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Static, Dynamic, and Causative Bipolarity of Affect

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In what sense are pleasant and unpleasant moods “bipolar”? One must differentiate three types of affective bipolarity: *static bipolarity* (the zero-order correlation between measures of pleasant and unpleasant affect, net of distortions due to measurement error, tends to be strongly negative), *dynamic bipolarity* (pleasant and unpleasant feelings generally change in opposite directions and to approximately the same extent), and *causative bipolarity* (the influence of pleasant and unpleasant affect on other variables is approximately equal and opposite). It is argued that static bipolarity is often attenuated by measurement error, dynamic bipolarity can be masked by asymmetrical scaling artifacts, and causative bipolarity is often obscured by both. The experience and influence of pleasant and unpleasant affect may occur along bipolar lines even if the sources of these feelings are understood as physiologically separable systems with distinct neurological loci.

The bipolar perspective on mood holds that feelings that are described by antonyms—*happiness* and *unhappiness, arousal* and *calm*—are, in most circumstances, experienced and expressed inversely. The bipolarity thesis can be expressed in terms of three distinct claims: *static bipolarity, dynamic bipolarity,* and *causative bipolarity. Static bipolarity* refers to the observation that affective space is bipolar; that is, across individuals the zero-order correlations (when corrected for measurement error) between pleasant and unpleasant feelings are strongly negative in most populations (Russell, 1979, 1980; Russell & Carroll, 1999). The principle of *dynamic bipolarity* holds that when the affective system is perturbed—for instance, when a mood is deliberately induced—pleasant and unpleasant feelings move in opposite directions and generally with proportional magnitude. Thus, whereas assessments of static bipolarity examine moods across individuals, the study of dynamic bipolarity looks at change within individuals over time. *Causative bipolarity* is the idea that pleasant and unpleasant feelings exert equal and opposite influences on other psychological processes, such as thought and behavior. An upsurge in happiness has approximately the same consequences as a corresponding decline in sadness.

Our purpose here is to explore three general conditions under which bipolarity in affect ratings is likely to be discovered, while noting the methodological reasons why bipolarity is so often masked. In doing so, we are not proposing an alternative model for the structure of affect. Existing models seem to us to provide reasonable representations of affective space. We like them—as models. That is, we believe that a circumplex is a reasonable Cartesian representation of affect terms, that drawing two axes within that circumplex is generally more helpful than delineating one or three, and that the orientation of these axes is arbitrary. We have never claimed that affect is characterized by only one dimension or that the masking of bipolarity in valence due to response biases would not also be a problem with other dimensions of affect, such as arousal (D. P. Green, Goldman, & Salovey, 1993). We have no argument with a theoretical model of affect that posits pleasant-unpleasant versus arousal-calm as independent nor one that posits positive affect (PA) and negative affect (NA) as independent (e.g., Goldstein & Strube, 1994; Watson, Clark, & Tellegen, 1988; Zevon & Tellegen, 1982).[1] Our concern is with moods which, from the standpoint of the circumplex, would seem to reside at opposite ends of the same dimension (e.g., happiness and unhappiness).

The focus of this essay is more methodological than theoretical. The fundamental problem confronting the study of mood is the fact that representing subjective, phenomenological experiences using common language and scaling methodology is fraught with error and compromise. To derive reliable inferences from mood research, one must use (multiple) methods of measurement that account for these systematic and random biases. Circumplexes and axes drawn within them represent idealized structures. We prefer to deal with a reality—the measurement of affect in all of its messiness—and then argue about which idealized theoretical model provides the most empirically useful approach to the study of mood and emotion.

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[1] We do note that as measured, PA and NA are not empirically independent, and as a result, may not be as useful a way of characterizing affective space as pleasant-unpleasant and arousal-calm, two separable and largely bipolar dimensions that map more easily onto affective terms used in common language by nonpsychologists.

The delineation of three types of bipolarity is important because one kind of bipolarity need not imply another. Yet debate about whether the structure of pleasant and unpleasant affect is well characterized by a single bipolar dimension, as opposed to relatively independent and distinct dimensions, has often blurred the distinction among the various conceptualizations of bipolarity and perhaps focused undue attention on one conceptualization, static bipolarity.

