

## Flourishing, Languishing, and Depressed Postdoctoral Fellows: Differences in Stress, Anxiety, and Depressive Symptoms

Christian T. Gloria (Department of Health Sciences, Hawaii Pacific University, USA) and Mary A. Steinhardt\* (Department of Kinesiology and Health Education, The University of Texas at Austin, USA)

\*Corresponding author. Email: msteinhardt@austin.utexas.edu

### Abstract

Based on the broaden-and-build theory of positive emotions, researchers discovered tipping points predicting whether individuals were flourishing, languishing, or depressed in life. These tipping points were based on a positivity ratio, calculated as the proportion of one's experienced positive and negative emotions. Individuals who were flourishing reported positivity ratios greater than 2.9, while languishing individuals reported scores at or below 2.9. Those who reported a ratio below 1.0 had clinically significant levels of depressive symptoms, and thus were classified as depressed. Studies have examined the utility of the positivity ratio, and findings supported these tipping points as related to a number of health indicators such as job performance, marital satisfaction, coping, and depression. The present study surveyed a sample of postdoctoral research fellows ( $n = 200$ ) to determine if the classifications of positivity (*viz.*, flourishing, languishing, and depressed) distinguished differences in reported stress, trait anxiety, and depressive symptoms. MANOVA results provided further support for the utility and generalizability of the positivity ratio, as the data revealed significant differences in stress, trait anxiety, and depressive symptoms among flourishing, languishing, and depressed postdocs. Flourishing postdocs demonstrated the lowest mean scores, while depressed postdocs recorded the highest.

**Keywords:** broaden-and-build theory, positivity, stress, emotions, anxiety, depression.

### Introduction

According to the broaden-and-build theory of positive emotions, positive emotions have the ability to enhance one's health and quality of life (Fredrickson 2001, 2004, 2005). Individuals who experience higher frequencies of positive emotions—such as love, gratitude, contentment, and joy—are generally more adaptive to stressful situations (Tugade and Fredrickson 2004, Gloria et al. 2013), demonstrate greater resilience (Cohn et al. 2009), have reduced risks of morbidity and mortality (Fredrickson and Levenson 1998, Danner et al. 2001), and are more likely to flourish in life (Fredrickson and Losada 2005, Fredrickson 2006). In contrast, those who experience fewer positive emotions and more negative emotions—such as fear, anger, sadness, and shame—tend to be less satisfied with life, are more likely to develop physical as well as psychological illnesses (Kiecolt-Glaser et al. 2002, Gallo and Matthews 2003), and have increased absenteeism and reduced productivity at the workplace (Penney and Spector 2005).

Researchers have discovered that the proportion of one's experienced positive and negative emotions—referred to as positivity ratio—has a predictive ability in distinguishing between individuals who flourish or languish in life. Fredrickson and Losada (2005) found that a positivity ratio of 2.9 served as a reliable cutoff score or a tipping point between flourishing and languishing individuals. Those who reported positivity ratios greater than 2.9 were classified as flourishing because they were satisfied with life, had a sense of fulfillment, were able to bounce back effectively from stressful situations, and felt as though things in their lives were going as or better than expected; in other words, having a positivity ratio above 2.9 was considered "the good life" (Fredrickson 2009). However, those who reported experiencing positivity ratios at or below 2.9 were considered to be

languishing in life. These individuals described life as unsatisfactory, unfulfilled, or stagnating; they were burdened by feelings of being "stuck in a rut" or that "the grass was greener on the other side." Moreover, individuals who reported a positivity ratio less than 1.0—in which negative emotions were experienced more frequently than positive emotions—had a sense of being overwhelmed by difficult life conditions and described life as a struggle "to keep their heads above water." These persons typically have clinically significant levels of depressive symptoms and were therefore classified as depressed (Schwartz et al. 2002, Fredrickson 2009).

A growing number of studies using an array of settings and samplings continue to confirm the utility of the positivity ratio in identifying individuals who flourish, languish, or are depressed. For instance, researchers have examined the utility of the ratio with samples of college students (Fredrickson 2006), employees (Rego et al. 2011), public school teachers, and military spouses (Faulk et al. 2012, 2013). These studies all found that the classifications of positivity significantly revealed differences in how individuals adapted to and bounced back from stressful situations, as well as differences in reported health and well-being. Further, in addition to individuals, the positivity ratio also has been useful in measuring interpersonal and organizational well-being (Fredrickson 2009, Fincham and Beach 2010). Researchers have found that long-lasting healthy marriages, as well as flourishing organizations, seem to follow a similar tipping point—a ratio greater than 2.9 (Fredrickson 2009).

