# The Effects of Affect Balance on Depression and Short-term Life Satisfaction: Considering the Activation Dimension of Affect

Katsuyuki Yamasaki[1*] and Kanako Uchida[2]

[1] Department of Human Development, Naruto University of Education, Naruto, Tokushima, Japan

[2] Department of Human Development, Naruto University of Education, Naruto, Tokushima, Japan

[*]*Corresponding author's email: ky341349 [AT] naruto-u.ac.jp*

**ABSTRACT—** ***The present study aimed to examine the effects of affect balance on depression and short-term life satisfaction (LS). In doing so, we considered the activation dimension of affect utilizing a prospective research design to predict causality between measured variables. The final sample included data collected from 131 undergraduates (66 men and 65 women). Participants answered four questionnaires to assess activated and deactivated positive and negative affect (PA and NA), depression, and short-term LS on three occasions separated by approximately five weeks. Hierarchical multiple regression analyses showed that deactivated affect balance (PA minus NA) was positively associated with short-term LS for women, and that the interaction effects between deactivated PA and NA on depression and short-term LS were significant for women and men, respectively. For the interaction effect on short-term LS, PA showed a significant positive association with short-term LS only when NA was low. Meanwhile, for the interaction effect in depression, PA revealed a significant positive association with depression when NA was high, while it showed a significant negative association with depression when NA was low. The findings are discussed in terms of the necessity for considering affect activation when examining the effect of affect on health/adjustment.***

**Keywords—** positive and negative affect, affect balance, activation dimension of affect, depression

## 1. INTRODUCTION

In recent years, an increasing amount of research has focused on the effects of affect (or emotions) on health and adjustment. In contrast to the detrimental influences of negative affect (NA) on health, positive affect (PA) has been found to play a crucial role in improving health (see Pressman & Cohen, 2005 for a review). These phenomena relating affect and health have recently been scrutinized by dividing PA and NA into their specific subtypes and examining the relationships between PA and NA.

According to the two-factor model of affect, the first unrotated factor is interpreted as a Valence dimension and the second unrotated factor as an Activation or Arousal dimension (Larsen & Diener, 1992; Russell, 1980). Thus, PA and NA, which represent the opposite ends of the Valence dimension, also change in the Activation dimension, which allows us to consider different types of PA and NA, i.e., activated PA (e.g., enthusiastic, happy), deactivated PA (e.g., calm, satisfied), activated NA (e.g., nervous, angry), and deactivated NA (e.g., sluggish, sad). It should be noted that the PANAS (Positive and Negative Affect Schedule; Watson, Clark, & Tellegen, 1988), one of the most frequently used questionnaires, measures only activated PA and NA (Huelsman & Furr, 2003; Huelsman, Nemanick, & Munz, 1998).

In recent years, a few studies have begun to discriminate the two types of affect along the activation axis (e.g., De Dreu, Baas, & Nijstad, 2008; Nezlek & Kuppens, 2008; Tsai, Knutson, & Fung, 2006), and these reports suggest distinct roles for activated and deactivated affect. For example, Nezlek and Kuppens (2008) showed that the suppression of negative emotions was negatively associated with deactivated but not activated NA. De Dreu et al. (2008) revealed that activating moods (i.e., activated PA and NA) lead to more creative fluency and originality compared to deactivating moods (i.e., deactivated PA and NA). In research on cultural variations in affect valuation, Tsai et al. (2006) found that European American and Asian American individuals valued high-arousal PA more so than the Hong Kong Chinese, while Hong Kong Chinese and Asian American individuals value low-arousal PA more so than European Americans. These findings would not have been discovered if measures of PA and NA had not been divided and recorded along the activation axis. Also, with respect to health and adjustment, differential effects of activated and deactivated affect are plausible. However, to the authors' knowledge, no prior research has focused on these differentiations.

Investigations into the effects of the different types of PA and NA on health also need to consider another dimension

of affect termed "affect balance." The overall affective balance between PA and NA has been shown to be important to health. Since PA and NA are not contrary concepts and display null or low correlations (e.g., Pettit, Kline, Gencoz, Gencoz, & Joiner, 2001; Watson et al., 1988), their relative contributions to health deserve further examination. In general, affect balance is represented by the difference score of PA minus NA. In addition to affect balance, we need to consider the complex interactions between PA and NA when examining various relationships with PA and NA. Previously, significant interactions between PA and NA were found to influence many health-related outcomes, such as well-being (Cheng, 2006), job performance (Van Yperen, 2003), and breast cancer concerns (Han, Shaw, Hawkins, Pingree, McTavish, & Gustafson, 2008). Cheng (2006) showed that the enhancing effect of PA on well-being appraisal became stronger when NA was higher. Han et al. (2008) found a tempering effect between writing positive emotion words and breast cancer concerns among those who wrote a higher percentage of negative emotion words. Similarly, Van Yperen (2003) found that the enhancing effect of PA on job performance was significant only when NA was high.