Debate over static bipolarity can be traced to Bradburn's (Brad-bum, 1969: Bradbum & Caplovitz, 1965) influential work on subjective well-being and that of other investigators concerned with the measurement of mood. Bradbum and Caplovitz (p. 18), for example, found a meager correlation of —.19 between respondents' reports of feeling "depressed or very unhappy" and reports of feeling "on top of the world," and, indeed, that was the strongest negative correlation they observed between positive and negative moods. Diener and Emmons (1984, pp. 1109-1 111) reported a host of between-subjects correlations between happy and sad emotions. Most hover around zero, and some are weakly positive. Larson (1987. p. 151) presented data indicating that the frequency with which happiness is reported correlates .05 with the frequency with which sadness is reported. Such findings, as Cacioppo and his colleagues have frequently pointed out, parallel results in other domains, such as racial ambivalence and attitudes toward blood and organ donation (reviewed in Cacioppo, Gardner. & Berntson, 1997). Katz and Hass (1988. p. 898), for example, reported a median correlation of just —14 across nine studies measuring pro-Black and anti-Black attitudes. Summarizing two unpublished studies of attitudes toward blood donation, Cacioppo, Gardner, and Berntson (1997. p. 9) reported correlations of — .08 and —.07 between positive and negative orientations toward donation. Similarly, Parisi and Katz's (1986) study of attitudes toward organ donation showed a correlation of exactly zero between positive and negative attitudes. To this list one may add analogous results showing weak correlations between optimism and pessimism (Plomin et al., 1992; Robinson-Whelen, Kim. MacCallum, & Kiecolt-Glaser, 1997), positive and negative attitudes toward the poor (Nelson, in press), and positive and negative evaluations of presidential traits (Kinder, 1986). Judged solely by the sheer weight of citations, the evidence in favor of static independence seems quite formidable.

Tellingly, every one of the aforementioned studies relies on a single method of mood (or attitude) assessment and makes no allowance for the problems associated with random and nonrandom response error, a longstanding methodological concern (Bentler, 1969). When one addresses these measurement concerns using a multimethod approach to mood assessment, a largely bipolar structure for affect is revealed (D. P. Green, Goldman, & Salovey, 1993; see also D. P. Green, 1988, and D. P. Green & Citrin, 1994, for critiques of the literatures on political attitudes). Our analysis showed, for example, that the correlation between mood terms like *happy* and *sad,* when corrected for random and nonrandom error, moved from the range of —.25 to —.75 (observed) to the range of —.84 to - .92 (corrected; D. P. Green et al, 1993).

Similar findings have emerged from the sophisticated analyses of Feldman Barrett and Russell (1998) and Carroll, Yik, Russell, and Feldman Barrett (1999). Using an approach similar to D. P. Green et al.'s (1993), Feldman Barrett and Russell conducted two studies in which random and systematic error were controlled using multiple formats for their mood scales and confirmatory factor analysis. Pleasant and unpleasant affect emerged as bipolar opposites in both studies, along with a second, arousal dimension.

In the first study, after controlling for random and nonrandom measurement error, the correlation between latent pleasant and unpleasant factors was -.92 (n = 129). In the second study, this correlation was —.89 (n = 225). Carroll et al. used a procedure described by Fabrigar, Visser, and Browne (1997) in which the correlations among items or clusters of items fit around a circumplex structure are estimated by measuring the angle between any two of them. Using this procedure, they found that high arousal, pleasant and unpleasant affect items showed low-to medium-sized negative correlations with each other (— .20 and —.39 in their two samples) but that moderately arousing pleasant and unpleasant affect items showed substantial negative correlations with each other (—.90 and —.91 in their two samples).[2] In sum, the complaint that bipolarity of mood is too often assumed rather than tested (Cacioppo & Berntson, 1994. p. 410; Cacioppo & Gardner, 1993. p. 270; Gardner & Cacioppo, 1995, p. 796; R. F. Green & Goldfried, 1965) has generated several methodologically sophisticated studies showing that, absent special circumstances or interventions that perturb mood, affective space tends to be approximately bipolar in most populations.[3]

Despite the support for static bipolarity reflected in these studies, the view that separate positive and negative dimensions offer a better representation of affective and evaluative processes (e.g., Cacioppo et al., 1997) remains quite widespread.[4] Some of this popularity appears to stem from recent evidence in neuroscience suggesting that the positive (approach) and negative (avoidance) responses of organisms may be rooted in separate physiological systems that have different foci in the brain (Ahern & Schwartz, 1985; Berntson, Cacioppo, & Quigley, 1991; Davidson, 1992; Davidson. Ekman, Saron, Senulis, & Friesen. 1990; Gray, 1990). This critique is buoyed also by evidence purporting to show that positive and negative affects have distinct and asymmetrical effects on behavior (Cacioppo & Gardner. 1993; Gardner & Cacioppo, 1997).