To our knowledge, no studies have examined the applicability of the positivity ratio toward the population of postdoctoral research fellows (postdocs). Postdocs, ironically, are an overlooked and understudied population. It has been reported that the work and life conditions of postdocs are inundated by constant exposures to high levels of stress (Smaglik 2006, Small 2012). Often characterized as neither a faculty nor a student, postdocs tend to fall in the cracks and consequently receive neither

the recognition nor the benefits that they feel are deserved (e.g., control over their work/funding, and health insurance for self and family; Aschwanden 2006, Smaglik 2006). They also often report having feelings of fear, uncertainty, pressure, and lack of security due to the impermanence of their employment, high work expectations, as well as the extreme competitiveness of the job market (i.e., low supply, high demand for ideal jobs such as tenure-track professors/researchers; Woolston 2002, Davis 2009, Kaplan 2012). Considering these points, is it not surprising that postdocs describe their work and life as extremely stressful, and often filled with feelings of anxiety and depression.

Despite these grim reports, according to the broaden-and-build theory of positive emotions, positive emotions have the potential to help postdocs deal more effectively with their stressors. Therefore, the purpose of the present study was to examine if groups of flourishing, languishing, and depressed postdocs significantly differ from each other in scores of stress, trait anxiety, and depressive symptoms. It was hypothesized that (a) flourishing individuals would report the lowest levels of stress, trait anxiety, and depressive symptoms; (b) depressed individuals would report the highest levels of stress, trait anxiety, and depressive symptoms; and (c) languishing individuals would report scores in between the flourishing and depressed groups.

## Methods

### Participants and Procedures

Participants were recruited from a pool of postdocs who were employed at a large research institution in Texas. The email addresses of potential participants ( $n = 523$ ) were obtained from the institution's human resources office, and recruitment letters were sent via email inviting postdocs to voluntarily participate in a Qualtrics online survey that required approximately 30 minutes to complete. The sample selection method did not have exclusion criteria, except that participants must be currently employed under a postdoctoral fellowship appointment during the time of data collection.

In order to enhance the survey response rate, a variety of incentive prizes were offered (Deutskens et al. 2004). Each participant was compensated with a \$5 Starbucks gift card, a deck of inspirational quote cards (\$2 value), and an Individual Feedback Profile document which provided a confidential report of the participant's results as well as an anonymous summary of the sample's aggregate results. In addition, participants were entered into a lottery drawing for a number of larger prizes (e.g., restaurant gift cards valued from \$10 to \$50, iPod Shuffles, and Amazon Touch Kindles); one prize was awarded for every 15 surveys completed. The present study was approved by the Institutional Review Board.

### Measures

The online survey assessed participants' demographic characteristics, positivity, stress, trait anxiety, and depressive symptoms. Each of these variables is further discussed in the following sections, and a copy of the

survey may be requested from the corresponding author.

**Demographics.** Participants were asked to report a variety of personal characteristics including age, sex, race/ethnicity, marital status, number of children, college/school (i.e., location of employment), employment length, and nationality (i.e., country of origin).

**Positivity.** The value of positivity represents the ratio of one's experienced positive emotions over negative emotions (Fredrickson and Losada 2005), and these emotions were measured by the 20-item Modified Differential Emotions Scale (mDES; Fredrickson et al. 2003, Fredrickson 2009). Ten of the scale's items assessed the participants' positive emotions (e.g., amused, hopeful, inspired, and proud) while the remaining 10 items examined negative emotions (e.g., angry, distrust, fearful, and overwhelmed).

On a five-point scale ranging from 0 to 4 (never to most of the time), respondents indicated to what extent they experienced various feelings and emotions over the past two weeks. For instance, a sample positive emotion item stated, "In the past two weeks, I have felt grateful, appreciative, or thankful." A sample negative emotion item stated, "In the past two weeks, I have felt sad, downhearted, or unhappy." Positive emotion items rated at least a score of 2 (some of the time) and negative emotion items rated at least a score of 1 (hardly) were tallied according to these asymmetric criteria in order to account for positivity offset and negativity bias (Fredrickson and Losada 2005). Positivity offset represents the notion that most people usually feel at least mild levels of positive emotions throughout their day-to-day activities (Cacioppo et al. 1999); on the other hand, negativity bias represents the idea that negative events have more weight and thus have stronger impacts than positive events (Cacioppo et al. 1999, Baumeister et al. 2001).

The positivity score, ranging from 0 to 10 points, was calculated by dividing the sum of the tallied positive emotion items with the sum of the tallied negative emotion items; if the sum of the negative emotion items was "0," it was recoded to "1" to prevent errors related to division by zero (Fredrickson 2009). Postdocs with positivity ratios greater than 2.9 were classified as flourishing individuals; those with ratios from 1.0 to 2.9 were considered languishing; and individuals with ratios below 1.0 were considered depressed. According to previous research, the internal reliability of the positive emotions subscale of the mDES was  $\alpha = .78$ , while the negative emotions subscale had a coefficient of  $\alpha = .69$  (Fredrickson et al. 2003); the present study recorded greater reliability scores on both the positive ( $\alpha = .87$ ) and negative emotions subscales ( $\alpha = .88$ ).