Meanwhile, the effects of affect balance per se have been investigated via cross-cultural research. For example, Schimmack, Radhakrishnan, Oishi, Dzokoto, and Ahadi (2002) found that affect balance was a stronger predictor of life satisfaction in individualistic cultures versus collectivistic ones. Suh, Diener, Oishi, and Triandis (1998) showed that correlations of affect balance with life satisfaction varied across nations, although the relationship was significantly positive in all cases. Thus, it is likely that PA and NA have not only main effects on health and adjustment but interactive effects as well.

Moreover, it may be necessary to combine affect balance and the activation dimension of PA and NA when examining the effects of affect on health. The effects of affect balance on health and adjustment could be different between activated and deactivated affect dimensions. However, again, to the authors' knowledge, no prior research has focused on these differentiations, which prevents us from building hypotheses on them. It is suggested that we might not precisely depict the real relationships between affect and health unless we succeed in taking into consideration these detailed patterns of affect.

Thus, the aim of the present study was to examine the effects of affect balance on health and adjustment. In doing so, we considered both activated and deactivated PA and NA. The main health measure was depression. In addition, we focused on short-term life satisfaction as a health/adjustment outcome. Investigations into health problems in non-clinical samples require measures sensitive to preconditions that could lead to future disease. One of those candidate measures is life satisfaction, which is a conscious cognitive judgment of one's past whole life in which the criteria for judgment are up to the individual (Pavot & Diener, 1993). Since "life" in life satisfaction does not need to be limited to the past whole life, we assessed it for only the past week, which would represent a more sensitive measure of short-term life satisfaction.

## 2. METHODS

*Participants and Procedures*

Participants were 136 undergraduate students from a university in Japan. Incomplete data were obtained from five participants whose data were therefore excluded, so that the final sample included data collected from 131 participants (66 men and 65 women). The mean ages and *SD*s for this sample were 22.74 ± 3.81 years for men and 22.72 ± 6.31 years for women. Each participant gave written informed consent.

Participants in various group sizes (approximate group sizes varied from 2 to 20 students) completed five questionnaires on three occasions (T1 to T3), four weeks apart. All of the questionnaires were Japanese versions, answered in terms of experiences over the past week. Since one of the five questionnaires was used for another study that did not relate to the purposes of the current study, its results are not reported in this paper. After T3, the purposes of the study was explained to participants in detail.

*Measures*

*Activated and Deactivated PA and NA*

Activated PA and NA were measured using the Japanese version of the Positive and Negative Affect Schedule (PANAS; Sato & Yasuda, 2001). The alphas were .82 and .84 for the PA and NA scales at T1 in this study, respectively. The construct validity of these scales was established by a study in which PA, NA, and neutral affect were experimentally manipulated (Sato & Yasuda, 2001). Unlike the original version (Watson et al., 1988), the Japanese version contains eight items for both PA (e.g., enthusiastic, proud, and excited) and NA (e.g., afraid, jittery, and scared), which are rated on a 6-point Likert scale (rated from "not at all" to "extremely"). Thus, scores on the PA and NA scales each ranged from 8 through 48. In this study, participants were instructed to indicate the extent to which each item represented the way they felt over the prior one-week period. Deactivated PA and NA were measured using the subscales of deactivated pleasure and boredom (respectively) from the Multiple Mood Scale (MMS: Terasaki, Kishimoto, & Koga, 1992). Each subscale contains five items (e.g., relaxed, calm, and placid for PA; dull, tired, and bored for NA), rated on a 4-point Likert scale (from "never felt" to "clearly felt") with score ranges of 5 through 20. In this study, participants were asked to rate how they experienced each emotion during the past week. The alphas were .89 and .77 for the PA and NA scales at T1 in this study, respectively. The concurrent validity of these subscales was established by Terasaki et al. (1992).

Finally, the affect balance scores were calculated by subtracting the NA score from the PA score (PA-NA).

