, the random error variances are homogeneous (i.e., they are equal at every time of measurement) in the ANOVA. Other obvious merits of the ALT model are to allows one to (1) introduce antecedents and consequences of growth factors (i.e., intercepts and slopes), (2) to consider plausible explanations for individual states (by introducing predictors of observed variables), (3) to control parameter estimates for biases introduced by measurement error.

### References

- Alessandri, G., Caprara, G. V., & Tisak, J. (2012a). Further explorations on the unique contribution of positive orientation to optimal functioning. *European Psychologist*, *17*, 44–45. doi:10.1027/1016-9040/a000070.
- Alessandri, G., Caprara, G. V., & Tisak, J. (2012b). A unified latent curve, latent state-trait analysis of the developmental trajectories and correlates of positive orientation. *Multivariate Behavioral Research*, *47*, 341–368. doi:10.1080/00273171.2012.673954.
- Alessandri, G., Vecchione, M., Tisak, J., DeIana, G., Caria S., & Caprara, G.V. (2012). The contribution of positivity to predict job performance and organizational citizenship behaviors. *Applied Psychology: An International Review*. doi:10.1111/j.1464-0597.2012.00511.x.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Baumeister, R. F. (1989). The optimal margin of illusion. *Journal of Social and Clinical Psychology*, *8*, 176–189. doi:10.1521/jscp.1989.8.2.176.
- Beck, A. T. (1967). *Depression: Clinical, experimental, and theoretical aspects*. New York: Harper & Row.

- Bollen, K. A., & Curran, P. J. (2004). Autoregressive latent trajectory (ALT) models: A synthesis of two traditions. *Sociological Methods and Research*, *32*, 336–383. doi:10.1177/0049124103260222.
- Bryant, F. B. (2003). Savoring beliefs inventory (SBI): A scale for measuring beliefs about savouring. *Journal of Mental Health*, *12*, 175–196. doi:10.1080/0963823031000103489.
- Caprara, G. V., Alessandri, G., & Barbaranelli, C. (2010a). Optimal functioning: Contribution of self-efficacy beliefs to positive orientation. *Psychotherapy and Psychosomatics*, *79*, 328–330. doi:10.1159/000319532.
- Caprara, G. V., Alessandri, G., Colaiaco, F., & Zuffianò, A. (2013). Dispositional bases of self-serving positive evaluations. *Personality and Individual Differences*, 864–867. doi:10.1016/j.paid.2013.07.465.
- Caprara, G. V., Alessandri, G., Eisenberg, N., Kupfer, A., Steca, P., Caprara, M. G., et al. (2012). The positivity scale. *Psychological Assessment*, *24*, 701–712. doi:10.1037/a0026681.
- Caprara, G. V., Alessandri, G., Trommsdorff, G., Heikamp, T., Yamaguchi, S., & Suzuki, F. (2010b). Positive orientation across countries. *Journal of Cross Cultural Psychology*, *43*, 77–83. doi:10.1177/0022022111422257.
- Caprara, G. V., Fagnani, C., Alessandri, G., Steca, P., Gigantesco, A., Cavalli Sforza, L. L., et al. (2009). Human optimal functioning: The genetics of positive orientation towards self, life, and the future. *Behaviour Genetics*, *39*, 277–284. doi:10.1007/s10519-009-9267-y.
- Caprara, G. V., Steca, P., Alessandri, G., Abela, J. R. Z., & McWhinnie, C. M. (2010c). Positive orientation: Explorations on what is common to life satisfaction, self-esteem, and optimism. *Epidemiologia e psichiatria Sociale*, *19*, 63–71. doi:10.1017/S1121189X00001615.
- Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modelling. *Journal of Abnormal Psychology*, *112*, 558–577. doi:10.1037/0021-843X.112.4.558.
- Colvin, C. R., Block, J., & Funder, D. C. (1995). Overly positive self-evaluations and personality: Negative implications for mental health. *Journal of Personality and Social Psychology*, *68*, 1152–1162. doi:10.1037/0022-3514.68.6.1152.