**Stress.** This variable was assessed using the 10-item Perceived Stress Scale (PSS-10; Cohen and Williamson 1988), which measured the appraised stressfulness of the respondent's life situations. The scale items asked participants to rate how often stressful events occurred

during the past month on a five-point scale from 0 (never) to 4 (very often). Sample items include "How often have you been upset because of something that happened unexpectedly?," "How often have you felt that you were unable to control the important things in your life?," and "How often have you felt difficulties were piling up so high that you could not overcome them?" The stress score was calculated as the sum of the 10 items, ranging from 0 to 40, with higher scores representing higher levels of stress. Previous research found the internal reliability of the PSS-10 to range from acceptable ( $\alpha = .78$ ) to excellent ( $\alpha = .91$ ; Cohen and Janicki-Deverts 2012), and the reliability from the present study was estimated at  $\alpha = .86$ .

**Trait anxiety.** The 20-item trait anxiety subscale of the State-Trait Anxiety Inventory for Adults (STAI; Spielberger et al. 1968, 1977) was used to measure the participants' tendency to appraise stressful events as threatening and thus respond with heightened levels of state anxiety reactions (Spielberger et al. 1983). Using a four-point scale ranging from 1 (almost never) to 4 (almost always), participants responded to items including, "I feel nervous and restless," "I feel like a failure," and "I get in a state of tension or turmoil as I think over my recent concerns and interests." Scores for this variable were calculated as the sum of the 20 items; scores ranged from 20 to 80, with higher scores representing higher levels of trait anxiety. Researchers cautioned that having a trait anxiety score of 43 or higher could signify the presence of an anxiety disorder (Van Dam et al. 2011). The trait anxiety subscale demonstrated very good to excellent internal reliability, with Cronbach's alphas ranging from .89 to .91 (Spielberger et al. 1983); the present study also recorded an excellent reliability score at  $\alpha = .91$ .

**Depressive symptoms.** The Center for Epidemiologic Studies Depression (CES-D) scale was used to assess the participants' level of experienced depressive symptoms (Radloff 1977). Consisting of 20 items, the instrument assessed how often respondents felt a variety of depressive symptoms during the previous week. Using a four-point scale ranging from 0 (rarely or none of the time; less than 1 day) to 3 (most or all of the time; 5-7 days), participants responded to statements such as "I was bothered by things that usually don't bother me," "I did not feel like eating; my appetite was poor," and "I had trouble keeping my mind on what I was doing." The CES-D score was calculated as the sum of the 20 items, ranging from 0 to 60, with higher scores representing higher levels of experienced depressive symptoms. A score of 16 or greater is considered a moderately severe level of symptoms and could be a marker for clinical depression (Radloff 1977). Previous research found the internal consistency of the scale ranged from good to excellent ( $\alpha = .85-.90$ ; Radloff 1977), and the present study also demonstrated very good reliability at  $\alpha = .86$ .

#### Data Analyses

All analyses were completed using the Statistical Package for the Social Sciences (SPSS) software version 21, and mean substitution was used to replace missing data.

**Descriptive statistics and correlations.** Means, standard deviations, and bivariate correlations of all study variables were calculated using descriptive statistics, Pearson correlations for continuous variables, point-biserial correlations for continuous and dichotomous variables, and chi-square tests for pairs of dichotomous variables.

**Multivariate analysis of variance.** A one-way between-groups multivariate analysis of variance (MANOVA) was performed to examine differences in reported stress, trait anxiety, and depressive symptoms among the varying levels of positivity. The independent variable, positivity, was classified into three groups (viz., flourishing, languishing, and depressed) according to the criteria scores determined by Fredrickson and Losada (2005). Using the procedures detailed by Pallant (2010), preliminary examinations of statistical assumptions were conducted to evaluate normality, univariate and multivariate outliers, linearity, homogeneity of regression, multicollinearity and singularity, and homogeneity of variance-covariance matrices. Post-hoc pairwise comparisons were performed using Tukey's Honestly Significant Difference (HSD) method; in the instance that equal variances were not assumed, the Games-Howell test was instead used. Cohen's *d* was calculated to estimate the effect size of group differences.

## Results

### Descriptive Analysis

Data collection was conducted over a period of two weeks and the study obtained a final sample size of  $n = 200$  postdocs (38% response rate). This response rate exceeded expectations as previous studies with similar methods recorded lower return rates ranging from 17% to 25% (Sax et al. 2003, Deutskens et al. 2004, Evans and Mathur 2005); a meta-analysis of 56 web-based surveys from 39 studies reported an average response rate of 35% (Cook et al. 2000).