[2] The lone exception to the generalization that more sophisticated studies find stronger negative correlations between pleasant and unpleasant moods is Diener, Smith, and Fujita (1995).

[3] Some investigators have noted that the bipolar nature of positive and negative affect is more apparent under conditions of acute arousal and over brief time frames, that is. when the affective system is perturbed (Diener & Emmons, 1984; Diener & Iran-Nejad, 1986). In effect, static bipolarity is more noticeable when there is more trait variance in happy and sad moods. This raises a more general complaint about correlational studies. A limitation of much prior research on the structure of affect (including our own) is that these studies merely describe the static pleasant-unpleasant mood correlations in the samples at hand. Mood seems to be bipolar in samples of undergraduates, but a sample of French existentialists or Tibetan monks might suggest otherwise. Indeed, as is always the case for correlational analysis, the size of correlations between happy and sad items depends critically on the variances of these underlying traits. A sample of recent lottery winners or of bereaved parents might produce a very low happy-sad correlation; if one combines the two samples, however, the correlation will be enormous.

[4] Although studies such as Watson and Clark's (1997) are often associated with the "independence" view, we are not here referring to their constructs of positive affect (excitement) and negative affect (jitteriness). Rather, when discussing mood bipolarity, we are thinking of either arousal-calm or happy-unhappy dimensions; when discussing evaluations, we are thinking of approval-disapproval or attraction-revulsion.

Before assessing the empirical bases for these claims, we hasten to point out that the existence of independent biological substrates for pleasant and unpleasant affect is an issue distinct from the question of how moods are experienced. Bipolar feelings can emanate from physiologically independent positive and negative systems. By way of example, imagine living in a home with two independent systems controlling your feelings of warmth or coolness (i.e., the temperature of your home): heating and air conditioning. These two systems generally operate inversely; when the heat is on, the air conditioning is off, and vice versa (they are activated reciprocally; see Cacioppo & Bemtson, 1994). However, the two systems do not have to operate this way. Both the heat and the air conditioning can be turned off, and, as is characteristic of our university, both the air conditioning and the heat can be running at the same time. But whether the two underlying systems are better characterized as completely independent or reciprocal does not matter with respect to how the occupants of the home feel. Generally, these residents do not feel both warm and cool simultaneously. As they become warmer, they become less likely to feel cool. As they feel cooler, they tend to feel less warm. Aside from unusual experiences, such as feverish chills, the phenomenological experience of temperature (and, certainly, the measurement of temperature itself; see Cacioppo et al., 1997) is best characterized as bipolar regardless of the underlying mechanics that produced these experiences. As Ito, Cacioppo, and Lang (1998) noted, “it is completely possible for two antagonistic forces to be separable and yet have their net effect well represented by a difference function” (p. 877; see also Bradburn & Caplovitz, 1965, pp. 59-60).

One way to assess the extent to which pleasant and unpleasant moods are functionally distinct is to examine the ways in which these moods change in response to experimental or nonexperimental perturbations. We argue that under ordinary conditions, mood change is bipolar (although, again, special precautions must be taken against potentially misleading statistical evidence). When people become happier, they tend to become correspondingly less sad.

Without denying that it is possible to induce nonbipolar mood change, we would emphasize the fact that in time moods tend to revert to a bipolar static equilibrium. To get a sense of what we have in mind by equilibration, consider another analogy. Oil and vinegar in a bottle of salad dressing may be mixed together; but left undisrupted, they tend to reequilibrate into distinct liquids. In much the same fashion, life’s twists and turns may leave one with a momentary sense of wistful happiness or energetic serenity. In time, however, moods tend to sort themselves out into a bipolar equilibrium. In relation to their typical mood states, sad people feel less happy; drowsy people, less peppy.

Another approach to the study of functional independence is to look for asymmetrical consequences of pleasant and unpleasant mood. When an outcome, *y*, is predicted by measures of pleasant and unpleasant affect, the bipolar hypothesis implies a constrained regression model in which $y = y$ (Pleasant — Unpleasant) + u, which is mathematically equivalent, of course, to $y = y$(Pleasant) + — y(Unpleasant) + u. The alternative hypothesis is that the unstandardized effects of Pleasant and Unpleasant are not equal in absolute value. As we point out below, this null hypothesis is seldom tested in a rigorous manner, and on close inspection, published evidence purporting to show asymmetries is quite flimsy.