- Cummins, R. A., & Nistico, H. (2002). Maintaining life satisfaction: The role of positive cognitive bias. *Journal of Happiness Studies*, *3*, 37–69. doi:10.1023/a:1015678915305.
- 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. doi:10.1111/j.1467-6494.2004.00293.x.
- Diener, E. (2000). Subjective well-being: The science of happiness, and a proposal for a national index. *American Psychologist*, *55*, 34–43. doi:10.1037/0003-066X.55.1.34.
- Diener, E., Sandvik, E., & Pavot, W. (1991). Happiness is the frequency, not the intensity, of positive versus negative affect. In F. Strack, M. Argyle, & N. Schwartz (Eds.), *Subjective well-being: An interdisciplinary perspective* (pp. 119–139). Oxford, UK: Pergamon.
- Forgas, J. P. (2002). Feeling and doing: Affective influences on interpersonal behavior. *Psychological Inquiry*, *13*, 1–28. doi:10.1207/s15327965pli1301\_01.
- Fredrickson, B. L., & Branigan, C. (2005). Positive emotions broaden the scope of attention and thought-action repertoires. *Cognition and Emotion*, *19*, 313–332. doi:10.1080/0269930441000238.
- Fredrickson, B. L., & Cohn, M. A. (2008). Positive emotions. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (pp. 777–796), 3rd Edn. New York: Guilford Press.
- Fredrickson, B. L., & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being. *Psychological Science*, *13*, 172–175. doi:10.1111/1467-9280.00431.
- 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*, 365–376. doi:10.1037/0022-3514.84.2.365.
- Judge, T. A., & Bono, J. E. (2001). Relationship of core self-evaluations traits—self-esteem, generalized self-efficacy, locus of control, and emotional stability—with job satisfaction and job performance: A meta-analysis. *Journal of Applied Psychology*, *86*, 80–92. doi:10.1037/0021-9010.86.1.80.
- Kanhegan, D., Diener, E., & Schwarz, N. (Eds.). (1999). *Well-being: The foundations of hedonic psychology*. New York: Russell Sage.
- Kline, R. B. (2010). *Principles and practice of structural equation modelling*. New York: The Guilford Press.
- Koenigsberg, H. W., Harvey, P. D., Mitropoulou, V., Schmeidler, J., New, A. S., Goodman, M., et al. (2002). Characterizing affective instability in borderline personality disorder. *The American Journal of Psychiatry*, *159*, 784–788. doi:10.1176/appi.ajp.159.5.784.
- Lewinsohn, P. M., Steinmetz, J. L., Larson, D. W., & Franklin, J. (1981). Depression related cognitions: Antecedent or consequence? *Journal of Abnormal Psychology*, *90*, 213–219. doi:10.1037/0021-843X.90.3.213.

- Litz, B. T., Orsillo, S. M., Kaloupek, D., & Weathers, F. (2000). Emotional processing in posttraumatic stress disorder. *Journal of Abnormal Psychology, 109*, 26–39. doi:10.1037/0021-843X.109.1.26.
- Lyubomirsky, S. (2001). Why are some people happier than others?: The role of cognitive and motivational processes in well-being. *American Psychologist, 56*, 239–249. doi:10.1037/0003-066X.56.3.239.
- Lyubomirsky, S., Caldwell, N. D., & Nolen-Hoeksema, S. (1998). Effects of ruminative and distracting responses to depressed mood on the retrieval of autobiographical memories. *Journal of Personality and Social Psychology, 75*, 166–177. doi:10.1037/0022-3514.75.1.166.
- Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131*, 803–855. doi:10.1037/0033-2909.131.6.803.
- Lyubomirsky, S., & Ross, L. (1999). Changes in attractiveness of elected, rejected and precluded alternatives: A comparison of happy and unhappy individuals. *Journal of Personality and Social Psychology, 76*, 988–1007. doi:10.1037/0022-3514.76.6.988.
- Lyubomirsky, S., & Tucker, K. L. (1998). Implications of individual differences in subjective happiness for perceiving, interpreting and thinking about life events. *Motivation and Emotion, 22*, 155–186. doi:10.1023/A:1021396422190.