Participants were primarily male (59.5%) with a mean age of 32 years, ranging from 26 to 52 years. In terms of race/ethnicity, 63.5% were non-Hispanic White or Caucasian, 18% Asian or Pacific Islander, 8.5% Hispanic or Latino, 7% Indian or South Asian, 0.5% Black or African American, and 2.5% other. The majority were married (59.5%), 31% were single, 7% were living with a partner, and the remaining 2.5% were either divorced or separated. Their family sizes ranged from having zero to four children; 71% had no children, 18.5% had one, 6% had two, 4% had three, and one participant had four children. The participants were employed as postdocs for an average of 1.5 years, and ranged from 1 year to 6 years and 8 months. The majority worked in the college of natural sciences (48.5%), 20% in engineering, 7.5% in liberal arts, 5.5% in geosciences, 5% in pharmacy, and the remaining were in communication, education, public affairs, social work, or other. Most of the postdocs were from the United States (US; 50.5%), 10.5% China, 6.5% India, 4% South Korea, 3.5% United Kingdom, 3% Canada, and the remaining were from 25 other countries around the globe.

**Table 1.** Means, standard deviations (SD), and bivariate correlations for all variables ( $n = 200$ ).

Variable	Mean	SD	S	TA	DS	A	NC	EL	F	M	NS	W	US
Stress (S)	16.21	5.76	--										
Trait Anxiety (TA)	39.66	9.09	.76***	--									
Depressive Symptoms (DS)	10.53	7.54	.72***	.75***	--								
Control													
Age (A) <sup>a</sup>	32.06	3.71	-.03	-.04	.00	--							
Number of Children (NC)	.45	.82	-.02	-.11	-.13	.45***	--						
Employment Length (EL)	1.50	1.23	.05	.09	.04	.26***	.15*	--					
Female (F) <sup>†</sup>	--	--	.02	-.03	-.07	-.03	-.00	-.16*	--				
Married (M) <sup>†</sup>	--	--	-.05	-.13	-.19**	.13	.43***	.15*	.04	--			
Natural Sciences (NS) <sup>bt</sup>	--	--	-.11	-.06	-.10	.01	.06	.21**	-.01	.11	--		
White (W) <sup>†</sup>	--	--	-.08	-.09	.01	.03	.10	.02	.08	-.08	-.03	--	
US American (US) <sup>†</sup>	--	--	-.03	-.03	.05	-.01	.03	.02	.19**	-.03	.04	.49***	--

<sup>a</sup> $n = 197$ ; <sup>b</sup> $n = 199$

<sup>†</sup>Sex (Female = 1, Male = 0); Marital Status (Married = 1, Unmarried = 0); College/School (Natural Sciences = 1, Other = 0);

Race/Ethnicity (White = 1, Other = 0); Nationality (US = 1, Other = 0).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Prior to correlation analyses, multiple-category demographic variables were collapsed into binary variables to produce appropriately sized groups: marital status (1 = married, 0 = unmarried), college/school (1 = natural sciences, 0 = other), race/ethnicity (1 = non-Hispanic White/Caucasian, 0 = other), and nationality (1 = from US, 0 = other). Age, number of children, and employment length were retained as continuous variables. Table 1 displays the means, standard deviations, and correlations for all study variables. The analysis indicated strong correlations between stress and trait anxiety ( $r = .76$ ,  $p < .001$ ), stress and depressive symptoms ( $r = .72$ ,  $p < .001$ ), as well as trait anxiety and depressive symptoms ( $r = .75$ ,  $p < .001$ ).

Among the demographic control variables, no significant associations were found with any of the focal dependent variables except for marital status. Results showed that, on average, married postdocs experienced fewer depressive symptoms than those who were unmarried ( $r = -.19$ ,  $p < .01$ ).

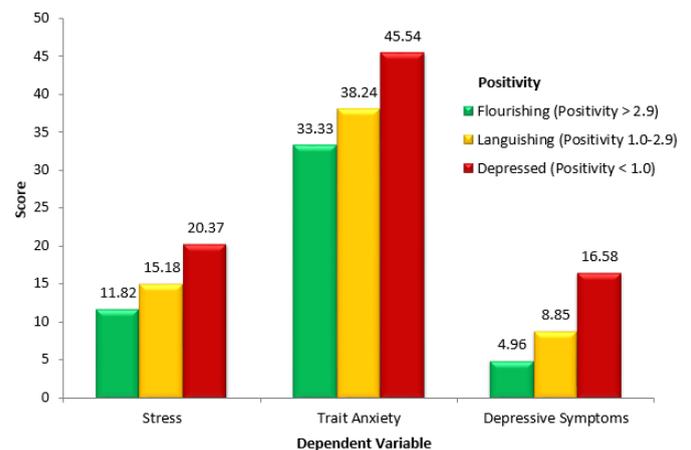
### Multivariate Analysis of Variance

Three data points related to positive emotions and one from depressive symptoms were missing; these were replaced via mean substitution. Preliminary tests of statistical assumptions found no serious violations, except for the equality of variances in depressive symptoms; according to Levene's Test of Equality of Error Variances, the variable depressive symptoms did not satisfy the assumption of equality of variances ( $p < .01$ ), and thus the Games-Howell test was used for post-hoc comparisons in depressive symptoms instead of Tukey's HSD.