In the remainder of this article, we attempt to demonstrate that the evidence in favor of dynamic and causative bipolarity is at least as strong as the now overwhelming evidence for static bipolarity. In doing so, we rely largely on the re-analysis of published data. We argue that just as static bipolarity is often masked by measurement error and other methodological considerations, dynamic and causative bipolarity are often masked by scaling asymmetries and distortions associated with measurement error. When these methodological difficulties are taken into account, the way that mood changes and influences other variables conforms to the predictions of the bipolar model.

Methodological Issues and the Discovery of Static Bipolarity: Random Error, Nonrandom Error, and Asymmetrical Scaling

Measurement Error

Gauging the correlations between latent mood constructs presents an array of methodological hazards. When dealing with individual-level data (as opposed to examining mean responses among different groups), the chief difficulties stem from response error. As we and many others have pointed out, errors of measurement distort correlation coefficients (D. P. Green et al.. 1993). *Random measurement error*—unsystematic fluctuations in the way survey questions are interpreted, how moods are represented as survey responses, or how these responses are coded by the analyst—attenuates estimated correlations. An underlying correlation of —.92 between happy and sad moods, for example, will be pushed toward zero; the degree of distortion is proportional to the reliabilities of the measures used to assess these moods.

Further distortion is introduced by *nonrandom error.* Questions that are worded in similar ways or that offer similar response options frequently pick up individual differences in acquiescence, charitability, willingness to disclose personal information, or attraction to middle or noncommital response options (Campbell & Fiske, 1959; Schwarz, Groves, & Schuman, 1998). In cases in which two measures contain positively correlated response errors, correlations are biased in the positive direction. In the case of the correlation between measures of pleasant and unpleasant moods, this type of distortion means that the expected negative coefficient is driven further in the direction of apparent independence. Small wonder, for example, that in the 1972 American National Election Study (Center for Political Studies, 1972), two mood measures asking respondents whether they have lately been “feeling on top of the world” or “feeling depressed or very unhappy” correlate at a mere —.01 (n = 966). Correlations of this kind represent a witches’ brew of genuine trait correlation, random measurement error, and systematic response biases.

When correlations of this kind were first encountered, however, they were interpreted to mean that underlying pleasant and unpleasant moods were uncorrelated (Bradbum & Caplovitz, 1965, p. 18). Affect researchers have become much more sophisticated about the consequences and treatment of measurement distortions (e.g., Carroll et al., 1999; Fabrigar et al., 1997). Looking back on the Bradburn and Caplovitz study, it seems clear why their uncorrelated measures of positive and negative feelings should bear .26 and —.30 correlations, respectively, to a criterion measure asking respondents whether they felt “very happy,” “pretty happy,” or "not too happy": all three measures tap essentially the same thing. The reason why the scales of positive and negative feelings are uncorrelated is that they share similar response formats and, consequently, response biases.

One further discovery is the robustness of multiple-measure research designs. When mood is measured using a variety of adjectives and response formats, the error-corrected correlations turn out to be quite consistent across a variety of different statistical models. The D. P. Green et al. (1993) studies, for example, indicate that when mood is measured in four different ways, it makes little difference whether one chooses to model nonrandom response error. Models that allow for nonrandom error produce a better fit to the data, but those that ignore nonrandom error yield the same substantive conclusions. The strengths of the research design can rescue us from the deficiencies of our statistical models.

Although the assessment of interfactor correlations has grown more methodologically sophisticated, measurement error is widely ignored in studies that use opposites as predictors in an effort to assess causative bipolarity. As we point out below, enormous estimation problems arise when competing mood predictors have different reliabilities, and these problems are compounded when response biases are correlated with the dependent variable. Progress in the study of causative bipolarity requires researchers to come to terms with the special problems that arise when imperfect mood scales are used as predictors.

Asymmetrical Scaling

By most survey measures, Americans are a rather buoyant people (see Veenhoven, 1993, for cross-national comparisons). In 1996, for example, the General Social Survey (Davis & Smith, 1996) asked respondents "on how many days during the past 7 days" had they "felt happy," garnering an average score of 5.3 (*n* = 1,451). Conversely, Americans tend not to report sad moods. The corresponding inquiry about the extent to which respondents "felt sad" produced an average score of 1.6 (*n* = 1,449). What makes this example unusual is that the two means are equidistant from their respective poles. Depending on the mood adjectives used and response options offered, the means of happy and sad measures may be far from complementary. Had we substituted the words *contented* (*M* = 4.5, *n* = 1,427) or *overjoyed* (*M* = 1.8, n = 1,433) for "felt happy," the contrast between happy and sad would have looked quite different.

