

RUNNING HEAD: EXTRAVERSION AND POSITIVE AFFECT

Extraversion and Positive Affect:

A Day Reconstruction Study of Person-Environment Transactions

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Abstract

Extraversion is robustly correlated with positive affect, but the reasons for this correlation remain unclear. One possibility is that extraverts and introverts both enjoy interacting with others, but extraverts do so more frequently. Another possibility is that extraverts enjoy social interactions more. Both hypotheses were tested using the Day Reconstruction Method. Subjects reported on interactions with others and positive affect experienced during all of the episodes from a single day. Results were consistent with the first hypothesis: the relation between extraversion and positive affect was partially mediated by extraverts' greater social participation. The findings support a transactional approach to personality, in which traits like extraversion are seen as styles of actively engaging with the environment.

## Extraversion and Positive Affect:

### A Day Reconstruction Study of Person-Environment Transactions

The life of an extravert contains, on average, more happiness than that of an introvert.<sup>1</sup> The correlation between extraversion and positive affect replicates across measures and methods (Lucas & Fujita, 2000), and is so robust that some have proposed that a tendency to experience positive affect is one of the defining features of extraversion (Watson & Clark, 1997). Yet in spite of the ubiquity of this finding, the explanation for it is not entirely clear. Why are extraverts happier?

One way of trying to understand why extraverts are happier than introverts is to study the ways that people engage with the world through person-environment transactions. *Proactive transactions* involve processes like situation selection and modification, in which individuals choose or alter the situations in which they live. *Reactive transactions* involve processes wherein two different people experience the same situation in different ways. In the study reported here, we examined whether proactive and reactive transactions can help explain the relation between extraversion and positive affect. Specifically, we examined whether extraverts are happier because they participate in more social interactions, or because they derive more enjoyment from social interactions.

### *Extraversion and Social Participation*

One proposed function of personality traits is that they cause different individuals to select different situations or to modify the situations in which they find themselves (Ickes, Snyder, & Garcia, 1997). According to the *social participation hypothesis*, such proactive transactions could explain why extraverts have higher levels of positive affect: extraverts participate in social interactions more than introverts, either by seeking out situations where they

can interact or by eliciting social interactions in situations where an introvert might not do so (e.g., chatting with a classmate rather than sitting quietly before class starts). Social participation, in turn, is hypothesized to lead to greater levels of positive affect (Argyle & Lu, 1990; Clark & Watson, 1988). Social participation would therefore be a mediator between extraversion and positive affect. This hypothesis assumes that both extraverts and introverts enjoy social interactions more than nonsocial situations (though not necessarily to the same degree).

The evidence that extraverts have more social interactions in their daily lives is mixed, with some studies showing an effect (Argyle & Lu, 1990) and others not able to find any differences between extraverts and introverts (Diener, Larsen, & Emmons, 1984; Pavot, Diener, & Fujita, 1990). One plausible reason for the mixed results is that the effect may be small and thus difficult to detect. Evidence for the second link in the social participation hypothesis is more consistent: several studies have shown that social participation is generally related to greater positive affect (Clark & Watson, 1988).

#### *Extraversion and Social Reactivity*

Another possibility is the *social reactivity hypothesis*. According to this hypothesis, extraverts derive more enjoyment from interacting with others than do introverts. Thus, one would expect differences in positive affect between social and nonsocial events to be larger for extraverts than for introverts. Because most people spend at least part of each day interacting with others, these differences in social reactivity would result in a net higher level of positive affect for an extravert over the course of an average day.

Some evidence suggests that extraverts derive enjoyment from being the object of others' attention: Ashton et al. (2002) presented data in which a social attention scale loaded higher on a common extraversion factor than either reward sensitivity or social interactions. In the present

study, we examine a related but somewhat broader version of this hypothesis: whether extraverts experience more positive affect as a function of being involved in social interactions.

### *Overview of the Present Study*

The present study tested two hypotheses about the link between extraversion and positive affect. We tested these hypotheses using the Day Reconstruction Method (DRM; Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004). The DRM is a moment-based assessment method in which participants reconstruct an entire day from waking until bedtime. For each episode from the previous day, participants reported whether they were interacting with others, as well as their positive affect. Thus, we were able to examine whether extraverts participated in more social interactions than introverts, as well as whether extraverts had different affective responses to social interactions.