Results found a significant difference among the flourishing, languishing, and depressed groups on the combined dependent variables,  $F_{6, 390} = 13.61$ ,  $p < .001$ ; Wilks' Lambda = .68;  $\eta_p^2 = .17$ . When the results for the dependent variables were individually examined using the

tests of between-subjects effects, significant differences were found for all dependent variables: stress ( $p < .001$ ,  $\eta_p^2 = .25$ ), trait anxiety ( $p < .001$ ,  $\eta_p^2 = .20$ ), and depressive symptoms ( $p < .001$ ,  $\eta_p^2 = .29$ ).

As shown in Figure 1, the flourishing group reported the lowest levels of stress, trait anxiety, and depressive symptoms. In contrast, the depressed group reported the highest levels of stress, trait anxiety, and depressive symptoms. And as expected, the languishing group had



Dependent Variable	Flourishing (n = 27)	Languishing (n = 116)	Depressed (n = 57)	F (2, 197)
Stress (range 0 - 40)	11.82 ± 5.02	15.18 ± 5.03	20.37 ± 5.03	32.28***
Trait Anxiety (range 20 - 80)	33.33 ± 7.23	38.24 ± 8.20	45.54 ± 8.49	24.64***
Depressive Symptoms (range 0 - 60)	4.96 ± 4.32	8.85 ± 5.76	16.58 ± 8.18	39.80***

**Note:** Higher scores indicate higher levels of stress, trait anxiety, or depressive symptoms. The cut-off scores for possible cases of anxiety disorder and clinical depression are 43 and 16, respectively. \*\*\* $p < .001$

**Figure 1.** Means, standard deviations, and ranges of stress, trait anxiety, and depressive symptoms as reported by flourishing, languishing, and depressed postdocs ( $n = 200$ ).

scores that were between the flourishing and depressed groups across all three of the dependent variables. All pairwise comparisons between the categories of positivity (viz., flourishing vs. languishing, flourishing vs. depressed, and languishing vs. depressed) yielded statistically significant differences in the mean scores of stress, trait anxiety, and depressive symptoms (see Table 2).

### Discussion

Using a sample of  $n = 200$  postdocs, the present study examined if groups of flourishing, languishing, and depressed postdocs would significantly differ from each other in scores of stress, trait anxiety, and depressive symptoms. As hypothesized, flourishing postdocs (positivity ratio  $> 2.9$ ) reported the lowest levels of stress, trait anxiety, and depressive symptoms; the languishing group (positivity ratio = 1.0 to 2.9) reported higher levels than the flourishing group; but the depressed postdocs (positivity ratio  $< 1.0$ ) exhibited the highest levels of stress, trait anxiety, and depressive symptoms.

These results lend further support for the utility of the positivity criteria as proposed by Fredrickson and Losada (2005). Post-hoc comparisons yielded significant group differences between all possible pairs within each dependent variable, indicating that the positivity tipping points effectively distinguished differences among flourishing, languishing, and depressed postdocs. The data showed that 13% of the postdocs were flourishing, 58% were languishing, and 29% were depressed. Previous researchers estimated that approximately 17 to 20% of the general population fit the criteria for flourishing

(Keyes 2002, 2007, Fredrickson and Losada 2005), while about 80% scored below the flourishing point (Fredrickson 2009).

As expected, depressed postdocs not only experienced the highest levels of stress, trait anxiety, and depressive symptoms, but they also reported average levels that were above the cutoff scores for possible cases of anxiety disorders (Van Dam et al. 2011) and clinically significant levels of depressive symptoms (Myers and Weissman 1980, Schulberg et al. 1985, Radloff 1977, Antoni et al. 2001). In terms of depressive symptoms, 21% had scores that were at or above the cutoff point of 16, indicating a moderately severe level of symptoms and a possible marker for clinical depression; this proportion aligns with the 21% in the general population who also report depressive symptoms scores above the cutoff value (Radloff 1977). However, out of the total sample, 35% of the postdocs reported scores at or above the trait anxiety cutoff score of 43, signifying that at least 1 out of 3 postdocs falls within the range for probable cases of clinical anxiety disorder; in comparison to a large community study with 6,685 participants, only 11.5% of the sample fell above the cutoff score (Van Dam et al. 2011).