It is not unusual for measures of happiness to have more variance than measures of sadness. The two General Social Survey measures "felt happy" and "felt sad," for example, have variances of 4.2 and 3.7, respectively. In college samples, the same pattern turns up when mood is measured using adjective checklists and certain kinds of semantic differential response formats (D. P. Green et al., 1993). Contrasting variances could be interpreted to mean that happy (ξ_h) and sad (ξ_h) moods are distinct constructs, but one must take care to consider methodological explanations, particularly because certain response formats do not produce this contrast (cf. D. P. Green et al., 1993, Study 1). One possibility suggested by empirical studies using confirmatory factor analysis is that a given measure of unpleasant mood (U) may have a smaller unstandardized factor loading than its pleasant counterpart (P). Suppose a pair of latent moods (ξ_u, ξ_p) with the same variance generates the observed measures (*U, P*) according to the following relation:

$$U = \lambda_u \xi_u + \delta_u$$
$$P = \lambda_p \xi_p + \delta_p,$$

where δ_p and δ_u represent errors of measurement and λ_p and λ_u represent factor loadings. The pattern $\lambda_p > \lambda_u$ would occur, for example, if respondents were reluctant to disclose very sad moods, in which case a one-unit change in would produce a relatively small observed change in *U.* Another explanation for contrasting variances is simply that a given measure of sadness may contain less measurement error variance than a given happiness measure.

These possible asymmetries need to be taken into account in any investigation of bipolarity. If an increase in latent happiness produces a corresponding decrease in latent sadness, this fact will only be apparent to a proportionality constant in our observed measures (because we cannot be certain a priori that $\lambda_p = \lambda_u$). By the same token, if we are interested in the possibility that happy and sad moods have (unstandardized) effects of different magnitude when used as predictor variables in a regression analysis, we must ensure that this finding does not come about because the particular pleasant and unpleasant measures load differently on their respective constructs. It is possible to overcome these problems with multiple-measure designs and models that take measurement error into account, but unfortunately this kind of research approach is the exception rather than the rule.

Dynamic Bipolarity

When moods are traced over time, does one find that people who become happier also become less unhappy? Not everyone believes so. For example, subjective well-being theorists such as Parducci (1995), who see happiness as relative, have argued that occasional unpleasant experiences can increase our happiness by revealing to us concrete examples of distress that by contrast increase our appreciation of contentment. "[S]ome misery is inevitable," Parducci noted, "but if sufficiently infrequent, even the worst experiences improve the overall balance of happiness by increasing the pleasantness of other, more frequent experiences" (p. vii). Others claim that over time, in certain circumstances, negative states can flip quickly into positive ones—the dread of a rock-climber looking into the abyss below may suddenly be experienced as a sensation of exhilaration (Csikszentmihalyi, 1985; see also Apter, 1992).

One of the most interesting studies to address the issue of whether, over time, happiness and unhappiness change inversely was conducted by Diener in 1986 (see Diener, Sandvik, Pavot, & Gallagher, 1991; Pavot, Diener, & Fujita, 1990). In this study, 109 participants recorded their moods at random intervals over a period of 26-30 days. Given this design, a simple test of dynamic bipolarity is to examine the correlation between pleasant and unpleasant moods within subjects for t = 28 observations. Using these data, we created a scale of pleasant mood composed of ratings for the adjectives *happy, joyful,* and *pleased* and an unpleasant scale based on the adjectives *sad, depressed/blue,* and *unhappy*. We then calculated the correlation between these two time series for each individual. We plotted the 109 resulting correlations in the histogram presented in Figure 1. Although

Table 1
Input Correlation Matrix and Resulting Inter/actor Correlations

Variable	1	2	3	4	5	6	7	8	Unstandardized factor loadings: Factor 1	Unstandardized factor loadings: Factor 2	Reliabilities
1, Mood adjective checklist: pleasant	1.840								1		.50
2 Mood adjective checklist: unpleasant	–.402	1.594								1	.74
3. Self–description: pleasant	597	–.509	1.031						0.68		.77
4. Self–description: unpleasant	– 475	.618	582	1.181						0.90	.73
5. Unipolar scale: pleasant	634	–.517	.752	–.651	1.872				1.26		.49
6. Unipolar scale: unpleasant	– .547	.566	– .635	694	–688	2.142				1.57	.73
7. Agree–disagree: pleasant	.614	– .509	.740	–.617	.748	–.593	1.651		1.08		.67
8. Agree–disagree: unpleasant	– .445	.544	–.593	.681	–.651	.626	–.729	1.549		1.10	.62