*Short-term Life Satisfaction (LS)*

LS was assessed by means of the Short-term Life Satisfaction Scale (SLSS), which was developed by three PhD psychologists specializing in the research topics of this paper and was based on the Satisfaction with Life Scale (SWLS: Pavot & Diener, 1993). Although the SLSS includes similar instructions and contains five items similar to the SWLS, these elements were revised to allow for asking about the past week instead of the past whole life. Participants answered the five items pertaining to life during the past week on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Item examples include: "If I could relive the past week again, I would change almost nothing." and "I am satisfied with my life." Total scores ranged from 5 to 35. The alpha was .87 at T1 in this study. The original U.S. version of the scale has high reliability and both convergent and discriminant validity (Pavot & Diener, 1993).

*Depression*

The Japanese version of the CES-D (Center for Epidemiologic Studies Depression Scale; Shima, Shikano, Kitamura, & Asai, 1985), which was originally developed by Radloff (1977), was utilized to measure depression. The CES-D is a 20-item self-report scale inquiring about the participant's experiences of negative mood states during the previous week. Each response is graded on a 4-point scale from 0= "rarely or none of the time" to 3= "most or all of the time." The alpha was .69 at T1 in this study. Shima et al. (1985) demonstrated the reliability of CES-D using correlations by test-retest and split-halves methods, and demonstrated validity by comparing scores between normal participants and depressed patients.

## 3. RESULTS

Table 1 shows the correlations among all measures for both men and women. Raw PA and NA scores were omitted from this table (for these data see Yamasaki, Sasaki, & Uchida, 2012). For both men and women, at the same measurement points, depression showed significantly negative correlations with activated and deactivated affect balance, while short-term LS showed significantly positive correlations with activated and deactivated affect balance. However, at different measurement points, these relations became weaker or null. No significant gender differences were found for any measure.

Table 1. Intercorrelations between All Measures for Men and Women

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. t1 aPA-aNA | | .47** | -.38** | .63** | .52** | .24 | -.22 | .23 | .40** | .29* | -.08 | .20 |
| 2. t1 dPA-dNA | .30* | | -.46** | .39** | .23 | .42** | -.24 | .26* | .30* | .41** | -.28* | .17 |
| 3. t1 DEP | -.39** | -.43** | | -.24 | -.22 | -.28* | .68** | .04 | -.23 | -.34** | .71** | .10 |
| 4. t1 LS | .38** | .31* | -.38** | | .33** | .25* | .01 | .32* | .14 | .11 | -.06 | .13 |
| 5. t2 aPA-aNA | .45** | .43** | -.46** | .14 | | .65** | -.42** | .64** | .34** | .29* | -.05 | .13 |
| 6. t2 dPA-dNA | -.02 | .37** | -.32** | .15 | .54** | | -.39** | .63** | .34** | .46** | -.24 | .25* |
| 7. t2 DEP | -.29* | -.31* | .62** | -.13 | -.61** | -.42** | | -.14 | -.24* | -.32** | .69** | .06 |
| 8. t2 LS | .23 | .37** | -.29* | .48** | .50** | .54** | -.37** | | .22 | .18 | .12 | .25* |
| 9. t3 aPA-aNA | .34** | .03 | -.14 | -.04 | .29* | .10 | -.19 | -.01 | | .59** | -.30* | .65** |
| 10. t3 dPA-dNA | .03 | .30* | -.09 | -.07 | .19 | .33** | .01 | -.08 | .47** | | -.42** | .38** |
| 11. t3 DEP | -.20 | -.11 | .50** | -.11 | -.30* | -.07 | .46** | .07 | -.53** | -.34** | | .02 |
| 12. t3 LS | .14 | .16 | -.29* | .37** | .19 | .33** | -.14 | .26* | .59** | .54** | -.43** | |

Note. $N$ = (66 men and 65 women); t1 = time 1; t2 = time 2; t3 = time 3; a= activated; d= deactivated; PA = positive affect; NA = negative affect; LS = life satisfaction; DEP = depression. Correlations are shown above the diagonal for men, and below the diagonal for women. *$p$ < .05. **$p$ < .01.

Next, in order to examine the effects of affect balance on depression and short-term LS, hierarchical regression analyses were conducted with depression or short-term LS at T3 regressed on affect balance at T2. In the hierarchical regression analyses, using depression (Table 2) or short-term LS (Table 3) at T3 as an outcome, depression or short-term LS and affect balance at T1 were entered on the first step, followed by affect balance at T2 on the second step, for each