Approximately 40 million American adults are affected by anxiety disorders each year (Kessler et al. 2005), with work stress being a major contributor to the development of anxiety (Melchior et al. 2007). Thus, it is not surprising that postdocs struggle with heightened levels of anxiety considering their exposure to high levels of work stress

**Table 2.** Pairwise comparisons for each dependent variable by positivity category.

Dependent Variable	Comparison of Positivity Categories	Mean Difference (Standard Error)	Cohen's <i>d</i>
Stress	Flourishing vs. Languishing	-3.37** (1.07)	-.67
	Flourishing vs. Depressed	-8.55*** (1.17)	-1.70
	Languishing vs. Depressed	-5.19*** (.81)	-1.03
Trait Anxiety	Flourishing vs. Languishing	-4.91* (1.75)	-.60
	Flourishing vs. Depressed	-12.21*** (1.91)	-1.49
	Languishing vs. Depressed	-7.30*** (1.32)	-.89
Depressive Symptoms	Flourishing vs. Languishing	-3.88** (.99)	-.61
	Flourishing vs. Depressed	-11.62*** (1.37)	-1.81
	Languishing vs. Depressed	-7.73*** (1.21)	-1.20

Note: Tukey's HSD was used for stress and trait anxiety. Games-Howell's test was used for depressive symptoms because equal variances were not assumed.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

(Smaglik 2006, Small 2012). Nonetheless, the fact that 35% of postdocs in the present sample reported anxiety levels above the cutoff value raises concerns for their health and well-being. Anxiety significantly contributes to the development of health problems such as hypertension, gastrointestinal problems, and cardiac disorders (Härter et al. 2003, Balon 2006). Individuals with high levels of anxiety and stress also suffer from migraines more frequently and for longer periods of time (Wacogne et al. 2003), and are more likely to be depressed (Kleppa et al. 2008, Hale III et al. 2009). Finally, individuals experiencing higher stress and anxiety report substantially lower satisfaction at work (Newbury-Birch and Kamali 2001).

Depending on the coping skills of postdocs, the harmful effects of stress can either be attenuated or exacerbated, leading to improved or worsened outcomes (Meyer 2001, Brown et al. 2005). Positive emotions have the ability to broaden one's adaptive coping skills and fuel resilience during times of stress (Fredrickson 2001, Fredrickson and Branigan 2005). Particularly in the work environment, studies have shown that positive emotions promote individual and organizational satisfaction, productivity, and well-being (Fredrickson 2003, Wright et al. 2007, Avey et al. 2008). Further research should examine whether interventions to enhance positive emotions can protect postdocs from experiencing harmful levels of anxiety. Employers could provide programs, opportunities, and resources to increase postdoc positivity, as well as decrease stress levels, trait anxiety, and depressive symptoms. Improving the positivity and well-being of postdocs is not only in the best interest of the postdoc, but also in the best interest of the organization, considering that happier and healthier employees are more engaged and more productive workers.

Results from the present study should be considered in light of the following limitations. Cross-sectional data were used, and thus causality and directionality cannot be determined from the found associations among the variables. It is also possible that the data may be biased due to the self-report nature of the survey instrument. The participants were recruited from a pool of postdocs who were employed at a large research institution in the state of Texas in 2012. There were no exclusion criteria, and all postdocs from any college or department across the university were allowed to participate. Due to this localized sampling, results and implications may not be applicable to postdocs from other institutions, locations, or time periods.

In conclusion, findings from the present study provide further support for the mathematically derived positivity ratio cutoff scores developed by Fredrickson and Losada (2005). As expected, flourishing postdocs recorded the lowest scores, while depressed postdocs reported the highest levels of stress, trait anxiety, and depressive symptoms. Although most of the participants' health indicators scored relatively close to the scores of the

general population, particular attention should be paid toward addressing anxiety issues among postdocs, given that 35% of postdocs—three times the rate from the general population—reported trait anxiety scores above the cutoff for probable clinical levels of anxiety disorder. Further, future research should investigate possible explanations behind why postdocs experience such high rates of anxiety. From an individual or interpersonal perspective, it may be that individuals in postdoc positions had higher anxiety levels prior to the postdoc experience; or that because postdocs are characterized neither as a faculty member nor a student, they do not have sufficient support and mentorship. From an organizational perspective, it could be that those who are unable to obtain medical care—because postdoc employment appointments often do not offer healthcare benefits (Smaglik 2006)—are the ones who are suffering from anxiety. Once the contributing factors of anxiety are determined, interventions based on the broaden-and-build theory of positive emotions should be developed with a multi-pronged approach at multiple ecological levels to increase positive emotions and decrease negative emotions in the day-to-day work and lives of postdocs.