Note. Standard deviations are on [he diagonal. Interfactor correlation between changes in pleasant and nonpleasant moods was —.873. Error covariances are nonsignificant except for the

no allowance was made for the imprecision with which moods are measured over time, the mean correlation is —.51. and the mode of the distribution falls at approximately - .70. (For quite similar within- subjects results, see Ito ct at., 1998. Figure 10.) Only a small fraction of participants reported pleasant and unpleasant mood stales that were dynamically unrelated. For most people, feeling more dispirited than usuai coincides with feeling less happy[5]

The same conclusion emerges even more strongly when we correct for measurement error in recorded mood fluctuations using multiple measurements. Re-analyzing the data from Study I of D. P. Green et al. (1993). in which moods were assessed twice during u I -month period, we created four distinct survey measures of change in pleasant and unpleasant mood, each based on a different type of response format. As shown in Table 1, we found the raw correlations between these two change scores to range from -.40 to .73. Using confirmatory factor analysis. X^2(15. *N* — 139) = 11 1. *p* = .75, we estimated the error-corrected correlation between mood change scores to be —.87. Clearly, participants who became happier tended also to become less sad.

An alternative approach to the study of mood dynamics is to manipulate mood experimentally. Suppose we take groups of people whose moods are in equilibrium and randomly expose them

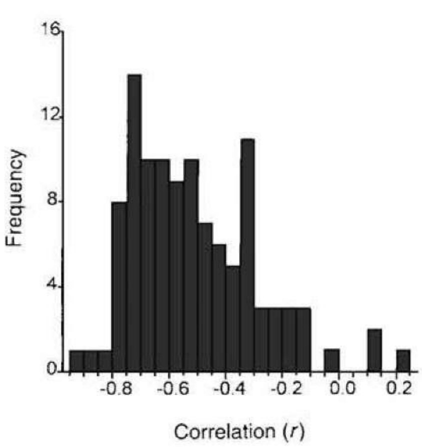


Figure 1. Within-subjects correlations from Diener et al.'s (1991) timeseries data

to various mood-inducing stimuli. Such an experiment would enable us to examine how their happiness and sadness change as a result of the treatment. Do we observe changes in happiness that are proportional in size to changes in sadness?

Numerous mood-induction experiments suggest that pleasant and unpleasant moods change in opposite fashion. Mayer, Allen, and Beauregard (1995. Experiment 2) induced happy, angry, fearful, and sad moods by means of written vignettes that participants read white listening to evocative music. Gross and Levenson (1995) induced mood by showing participants excerpts from films or television shows. Albersnagel (1988) used a variety of different Velten mood inductions, whereas Clark (1983) used a combination of Velten and musical mood induction procedures. In each case, participants were asked to report their moods following each manipulation using both measures of pleasant and unpleasant mood.

In every one of these experiments, pleasant and unpleasant moods (variously dubbed *elation, happiness, joy* or *despondency, sadness, depression*) changed in inverse fashion. Consider, for example, the results of the Mayer ct al. (1995) study. Figure 2 shows the mean levels of happy and sad mood across different mood inductions. To facilitate comparison, we rescaled the happy and sad measures so that 0 is the lowest possible score and 1 is the highest. If mood is bipolar, we should observe an inverse relationship between mean levels of happiness and sadness for any given experimental group:

$$\bar{P}\ x\ 1 - \bar{U}.$$

The implied downward-sloping line suggests that an increment in unhappiness produces a corresponding decrement in happiness,

[5]Note the contrast between the dynamic bipolarity argument and Ito et a l ' s observation concerning static bipolarity under conditions of disequilibrium. Ito et al. pointed out that within an induction condition the across-subjects correlation between pleasant and unpleasant mood sometimes drops to zero If everyone responded to the mood induction in the same way, the only variance on each dimension (pleasant, unpleasant) would be the result of measurement error, and the observed correlations would be zero. Between-subjects correlations within a given mood induction therefore reflect the heterogeneity with which the mood stimulus is perceived.

which is just the pattern revealed in Figure 2. In the Mayer et al. study, prior to any manipulations, participants showed the typical equilibrium pattern of moderate-to-high happiness coupled with low levels of sadness, what Ito et al. (1998) call a *positivity offset.*[6] When presented with a positive stimulus, ratings of happiness go up further, whereas ratings of sadness drop to minimal levels. The negative stimulus, on the other hand, causes happiness ratings to plummet and sadness to rise. For all of the groups taken together (n = 36), happiness scores rise from .79 (baseline) to .91 (happy) and then fall to .31 (sad), whereas sadness changes from .22 to .12 to .79.