Table 2. Predicting Depression at T3 via Affect Balance (Positive Affect - Negative Affect)

| Steps and Variables Entered | | | Step 1 $\beta$ | Step 2 $\beta$ | $R^2$ | $R^2$ change |
|---|---|---|---|---|---|---|
| Men | | | | | | |
| Step | 1 | t1 DEP | .80** | .80** | | |
| | | t1 aPA-aNA | .22* | .22* | .55** | |
| | 2 | t2 aPA-aNA | | .01 | .55** | .00 |
| Women | | | | | | |
| Step | 1 | t1 DEP | .50** | .47** | | |
| | | t1 aPA-aNA | -.01 | .03 | .25** | |
| | 2 | t2 aPA-aNA | | -.10 | .26** | .01 |
| Men | | | | | | |
| Step | 1 | t1 DEP | .74** | .73** | | |
| | | t1 dPA-dNA | .06 | .08 | .51** | |
| | 2 | t2 dPA-dNA | | -.07 | .51** | .00 |
| Women | | | | | | |
| Step | 1 | t1 DEP | .55** | .57** | | |
| | | t1 dPA-dNA | .13 | .10 | .26** | |
| | 2 | t2 dPA-dNA | | .08 | .27** | .01 |

Note. $N$ = (66 men and 65 women); t1 = time 1; t2 = time 2; a= activated; d= deactivated; PA = positive affect; NA = negative affect; DEP = depression. *$p$ < .05. **$p$ < .01.

Table 3. Predicting Short-term Life Satisfaction at T3 via Affect Balance (Positive Affect - Negative Affect)

| Steps and Variables Entered | | | Step 1 $\beta$ | Step 2 $\beta$ | $R^2$ | $R^2$ change |
|---|---|---|---|---|---|---|
| Men | | | | | | |
| Step | 1 | t1 LS | .00 | .00 | | |
| | | t1 aPA-aNA | .20 | .18 | .04 | |
| | 2 | t2 aPA-aNA | | .04 | .04 | .00 |
| Women | | | | | | |
| Step | 1 | t1 LS | .37** | .37** | | |
| | | t1 aPA-aNA | .00 | -.08 | .14* | |
| | 2 | t2 aPA-aNA | | .17 | .16 | .02 |
| Men | | | | | | |
| Step | 1 | t1 LS | .07 | .05 | | |
| | | t1 dPA-dNA | .14 | .06 | .03 | |
| | 2 | t2 dPA-dNA | | .21 | .07 | .04 |
| Women | | | | | | |
| Step | 1 | t1 LS | .35** | .34 | | |
| | | t1 dPA-dNA | .05 | -.06 | .14* | |
| | 2 | t2 dPA-dNA | | .30* | .22** | .08* |

Note. $N$ = (66 men and 65 women); t1 = time 1; t2 = time 2; a= activated; d= deactivated; PA = positive affect; NA = negative affect; LS = life satisfaction. *$p$ < .05. **$p$ < .01.

sex and each affect balance (activated or deactivated). This procedure means that we attempted to predict changes in outcomes from T1 to T3 via changes in predictors from T1 to T2. We focused on significant $\beta$s with significant $R^2$ changes on the second step. As a result, with regard to short-term LS, deactivated affect at T2 showed a significant positive $\beta$ (.30, $p$ <.05), along with a significant $R^2$ change (.08, $p$ < .05).

Table 4. Predicting Depression at T3 via Activated Positive and Negative Affect

| Steps and Variables Entered | | Step 1 $\beta$ | Step 2 $\beta$ | Step 3 $\beta$ | $R^2$ | $R^2$ change |
|---|---|---|---|---|---|---|
| Men | | | | | | |
| Step 1 | t1 aPA | .24 | .18 | .20 | | |
| | t1 aNA | -.02 | -.04 | -.03 | | |
| | t1 DEP | .75** | .73** | .73** | .56** | |
| 2 | t2 aPA | | .10 | .09 | | |
| | t2 aNA | | .07 | .09 | .57** | .01 |
| 3 | t2 aPA x t2 aNA | | | -.09 | .58** | .01 |
| Women | | | | | | |
| Step 1 | t1 aPA | .08 | .06 | .04 | | |
| | t1 aNA | .08 | .01 | .00 | | |
| | t1 DEP | .49** | .45** | .45** | .26** | |
| 2 | t2 aPA | | .06 | .07 | | |
| | t2 aNA | | .19 | .18 | .30** | .03 |
| 3 | t2 aPA x t2 aNA | | | .06 | .30** | .00 |

Note. $N$ = (66 men and 65 women); t1 = time 1; t2 = time 2; a= activated; PA = positive affect; NA = negative affect; DEP = depression. *$p$ < .05. **$p$ < .01.