## Method

### *Participants*

The participants were  $N = 110$  college students (69% female) who completed the study for credit in introductory psychology and linguistics courses. Ages ranged from 18 to 55, with a median of 19. The ethnic and racial composition of the sample was similar to the university from which participants came: 11% identified as Asian or Pacific Islander, 2% Black, 5% Hispanic, 76% White, and 6% multiple or other.

### *Procedure*

The procedure for this study was closely modeled on the original DRM procedure reported by Kahneman et al. (2004). Each participant completed four packets in order, and did not know what was in upcoming packets. Packet 1, which was not analyzed for the current report, contained a few brief questions about life satisfaction. For Packet 2, participants

generated a record of the previous day.<sup>2</sup> They were instructed to think carefully about everything they did from waking up until going to sleep, then divide the day into discrete episodes and name each one (e.g., “commuting to work” or “at lunch”). For Packet 3, participants completed a detailed report for each of the episodes identified in Packet 2, including questions about social interactions and about positive affect. Participants were initially given 20 blank episode reports, and extras were provided to those who needed them. Overall, participants completed an average of 13 episode reports ( $SD = 4$ , range from 6 to 27), resulting in a total of 1,480 observations in the dataset. Packet 4, the final packet, contained individual difference questionnaires (including the extraversion scale) as well as demographic questions.

The DRM was designed by Kahneman et al. (2004) to minimize retrospection biases, similar to an experience-sampling design. Global retrospective reports can be biased by implicit theories and beliefs, so investigators often turn to labor-intensive and costly experience-sampling designs when they wish to minimize such biases (Scollon, Kim-Prieto, & Diener, 2003). Although the DRM procedure is technically retrospective, it is different from global retrospective reports in that it requires participants to summon up specific and recent episodic memories, which should promote accuracy (Robinson & Clore, 2002). The DRM is a new procedure, but initial evidence has suggested that it is effective in this regard (Kahneman et al., 2004). Because the DRM covers a full day, it can sample a variety of different situations and events for each subject.

Moment-based methods like the DRM may be especially appropriate for studying extraversion and positive affect. In a meta-analysis, Lucas and Fujita (2000) found that correlations between extraversion and positive affect were generally lower when positive affect was measured with aggregated moment-based reports. They suggested that global retrospective

reports of positive affect may share method variance with extraversion scales. Reliance on nonoverlapping methods for different variables (such as global assessments of extraversion versus moment-based reports of positive affect) would avoid inflation of effects due to shared method variance.

### *Measures*

*Extraversion.* Extraversion was measured with the extraversion subscale of the Big Five Inventory (John & Srivastava, 1999). Sample items include “Is talkative” and “Is reserved” (reverse-scored). Participants indicated how well each item described them on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). To facilitate interpretation, scores were transformed to Percent of Maximum Possible (POMP) metric (Cohen, Cohen, Aiken, & West, 1999). The POMP transformation gives a scale a theoretical range from 0 to 100, making unstandardized statistics (like coefficients from multilevel models) more intuitively interpretable. Standardized and inferential statistics are unaffected by POMP transformation. The sample mean was 58.9; SD = 21.4. The scale showed good reliability;  $\alpha = .88$ .

*Positive affect.* Participants rated their positive affect during each episode with the items “Happy” and “Enjoying myself.” These items were rated on a scale from 0 (*not at all*) to 6 (*very much*). We combined these two items into a positive affect composite by averaging them together and transforming the average to POMP metric. The sample mean was 59.7, the between-subjects standard deviation was 15.0, and the within-subjects standard deviation was 23.2. The between-subjects alpha was .96, and the within-subjects alpha was .84.

*Social interactions.* For each episode, participants were asked, “Were you interacting with anyone (including on the phone, email, text, chat, etc.)?” The three responses options were: not interacting socially (32% of all episodes), interacting with 1 other person (24%), or

interacting with multiple others (43%). We coded the response categories [0, 1, 2] and transformed them to POMP metric for analyses.<sup>3</sup> The mean of the POMP-transformed variable was 56.03. The between-subjects standard deviation was 14.1, and the within-subjects standard deviation was 40.4.