---

## References

- Antoni, M. H., et al. 2001. Cognitive-behavioral stress management intervention decreases the prevalence of depression and enhances benefit finding among women under treatment for early-stage breast cancer. *Health Psychology*, 20, 20-32.
- Aschwanden, C. 2006. Professionalizing the postdoctoral experience. *Cell*, 124, 445-447.
- Avey, J. B., Wernsing, T. S. and Luthans, F. 2008. Can positive employees help positive organizational change? Impact of psychological capital and emotions on relevant attitudes and behaviors. *The Journal of Applied Behavioral Science*, 44, 48-70.
- Baumeister, R. F., et al. 2001. Bad is stronger than good. *Review of General Psychology*, 5, 323-370.
- Balon, R. 2006. Mood, anxiety, and physical illness: Body and mind, or mind and body? *Depression and Anxiety*, 23, 377-387.
- Brown, S. P., Westbrook, R. A. and Challagalla, G. 2005. Good cope, bad cope: Adaptive and maladaptive coping strategies following a critical negative work event. *Journal of Applied Psychology*, 90, 792-798.
- Cacioppo, J. T., Gardner, W. L. and Berntson, G. G. 1999. The affect system has parallel and integrative processing components: Form follows function. *Journal of Personality and Social Psychology*, 76, 839-855.
- Cohen, S. and Janicki-Deverts, D. 2012. Who's stressed? Distributions of psychological stress in the United States in probability samples from 1983, 2006 and 2009. *Journal of Applied Social Psychology*, 42, 1320-1334.
- Cohen, S. and Williamson, G. 1988. Perceived stress in a probability sample of the United States. In: SPACAPAN, S. & OSKAMP, S. (eds.) *The social psychology of health: Claremont Symposium on applied social psychology*. Newbury Park, CA: Sage.

- Cohn, M. A., et al. 2009. Happiness unpacked: Positive emotions increase life satisfaction by building resilience. *Emotion*, 9, 361-368.
- Cook, C., Heath, F. and Thompson, R. L. 2000. A meta-analysis of response rates in web- or internet-based surveys. *Educational and Psychological Measurement*, 60, 821-836.
- Danner, D. D., Snowdon, D. A. and Friesen, W. V. 2001. Positive emotions in early life and longevity: Findings from the nun study. *Journal of personality and Social Psychology*, 80, 804-813.
- Davis, G. 2009. Improving the postdoctoral experience: An empirical approach. In: FREEMAN, R. B. & GOROFF, D. L. (eds.) *Science and engineering careers in the United States: An analysis of markets and employment*. Chicago, IL: The University of Chicago Press.
- Deutskens, E., et al. 2004. Response rate and response quality of internet-based surveys: An experimental study. *Marketing Letters*, 15, 21-36.
- Evans, J. R. and Mathur, A. 2005. The value of online surveys. *Internet Research*, 15, 195-219.
- Faulk, K. E., et al. 2012. Depressive symptoms among US military spouses during deployment: The protective effect of positive emotions. *Armed Forces & Society*, 38, 373-390.
- Faulk, K. E., Gloria, C. T. and Steinhardt, M. A. 2013. Coping profiles characterize individual flourishing, languishing, and depression. *Anxiety, Stress & Coping*, 26, 378-390.
- Fincham, F. D. and Beach, S. R. H. 2010. Of memes and marriage: Toward a positive relationship science. *Journal of Family Theory & Review*, 2, 4-24.
- Fredrickson, B. L. 2001. The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56, 218-226.
- Fredrickson, B. L. 2003. Positive emotions and upward spirals in organizations. In: CAMERON, K. S., DUTTON, J. E. & QUINN, R. E. (eds.) *Positive organizational scholarship*. San Francisco, CA: Berrett-Koehler Publishers.
- Fredrickson, B. L. 2004. The broaden-and-build theory of positive emotions. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 359, 1367-1377.
- Fredrickson, B. L. 2005. The broaden-and-build theory of positive emotions. In: HUPPERT, F. A., BAYLIS, N. & KEVERNE, B. (eds.) *The science of well-being*. New York, NY: Oxford University Press.
- Fredrickson, B. L. 2006. Unpacking positive emotions: Investigating the seeds of human flourishing. *The Journal of Positive Psychology*, 1, 57-59.
- Fredrickson, B. L. 2009. *Positivity: Groundbreaking research reveals how to embrace the hidden strength of positive emotions, overcome negativity, and thrive*. New York, NY, Crown Publishers.
- Fredrickson, B. L. and Branigan, C. 2005. Positive emotions broaden the scope of attention and thought-action repertoires. *Cognition & Emotion*, 19, 313-332.
- Fredrickson, B. L. and Levenson, R. W. 1998. Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cognition & Emotion*, 12, 191-220.
- Fredrickson, B. L. and Losada, M. F. 2005. Positive affect and the complex dynamics of human flourishing. *American Psychologist*, 60, 678-686.
- Fredrickson, B. L., et al. 2003. What good are positive emotions in crises? 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.
- Gallo, L. C. and Matthews, K. A. 2003. Understanding the association between socioeconomic status and physical health: do negative emotions play a role? *Psychological bulletin*, 129, 10-51.
- Gloria, C. T., Faulk, K. E. and Steinhardt, M. A. 2013. Positive affectivity predicts successful and unsuccessful adaptation to stress. *Motivation and Emotion*, 37, 185-193.
- Hale III, W. W., et al. 2009. One factor or two parallel processes? Comorbidity and development of adolescent anxiety and depressive disorder symptoms. *Journal of Child Psychology and Psychiatry*, 50, 1218-1226.
- Härter, M., Conway, K. and Merikangas, K. 2003. Associations between anxiety disorders and physical illness. *European Archives of Psychiatry and Clinical Neuroscience*, 253, 313-320.
- Kaplan, K. 2012. Postdoc or not? *Nature*, 483, 499-500.
- Kessler, R. C., et al. 2005. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62, 617-627.
- Keyes, C. L. 2002. The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior*, 207-222.
- Keyes, C. L. 2007. Promoting and protecting mental health as flourishing. *American psychologist*, 62, 95-108.
- Kiecolt-Glaser, J. K., et al. 2002. Emotions, morbidity, and mortality: new perspectives from psychoneuroimmunology. *Annual Review of Psychology*, 53, 83-107.
- Kleppa, E., Sanne, B. and Tell, G. S. 2008. Working overtime is associated with anxiety and depression: The Hordaland Health Study. *Journal of Occupational and Environmental Medicine*, 50, 658-666.
- Melchior, M., et al. 2007. Work stress precipitates depression and anxiety in young, working women and men. *Psychological Medicine*, 37, 1119-1129.
- Meyer, B. 2001. Coping with severe mental illness: Relations of the Brief COPE with symptoms, functioning, and well-being. *Journal of Psychopathology and Behavioral Assessment*, 23, 265-277.
- Myers, J. K. and Weissman, M. M. 1980. Use of a self-report symptom scale to detect depression in a community sample. *The American Journal of Psychiatry*, 137, 1081-1084.
- Newbury-Birch, D. and Kamali, F. 2001. Psychological stress, anxiety, depression, job satisfaction, and personality characteristics in preregistration house officers. *Postgraduate Medical Journal*, 77, 109-111.
- Pallant, J. 2010. *SPSS survival manual: A step by step guide to*