- McCrae, R. R., & Costa, P. T. (1986). Personality, coping, and coping effectiveness in an adult sample. *Journal of Personality, 54*, 385–405. doi:10.1111/j.1467-6494.1986.tb00401.x.
- Mehl, M. R., Conner, T. S., & Csikszentmihalyi, M. (Eds.). (2012). *Handbook of research methods for studying daily life*. New York: Guilford Press.
- Meredith, W., & Tisak, J. (1990). Latent curve analysis. *Psychometrika, 55*, 107–122. doi:10.1007/BF02294746.
- Morin, A. J. S., Maiano, C., Marsh, H. W., Janosz, M., & Nagengast, B. (2011). The longitudinal interplay of adolescents' self-esteem and body image: A conditional autoregressive latent trajectory analysis. *Multivariate Behavioral Research, 46*, 157–201. doi:10.1080/00273171.2010.546731.
- Mroczek, D. K., & Spiro, A. (2005). Change in life satisfaction during adulthood: Findings from the Veterans affairs normative aging study. *Journal of Personality and Social Psychology, 88*, 189–202. doi:10.1037/0022-3514.88.1.189.
- Muthén, L., & Muthén, B. (2012). *Mplus user's guide*. Los Angeles, CA: Muthén & Muthén.
- Neyer, F. J., & Asendorpf, J. B. (2001). Personality–relationship transaction in young adulthood. *Journal of Personality and Social Psychology, 81*, 1190–1204. doi:10.1037/0022-3514.81.6.1190.
- Pressman, S. D., & Cohen, S. (2005). Does positive affect influence health? *Psychological Bulletin, 131*, 925–971. doi:10.1037/0033-2909.131.6.925.
- Reich, J. W., & Zautra, A. J. (2002). Arousal and the relationship between positive and negative affect: An analysis of the data of Ito, Cacioppo, and Lang (1998). *Motivation and Emotion, 26*, 209–222. doi:10.1023/A:1021773013487.
- Rowe, G., Hirsh, J. B., & Anderson, A. K. (2007). Positive affect increases the breadth of attentional selection. *Proceedings of National Academy of Sciences, 104*, 383–388. doi:10.1073/pnas.0605198104.
- Ryan, R. M., Bernstein, J. H., & Brown, K. W. (2010). Weekends, work, and well-being: Psychological need satisfactions and day of the week effects on mood, vitality, and physical symptoms. *Journal of Social and Clinical Psychology, 29*, 95–122. doi:10.1521/jscp.2010.29.1.95.
- Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Reviews of Psychology, 52*, 141–166. doi:10.1146/annurev.psych.52.1.141.
- Sallquist, J., DiDonato, M. D., Hanish, L. D., Martin, C. L., & Fabes, R. A. (2012). The importance of mutual positive expressivity in social adjustment: Understanding the role of peers and gender. *Emotion, 12*, 304–313. doi:10.1037/a0025238.
- Sedikides, C. (1995). Central and peripheral self-conceptions are differentially influenced by mood: Tests of the differential sensitivity hypothesis. *Journal of Personality and Social Psychology, 69*, 759–777. doi:10.1037/0022-3514.69.4.759.
- Seidlitz, L., & Diener, E. (1993). Memory for positive versus negative events: Theories for the differences between happy and unhappy persons. *Journal of Personality and Social Psychology, 64*, 654–664. doi:10.1037/0022-3514.64.4.654.
- Sheldon, K. M., & Lyubomirsky, S. (2006). How to increase and sustain positive emotion: The effects of expressing gratitude and visualizing best possible selves. *The Journal of Positive Psychology, 1*, 73–82. doi:10.1080/17439760500510676.
- Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin, 103*, 193–210. doi:10.1037/0033-2909.103.2.193.
- Tomyn, A. J., & Cummins, R. A. (2011). Subjective well-being and homeostatically protected mood: Theory validation with adolescents. *Journal of Happiness Studies, 12*, 897–914. doi:10.1007/s10902-010-9235-5.
- 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*, 1063–1070. doi:10.1037/0022-3514.54.6.1063.