## Results

We report the results in three sections. First, we report analyses replicating the commonly reported finding that extraversion is related to positive affect. Second, we report tests of the social participation hypothesis. Third, we report tests of the social reactivity hypotheses. Because of the nested data structure (multiple episodes nested within each participant), all hypotheses were tested using multilevel models.

### *Extraversion and Positive Affect*

We expected extraversion to be positively associated with positive affect. To test this hypothesis, we estimated a multilevel model with positive affect (PA) as the dependent variable and extraversion (EXT) as a level-2 predictor:

$$PA_i = \beta_{0i} + r_{ij}$$

$$\beta_{0i} = \gamma_{00} + \gamma_{01}EXT_i + u_i$$

The results from this analysis are shown as Model 1 in Table 1. The effect of extraversion was significant,  $\gamma = 0.15$ ,  $p < .05$ , indicating that extraverts felt more positive affect over the course of their day.

### *The Social Participation Hypothesis*

The social participation hypothesis states that extraverts have greater positive affect because they have more social interaction, which in turn produces positive affect. In statistical terms, social participation is said to mediate the effect of extraversion on positive affect. To test



this hypothesis, we followed standard inferential steps to establish mediation (Baron & Kenny, 1986). In the previous section, we established that extraversion is associated with positive affect. The remaining steps in establishing mediation are to show that extraversion is associated with social interaction, and that social interaction is associated with positive affect when extraversion is controlled.

*Did extraverts have greater social participation?* To test whether extraverts had greater social interaction, we ran a multilevel model with social interaction as the dependent variable, and extraversion as a level-2 predictor. The results of this analysis, shown as Model 2 in Table 1, indicated that extraversion was a significant predictor of social interaction,  $\gamma = 0.16, p < .05$ .

*Did people feel more positive affect during social interactions?* To test whether social interaction leads to positive affect, we ran a multilevel model with positive affect as the dependent variable, social interaction as a level-1 predictor, and extraversion as a level-2 predictor. The results of this analysis, shown as Model 3 in Table 1, indicated that individuals felt more positive affect during social interaction,  $\gamma = 0.10, p < .05$ . The effect of extraversion was not reduced to zero after social interaction was introduced into the model,  $\gamma = 0.13, p < .10$ . This constituted a 17% reduction in the effect and was consistent with partial but not total mediation.<sup>4</sup>

### *The Social Reactivity Hypothesis*

According to the social reactivity hypothesis, extraverts derive more pleasure than introverts from interacting with others. In the previous analysis, we found that for an average subject, social interaction was associated with positive affect; but according to the social reactivity hypothesis, that effect should be larger for extraverts than for introverts (i.e., extraversion should statistically interact with the social interactions variable). To test this

hypothesis, we estimated a multilevel model in which positive affect was predicted by social interactions (at level 1), extraversion (at level 2), and their cross-level interaction. This statistical interaction term tested the social reactivity hypothesis. As shown in Model 4 of Table 1, the statistical interaction was very near zero. The narrow confidence interval indicates that it is unlikely that we simply failed to detect an effect due to low statistical power. Furthermore, when we plotted the data (Figure 1), there did not appear to be a non-significant trend. Thus, we found no support for the social reactivity hypothesis.

### Discussion

We tested two possible explanations for why extraverts have greater positive affect. We found evidence in favor of social participation: social interactions partially mediated the relation between extraversion and positive affect. Extraverts and introverts both enjoy participating in social interactions, but extraverts socially participate more.

### *Potential and Limitations of the DRM*

The DRM, a relatively new research method, produces moment-based reports, similar to an experience sampling design. The results we found were consistent with what Lucas and Fujita (2000) found in their meta-analysis of experience-sampling studies. The DRM is technically retrospective, but it was designed to minimize retrospection biases, and preliminary evidence suggests it may be successful in doing so. However, as with any new method, some caution is warranted. The design had other limitations. We only assessed one weekday per participant. These weekdays contained considerable within-subject variability in social participation and positive affect; but a traditional experience-sampling design with more events per person and coverage of multiple days (including weekends) would have enhanced generalizability.