- data analysis using the SPSS program, New York, NY, Open University Press.
- Penney, L. M. and Spector, P. E. 2005. Job stress, incivility, and counterproductive work behavior (CWB): the moderating role of negative affectivity. *Journal of Organizational Behavior*, 26, 777-796.
- Radloff, L. S. 1977. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385-401.
- Rego, A., et al. 2011. Optimism predicting employees' creativity: The mediating role of positive affect and the positivity ratio. *European Journal of Work and Organizational Psychology*, 21, 244-270.
- Sax, L. J., Gilmartin, S. K. and Bryant, A. N. 2003. Assessing response rates and nonresponse bias in web and paper surveys. *Research in Higher Education*, 44, 409-432.
- Schulberg, H. C., et al. 1985. Assessing depression in primary medical and psychiatric practices. *Archives of General Psychiatry*, 42, 1164-1170.
- Schwartz, R. M., et al. 2002. Optimal and normal affect balance in psychotherapy of major depression: Evaluation of the balanced states of mind model. *Behavioural and Cognitive Psychotherapy*, 30, 439-450.
- Smaglik, P. 2006. Stress management: Universities take a look at postdocs' mental-health issues. *Nature*. New York City: Nature Publishing Group.
- Small, G. 2012. The postdoc dilemma. *Nature*, 483, 235-235.
- Spielberger, C. D., et al. 1968, 1977. State-Trait Anxiety Inventory for adults. Available: <http://www.mindgarden.com/products/staisad.htm>.
- Spielberger, C. D., et al. 1983. State-Trait Anxiety Inventory for adults: Manual and sample. Available: <http://www.mindgarden.com/products/staisad.htm>.
- Tugade, M. M. and Fredrickson, B. L. 2004. Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology*, 86, 320-333.
- Van Dam, N. T., et al. 2011. Establishing a trait anxiety threshold that signals likelihood of anxiety disorders. *Anxiety, Stress & Coping*, 1-17.
- Wacogne, C., et al. 2003. Stress, anxiety, depression and migraine. *Cephalalgia*, 23(6), 451-455.
- Woolston, C. 2002. Perpetual postdocs [Online]. Washington, DC: The Chronicle of Higher Education. Available: <http://chronicle.com/article/Perpetual-Postdocs/46038/> [Accessed January 2013].
- Wright, T. A., Cropanzano, R. and Bonett, D. G. 2007. The moderating role of employee positive well being on the relation between job satisfaction and job performance. *Journal of Occupational Health Psychology*, 12, 93-104.