The most extensive demonstration of this point was presented by Ito et al. (1998), who measured mood after presenting 472 evocative photographic slides. Mean levels of what they called *positivity* (happy, satisfied, good, delighted, approving, pleasant) and *negativity* (unlikable, unattractive, unpleasant, disapproving, distressed, disagreeable) were obtained from many small samples. (Apart from sampling variability, these samples are identical prior to each treatment, so comparing moods after each induction is analogous to tracing a single group over time.) Across the various groups, positivity and negativity correlate at —.83, without any correction for unreliability in the means (all of which were based on small numbers of raters). When we take the log of each scale to correct for the crowding of observations near the endpoints of each scale, we obtain a correlation of —.91 (see Figure 3). Equally impressive is how closcly these positive and negative ratings map onto a bipolar measure of pleasant-unpleasant valence. Ito et al. computed the difference between mean positivity and negativity scores for each slide. Across the 472 stimulus objects, the mean bipolar valence ratings correlated .93 with the means of this affective difference score. In short, when we examine how mood changes across settings, bipolar and combined unipolar scales prove to be well-nigh interchangeable.

Is it possible to disrupt this inverse relationship between pleasant and unpleasant affect? The Mayer et al. (1995) data presented in Figure 2, as well as the Gross and Levenson (1995) results, show that fear- and anger-arousing stimuli can push participants off the downward-sloping 45° line, at least temporarily. The happy-sad mean pairs for the disgust, fear, and surprise conditions in the Gross and Levenson study show that the revulsion induced,

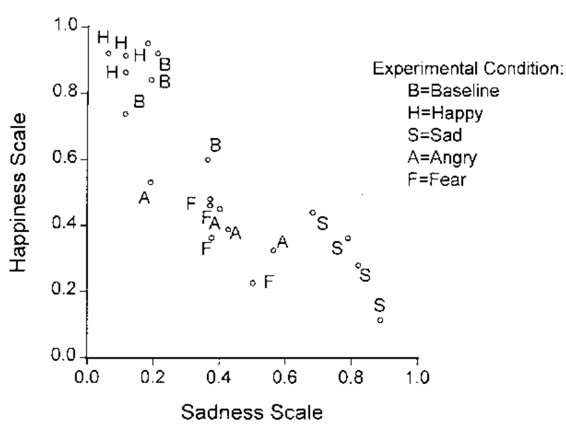
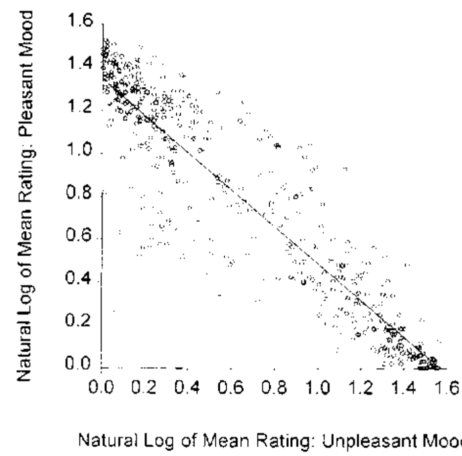


Figure 2. Happy and sad moods following happy, angry, fearful, and sad mood inductions in Mayer, Allen, and Beauregard (1995, Experiment 2).



inductions reported in Ito, Cacioppo. and Lang (1998). r = —.913.

for example, by the movie *Pink Flamingos* diminishes both happiness and sadness. Under such conditions, Cacioppo and Berntson's (1994) thesis about independent biological structures may seem compelling. The heater and air conditioner both shut off.

For most people most of the time, however, life is less appalling than a John Waters movie and less chilling than *Silence of the Lambs.* And those of us who experience the anxiety of *Titanic* or the sorrow of *Terms of Endearment* tend not to experience these moods indefinitely. Indeed, one of the most important characteristics of mood is its susceptibility to change. Panel studies tracking individuals over time show very little autocorrelation in mood reports. Even when measurement error is taken into account, pleasant and unpleasant moods at one time prove to be weak predictors of mood a few weeks later (D. P. Green et al., 1993). This finding does not deny the individuals have "set points" to which their moods return (Ito et al., 1998); it rather suggests that within a typical sample, variance in these set points tends to be small relative to the variance in agents of mood change.[7]

In sum, experimental studies of mood change suggest a general pattern of dynamic bipolarity. Increases in happiness lead to proportional decreases in sadness, and vice versa. At the same time, these studies also suggest that nonbipolar mood shifts are possible, as when a revulsion-inducing stimulus produces a greater drop in happiness than surge in sadness. These disequilibria tend to be short-lived, however. In the Mayer et al. (1995) experiment, for example, the fear and hostility mood inductions were randomly interspersed with the happy and sad inductions, and yet all four groups show the bipolar pattern of mood change in Figure 2. Left undisturbed, salad dressing returns to its two-tiered equilibrium.