Relatedly, our participants were all college students and nearly all were young adults; future research could benefit from examining other populations.

### *Considering Causality*

Tests of both hypotheses assumed that extraversion is causally prior to other variables, and that positive affect is a response to social participation rather than an antecedent of it. The first assumption, we think, is not unreasonable: although social environments may affect personality traits (e.g., Fraley & Roberts, 2005; Srivastava, John, Gosling, & Potter, 2003), they probably do so at developmental timescales, and such effects would be unlikely to confound the present results. The second assumption is more open, however: perhaps the apparent effect of social participation on positive affect was really due to extraverts feeling generally happier, which motivated them to socialize. To address this possibility, we re-ran the mediation model depicted in Figure 1 while controlling for lagged positive affect from the previous episode. The effect of social participation on positive affect was still significant, suggesting that prior positive affect was not a confound. Nevertheless, it is impossible to make airtight causal inferences in a nonexperimental design, and thus we cannot completely rule out alternative models.

### *Making Sense of Social Participation and Social Reactivity*

In the real world, situations are not randomly assigned. Evidence for the social participation hypothesis fits with a general principle that personality is an important factor in determining which situations an individual will end up in (Ickes et al., 1997). Proactive transactions undermine the logic of comparing how traits “versus” situations affect feelings or behavior; rather, situations are selected or modified by individuals on the basis of their traits. Specifically, our findings indicated that one aspect of extraversion is a tendency to seek or initiate contact with others. The modest effect size may help explain why previous studies have

not found this effect consistently. Introverts' days contained nearly as much social interaction as those of extraverts; presumably a variety of other contextual and personal factors are important determinants of social participation.

The present results indicate that greater social participation is one reason why extraverts are happier. However, it is important to recognize that the data only supported partial mediation: social participation explained about 17% of the total effect. Extraverts' greater happiness probably has multiple explanations. Although we did not find effects of social reactivity, other kinds of reactivity (such as to rewarding stimuli) may also be important (Derryberry & Reed, 1994).

Extraverts and introverts had similar affective responses to social interaction; so why did extraverts socially interact more? Extraverts are more assertive (John & Srivastava, 1999), so one possibility is that they are more active in selecting or altering their situations. Another possibility is that introverts prefer activities that elicit different emotions. We defined and measured positive affect with high-arousal positive emotions, consistent with previous studies of extraversion. However, some recent evidence suggests that introverts value pleasant but low-arousal affective states like *calm* and *relaxed* (Tsai, Knutson, & Fung, 2006). Future studies might benefit from identifying situations that elicit low-arousal emotions, and examining whether introverts select those situations in lieu of social participation.

#### *Extraversion and Person-Environment Transactions*

A broader goal of this study was to expand on the importance of person-environment transactions in explaining personality traits. Transactional accounts of traits differ markedly from basic-tendency accounts. In basic-tendency accounts, traits are conceived as stable behavioral "set points" to which individuals return after brief environmental perturbations (Fraley &

Roberts, 2005). By contrast, transactional accounts explain traits as styles of engaging with and responding to the world; transactions are thus consistent with findings that traits change and develop over the long term (Fraley & Roberts, 2005; Srivastava et al., 2003). The findings of this study indicate that extraverts engage in proactive transactions with their social environments. Extraverts' lives have a different distribution of situations than introverts' lives, and an understanding of such environmental differences is important for a full understanding of what extraversion is.