Table 5. Predicting Depression at T3 via Deactivated Positive and Negative Affect

| Steps and Variables Entered | | Step 1 $\beta$ | Step 2 $\beta$ | Step 3 $\beta$ | $R^2$ | $R^2$ change |
|---|---|---|---|---|---|---|
| Men | | | | | | |
| Step 1 | t1 dPA | -.05 | -.05 | -.05 | | |
| | t1 dNA | -.14 | -.19 | -.20 | | |
| | t1 DEP | .76** | .73** | .74** | .52** | |
| 2 | t2 PdA | | .02 | .03 | | |
| | t2 dNA | | .14 | .14 | .54** | .02 |
| 3 | t2 dPA x t2 dNA | | | .09 | .55** | .01 |
| Women | | | | | | |
| Step 1 | t1 dPA | .10 | .07 | .11 | | |
| | t1 dNA | -.10 | -.11 | -.05 | | |
| | t1 DEP | .56** | .58** | .53** | .26** | |
| 2 | t2 PdA | | .09 | .06 | | |
| | t2 dNA | | .00 | .00 | .27** | .01 |
| 3 | t2 dPA x t2 dNA | | | .32** | .37** | .10** |

Note. $N$ = (66 men and 65 women); t1 = time 1; t2 = time 2; d= deactivated; PA = positive affect; NA = negative affect; DEP = depression. *$p$ < .05. **$p$ < .01.

Table 6. Predicting Short-term Life Satisfaction at T3 via Activated Positive and Negative Affect

| Steps and Variables Entered | | Step 1 $\beta$ | Step 2 $\beta$ | Step 3 $\beta$ | $R^2$ | $R^2$ change |
|---|---|---|---|---|---|---|
| Men | | | | | | |
| Step 1 | t1 aPA | .12 | .06 | .14 | | |
| | t1 aNA | -.15 | -.15 | -.17 | | |
| | t1 LS | .01 | .01 | -.06 | .04 | |
| 2 | t2 aPA | | .09 | .06 | | |
| | t2 aNA | | .02 | .04 | .05 | .01 |
| 3 | t2 aPA x t2 aNA | | | -.24 | .10 | .05 |
| Women | | | | | | |
| Step 1 | t1 aPA | .14 | .09 | .12 | | |
| | t1 aNA | .12 | .18 | .19 | | |
| | t1 LS | .35** | .36** | .38* | .17* | |
| 2 | t2 aPA | | .11 | .09 | | |
| | t2 aNA | | -.15 | -.13 | .19* | .02 |
| 3 | t2 aPA x t2 aNA | | | -.11 | .20* | .01 |

Note. $N$ = (66 men and 65 women); t1 = time 1; t2 = time 2; a= activated; PA = positive affect; NA = negative affect; LS = life satisfaction. *$p$ < .05. **$p$ < .01.

Table 7. Predicting Short-term Life Satisfaction via Deactivated Positive and Negative Affect

| Steps and Variables Entered | | Step 1 $\beta$ | Step 2 $\beta$ | Step 3 $\beta$ | $R^2$ | $R^2$ change |
|---|---|---|---|---|---|---|
| Men | | | | | | |
| Step 1 | t1 dPA | .04 | .01 | .00 | | |
| | t1 dNA | -.16 | -.08 | -.04 | | |
| | t1 LS | .05 | .04 | .10 | .04 | |
| 2 | t2 dPA | | .09 | .06 | | |
| | t2 dNA | | -.19 | -.18 | .08 | .04 |
| 3 | t2 dPA x t2 dNA | | | -.31* | .17 | .09* |
| Women | | | | | | |
| Step 1 | t1 dPA | -.04 | -.11 | -.11 | | |
| | t1 dNA | -.15 | -.05 | -.06 | | |
| | t1 LS | .32* | .32* | .32* | .16* | |
| 2 | t2 dPA | | .22 | .22 | | |
| | t2 dNA | | -.19 | -.19 | .23** | .07 |
| 3 | t2 dPA x t2 dNA | | | -.01 | .23* | .00 |

Note. $N$ = (66 men and 65 women); t1 = time 1; t2 = time 2; d = deactivated; PA = positive affect; NA = negative affect; LS = life satisfaction. *$p$ < .05. **$p$ < .01.

Furthermore, in order to investigate the interactive effects of PA and NA on depression and short-term LS, hierarchical regression analyses were conducted with depression or short-term LS at T3 regressed on PA, NA, and PA x NA at T2 for activated affect (Tables 4 and 6 for depression and short-term LS, respectively) and deactivated affect (Tables 5 and 7 for depression and short-term LS, respectively). Following the recommendations of Aiken and West (1991), the predictor variables were standardized to avoid multicollinearity between the predictors and the interaction terms. In the regression analyses, PA, NA, and depression (or short-term LS) at T1 were entered on the first step, followed by PA and NA at T2 on the second step, and then PA x NA at T2 on the third step.

Regarding depression, when focusing on significant $\beta$s with significant $R^2$ changes on the third step, only deactivated PA x NA at T2 showed a significant $\beta$ (.32, $p < .01$), along with a significant $R^2$ change (.10, $p < .01$), for women (see Table 5). This significant interaction of PA and NA was plotted using the procedure proposed by Aiken and West (1991) in Fig. 1 (a). The predicted values on depression were computed on the basis of the scores for PA and NA of 1 *SD* below the mean and 1 *SD* above the mean. Both slopes were significant, with *t*s(61) = 2.08 for high NA and -2.02 for low NA (*p*s < .05). These results suggest that deactivated PA was significantly negatively associated with depression when deactivated NA was low, and significantly positively associated with depression when deactivated NA was high.

Likewise, with respect to short-term LS, only deactivated PA x NA at T2 showed a significant $\beta$ (-.31, $p < .01$), along with a significant $R^2$ change (.09, $p < .05$), for men (see Table 7). Fig. 1 (b) shows this significant interaction using the same method as in Fig. 1 (a). Only the slope was significant when deactivated NA was low: $t(62) = 2.36$ ( $p < .05$). This result suggests that deactivated PA was significantly positively associated with short-term LS when deactivated NA was low, but not when it was high.

## 4. DISCUSSION

The current study focused on the relationship between affect balance and depression or short-term LS taking into account the dimension of affect activation. Correlational analyses using the variables measured in the same period showed that depression and short-term LS were negatively and positively associated with affect balance (PA-NA), respectively, for both men and women, regardless of activated and deactivated characteristics of affect. However, after conducting hierarchical regression analyses in which causal relationships can be predicted, only deactivated affect

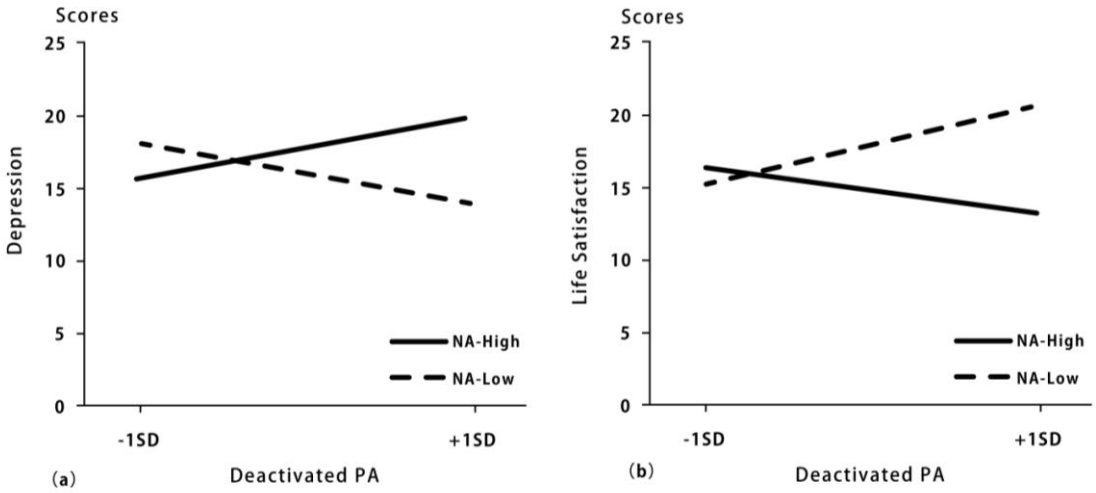


Fig. 1. (a) scores on depression as a function of deactivated negative affect (NA) and positive affect (PA) in women; and (b) scores on short-term life satisfaction as a function of deactivated negative affect (NA) and positive affect (PA) in men.

balance showed a significantly positive association with short-term LS for women (i.e., this association was true neither with depression nor for men).

To the authors' knowledge, there has been no research conducted in which activated and deactivated affect balance were discriminated in terms of their influences on heath and adjustment. Our findings suggest that deactivated affect balance was more influential on short-term LS than activated affect balance. In general, deactivated affect lasts for a longer time than activated affect, which might be one of the reasons for this finding. However, the reasons why this finding was limited to short-term LS and women are not clear, suggesting the necessity for future research to examine whether this phenomenon is reproducible.