## References

- Argyle & Lu (1990). The happiness of extraverts. *Personality and Individual Differences*, *11*, 1011-1017.
- Ashton, M.C., Lee, K., & Paunonen, S. (2002). What is the central feature of extraversion? Social attention versus reward sensitivity. *Journal of Personality and Social Psychology*, *83*, 245-252.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182.
- Clark, L.A., & Watson, D. (1988). Mood and the mundane: Relations between daily life events and self-reported mood. *Journal of Personality and Social Psychology*, *54*, 296-308.
- Derryberry, D., & Reed, M.A. (1994). Temperament and attention: Orienting toward and away from positive and negative signals. *Journal of Personality and Social Psychology*, *66*, 1128-1139.
- Diener, E., Larsen, R.J., & Emmons, R.A. (1984). Person by situation interactions: Choice of situations and congruence response models. *Journal of Personality and Social Psychology*, *47*, 580-592.
- Fraley, R. C., & Roberts, B. W. (2005). Patterns of continuity: A dynamic model for conceptualizing the stability of individual differences in psychological constructs across the life course. *Psychological Review*, *112*, 60-74.
- Ickes, W., Snyder, M., & Garcia, S. (1997). Personality influences on the choice of situations. In R. Hogan, J. A. Johnson, & S. R. Briggs (Eds.), *Handbook of personality psychology* (pp. 165-195). San Diego, CA: Academic Press.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102-138). New York: Guilford.

Kahneman, D., Krueger, A. B., Schkade, D. A., Schwarz, N., & Stone, A. A. (2004). A survey method for characterizing daily life experience: The day reconstruction method. *Science*, *306*, 1776-1780.

Lucas, R. E., & Fujita, F. (2000). Factors influencing the relation between extraversion and pleasant affect. *Journal of Personality and Social Psychology*, *79*, 1039-1056.

Pavot, W., Diener, E., & Fujita, F. (1990). Extraversion and happiness. *Personality and Individual Differences*, *11*, 1299-1306.

Robinson, M. D., & Clore, G. L. (2002). Belief and feeling: Evidence for an accessibility model of emotional self-report. *Psychological Bulletin*, *128*, 936-960.

Scollon, C. N., Kim-Prieto, C., & Diener, E. (2003). Experience sampling: Promises and pitfalls, strengths and weaknesses. *Journal of Happiness Studies*, *4*, 5-34.

Srivastava, S., John, O. P., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: Set like plaster or persistent change? *Journal of Personality and Social Psychology*, *84*, 1041-1053.

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

Watson, D., & Clark, L.A. (1997). Extraversion and its positive emotional core. In R. Hogan & J.A. Johnson (Eds.), *Handbook of social psychology* (4<sup>th</sup> ed., Vol. 2, pp. 446-496). New York: McGraw-Hill.

Footnote

1. In this manuscript, extraversion is conceptualized and measured as a continuous dimension, not a dichotomous classification. For the sake of brevity, however, we use the terms “extravert” and “introvert” to refer to individuals who are relatively high or low on the dimension of extraversion.

2. All participants were run on a Tuesday or Thursday so that they were always reporting on a weekday.

3. We also ran analyses in which we treated social interactions as a categorical variable (alone vs. with others), using multilevel logistic analyses when social interaction was the dependent variable. The multilevel logistic analyses produced the same substantive results.

4. Results of Sobel and bootstrap tests were consistent with mediation as well. They indicated that the compound mediated path (i.e., from extraversion to social participation to positive affect) was significantly different from zero.



Table 1

*Multilevel Models of Positive Affect, Extraversion, and Social Participation*

Variable	Effect	SE	95% CI	<i>t</i>
<u>Model 1 (DV: Positive Affect)</u>				
Extraversion	0.15	0.07	[0.01, 0.29]	2.12*
<u>Model 2 (DV: Social Participation)</u>				
Extraversion	0.16	0.08	[0.00, 0.31]	1.98*
<u>Model 3 (DV: Positive Affect)</u>				
Extraversion	0.13	0.07	[-0.01, 0.26]	1.82†
Social Participation	0.10	0.02	[0.06, 0.13]	5.27*
<u>Model 4 (DV: Positive Affect)</u>				
Extraversion	0.13	0.07	[-0.01, 0.27]	1.86†
Social Participation	0.10	0.02	[0.06, 0.13]	5.28*
Extraversion X Social Participation	-0.00	0.00	[-0.002, 0.001]	-0.41

*Note.*  $N = 110$ . CI = confidence interval; DV = dependent variable. Extraversion and social participation were centered around their grand means.

†  $p < .10$ ; \*  $p < .05$ .

Figure Caption

*Figure 1.* Positive affect as a function of social participation and the individual's extraversion. High and low extraversion are calculated as  $\pm 1$  standard deviation from the sample mean.