The present findings that deactivated PA and NA had significant interactive effects on depression for women and on short-term LS for men deserve note. In particular, like the findings with regard to affect balance, it is noteworthy that deactivated affect (but not activated affect) was related to these phenomena. The tripartite model of anxiety and depression (Clark & Watson, 1991) suggests that depression is characterized by low PA. However, the model does not discriminate between activated and deactivated PA. Also, previous studies have focused on activated PA when examining the model (e.g., Greene, Chorpita, & Austin, 2009; Kiernan, Laurent, Joiner, Cantanzaro, & MacLachlan, 2001). In the present study, deactivated PA was negatively associated with depression only when deactivated NA was low. Comparatively, when deactivated NA was high, it was positively associated with depression. This positive association is difficult to interpret. In general, the coexistence of high NA and high PA represents a rare case, since many prior studies

have revealed null or slightly negative relationships between PA and NA (e.g., Pettit et al., 2001; Watson et al., 1988). In line with this consideration, it might be plausible that the coexistence of high NA and PA represents extremely stressful conditions leading to depression. Future research needs to examine what high deactivated PA with high deactivated NA means in terms of depression, along with retesting this phenomenon. The findings regarding short-term LS showed a reverse relationship. Namely, deactivated PA was positively associated with short-term LS when deactivated NA was low, while deactivated PA was negatively associated with short-term LS when deactivated NA was high (albeit this latter association was not significant). Considering the difference in direction in the health dimension from unhealthy (depression) to healthy status (short-term LS), it seems likely that deactivated PA and NA (and their relationship) have consistent effects on health status.

Some limitations should be indicated for future research. First, we need to improve our methods to predict causality. The present research attempted to predict causal relationships between affect balance (or the interaction between PA and NA) and depression (or short-term LS), utilizing a special prospective research design. Generally, in this kind of short-term prospective design, two measurement points (T1 and T2) are set, in which a predictor variable at T1 predicts an outcome variable at T2, with the outcome variable at T1 controlled for (e.g., Fredrickson & Joiner, 2002). However, as Burns et al. (2008) suggested, we cannot utilize the information regarding what takes place between T1 and T2. So, we set up another measurement point between these two points, by which we attempted to predict the change of an outcome variable from T1 to T3 by the change of a predictor variable from T1 to T2. However, this new prospective design has another fault like the extant prospective designs in that if no stressful event that can influence the outcome variable during the period from T1 to T3 takes place, any causal relations would not be extracted because changes in the outcome variable are completely lost by controlling for the outcome variable at T1. In order to overcome this design flaw, it is necessary that some stressful event takes place just before T3, as described by Fredrickson, Tugade, Waugh, and Larkin (2003), in which the September 11th terrorist attacks took place before the final measurement point. Thus, we need to have some stressful event occur just before T3, although it is difficult to incorporate such an event at a determined time in natural settings.

Second, the Short-Term Life Satisfaction Scale needs further tests to check its validity. In addition, the relationship between short-term (past one week) and long-term (whole past life) life satisfaction should be examined in future research to further clarify what short-term life satisfaction represents. Third, our samples were limited to undergraduates in one area of Japan. The present findings have limitations in terms of generalization to other samples, suggesting the necessity of future research using other samples incorporating other areas in Japan as well as other countries. Finally, utilizing various direct health measures in clinical subjects or individuals at high risk for health impairment, we should conduct longitudinal research to determine whether the findings in the present study are consistently observed. If we find similar roles of activated/deactivated affect in future studies, we could then move forward towards prevention or interventional research that might enhance health and adjustment in practical settings.

## 5. CONCLUSION

The present article provided the findings that affect balance had differential effects on depression and short-term LS when considering the activation dimension of affect. Deactivated affect balance was positively associated with short-term LS for women, and the interaction effects between deactivated PA and NA on depression and short-term LS were found for women and men. Deactivated PA showed a negative association with depression when NA was low, while it revealed a positive association with depression when NA was high. PA showed a positive association with short-term LS only when NA was low. It seems that we need to consider both valence and activation dimensions of affect when examining the effects of affect balance on health and adjustment.

Acknowledgements:
The authors are grateful to Dr. Megumi Sasaki for assistance in conducting this research.

## REFERENCES

[1] Aiken, L.S., & West, S.G. (1991). *Multiple regression: Testing and interactions.* Newbury Park, CA: Sage.
[2] Burns, A.B., Brown, J.S., Sachs-Ericsson, N., Plant, E.A., Curtis, J.T., Fredrickson, B.L., & Joiner, T.E. (2008). Upward spirals of positive emotion and coping: Replication, extension, and initial exploration of neurochemical substrates. *Personality and Individual Differences, 44,* 360-370.
[3] Cheng, S-T. (2006). Negative emotions make positive emotions more salient in well-being appraisal. *Personality and Individual Differences*, *40*, 557-567.
[4] Clark, L.A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*, *100*, 316-336.
[5] De Dreu, C.K.W., Baas, M., & Nijstad, B.A. (2008). Hedonic tone and activation level in the mood-creativity link toward a dual pathway to creativity model. *Journal of Personality and Social Psychology*, *94*, 739-756.
[6] Fredrickson, B.L., & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being. *Psychological Science, 13,* 172-175.
[7] Fredrickson, B.L., Tugade, M.M., Waugh, C.E., & Larkin, G.R. (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.

[8] Greene, F.N., Chorpita, B.F., & Austin, A.A. (2009). Examining youth anxiety symptoms and suicidal ideation in the context of the tripartite model of emotion. *Journal of Psychopathology and Behavioral Assessment*, *31*, 405-411.

[9] Han, J.Y., Shaw, B.R., Hawkins, R.P., Pingree, S., McTavish, F., & Gustafson, D.H. (2008). Expressing positive emotions within online support groups by women with breast cancer. *Journal of Health Psychology*, *13*, 1002-1007.

[10]Huelsman, T.J., & Furr, R.M. (2003). Measurement of dispositional affect: Construct validity and convergence with a circumplex model of affect. *Educational and Psychological Measurement*, *63*, 655-673.

[11]Huelsman, T.J., Nemanick, R.C., Jr., & Munz, D.C. (1998). Scales to measure four dimensions of dispositional mood: Positive energy, tiredness, negative activation, and relaxation. *Educational and Psychological Measurement*, *58*, 804-819.

[12]Kiernan, G., Laurent, J., Joiner, T.E., Jr., Cantanzaro, S.J., & MacLachlan, M. (2001). Cross-cultural examination of the tripartite model with children: Data from Barretstown studies. *Journal of Personality Assessment*, *77*, 359-379.

[13]Larsen, R.J., & Diener, E. (1992). Promises and problems with the circumplex model of emotion. In M.S. Clard (Ed.), *Review of personality and social Psychology: Emotion* (Vol. 13, pp.25-59). Newbury Park, CA: Sage.

[14]Nezlek, J.B., & Kuppens, P. (2008). Regulating positive and negative emotions in daily life. *Journal of Personality*, *76*, 561-579.

[15]Pavot, W., & Diener, E. (1993). Review of the satisfaction with life scale. *Psychological Assessment, 5*, 164-172.

[16]Pettit, J.W., Kline, J.P., Gencoz, T., Gencoz, F., & Joiner, T.E. (2001). Are happy people healthier? The specific role of positive affect in predicting self-reported health symptoms. *Journal of Research in Personality, 35*, 521-536.

[17]Pressman, S.D., & Cohen, S. (2005). Does positive affect influence health? *Psychological Bulletin*, *131*, 925-971.

[18]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.

[19]Russell, J.A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*, 1161-1178.

[20]Sato, A., & Yasuda, A. (2001). Development of the Japanese version of Positive and Negative Affect Schedule (PANAS) scales. *Japanese Journal of Personality, 9*, 138-189.

[21]Schimmack, U., Radhakrishnan, P., Oishi, S., Dzokoto, V., & Ahadi, S. (2002). Culture, personality, and subjective well-being: Integrating process models of life satisfaction. *Journal of Personality and Social Psychology*, *82*, 582-593.

[22]Shima, S., Shikano, T., Kitamura, T., & Asai, M. (1985). New-rating scales for depression. *Seishin Igaku（Clinical Psychiatry）, 27*, 717-723. (In Japanese)

[23]Suh, E., Diener, E., Oishi, S., & Triandis, H.C. (1998). The shifting basis of life satisfaction judgments across cultures: Emotions versus norms. *Journal of Personality and Social Psychology*, 74, 482-493.

[24]Terasaki, S., Kishimoto, Y., & Koga, A. (1992). Construction of a multiple mood scale. *Japanese Journal of Psychology*, *62*, 350-356.

[25]Tsai, J.L., Knutson, B., & Fung, H.H. (2006). Cultural variation in affect valuation. *Journal of Personality and Social Psychology, 90, 90*, 288-307.

[26]Van Yperen, N.W. (2003). On the link between different combinations of negative affectivity (NA) and positive affectivity (PA) and job performance. *Personality and Individual Differences, 35*, 1873-181.

[27]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.

[28]Yamasaki, K., Sasaki, M., & Uchida, K. (2012). Effects of positive and negative affect and emotional suppression on short-term life satisfaction and depression. *Research Bulletin of Naruto University of Education*, *27*. 1-11.