[6] Each of the four baseline groups represented in Figure 2 was exposed to the mood inductions in a different order.

[7] Re-equilibration is apparent as well at the aggregate level, where ambient levels of happiness are relatively unchanged in the wake of dramatic economic, cultural, and technological developments. Since 1972, the General Social Survey has routinely asked a national cross-section of adults "Taken all together, how would you say things are these days— would you say that you are very happy, pretty happy, or not too happy?" The results suggest that mood in the aggregate changes almost imperceptibly from year to year.

Causative Bipolarity *The*

Anomaly of Asymmetrical Effects

Suppose it were true that (a) pleasant or unpleasant mood reverts rapidly to equilibrium; (b) in equilibrium, these moods tend to bear a strong negative correlation toward one another; and (c) an exogenous increase in pleasant mood produces a proportional decrease in unpleasant mood.[8] There nonetheless remains the possibility that pleasant and unpleasant moods—or, analogously, positive and negative evaluations—have different consequences for behavior and other psychological outcomes. This point has been made most vigorously by Cacioppo and Gardner (1993), who argued that it may explain, for example, why certain kinds of prosocial appeals work while others fail:

> Why are so few people with positive attitudes toward donor behavior themselves donors? ... The positive and negative evaluative processes underlying donor attitudes and behaviors are separable, and it is the negative substrate that tends to be the impediment. ... The importance of this issue extends beyond the domain of measurement: Whether the bivalent processes underlying donor attitudes and behaviors are bipolar or bivariate has significant implications for behavior change. Public health campaigns to increase blood donations have often appealed to social responsibility and altruistic tendencies, with modest success at best ... Given the separability of the positive and negative substrates and the relative importance of negative substrates in restraining donor behaviors, understanding and changing the negative as well as the positive substrates may be key. (pp. 269-271)

Before examining the quality of the evidence for the asymmetry hypothesis, we hasten to point out which kinds of studies are not at issue. Studies that induce pleasant and unpleasant moods experimentally and then track the effects of each treatment on dependent variables such as impressions of other people (Bless, Hamilton, & Mackie, 1992; Forgas, 1992), reactions to persuasive messages (Bohner, Crow, Erb, & Schwarz, 1992), and helping behavior (Salovey, Mayer, & Rosenhan, 1991) do not speak to the issue of asymmetry. Such studies are not intended to gauge the causal force of pleasant and unpleasant moods as variables; rather, they focus on the effects of pleasant and unpleasant mood inductions. One cannot tell from an experiment that finds, for example, that unpleasant stimuli enhance recall of negative childhood memories whereas pleasant stimuli do not whether the unipolar dimension of pleasant mood is more causative than the unipolar dimension of unpleasant mood.

An appropriate way to test whether or not pleasant and unpleasant moods have equal and opposite effects is by means of regression analysis. Presumably, if moods and other affective reactions were truly bipolar, their effects should be oppositely signed but equal in magnitude,[9] such that $\gamma_p = \gamma_u$ given the model

$$Y = \alpha + \gamma_p \xi_P + \gamma_u \xi_u + \xi .$$

However, we know of no published research in which this null hypothesis is tested rigorously and rejected.

Studies such as those of Diener and Emmons (1984), Parisi and Katz (1986), and Katz and Hass (1988), in which the correlations between dependent variables and pleasant and unpleasant moods (or favorable and unfavorable evaluations) are reported, call attention to the fact that sometimes one unipolar dimension is significantly correlated with some putative dependent variable whereas the opposite dimension is not. This raises two methodological concerns. First, because measures of pleasant and unpleasant mood often have different variances, it should not be surprising to find that their correlations (as opposed to regression slopes) differ in magnitude. Second, testing the null hypothesis that a given correlation is zero is not the same as testing the null hypothesis that two correlations are significantly different from each other in absolute value.[10] As it happens, none of the correlation pairs that Parisi and Katz reported (p. 576) indicate significantly different absolute relationships between positive and negative attitudes and such dependent variables as behavioral commitment, transplant efficacy, and willingness to accept animal organs. Indeed, their central dependent variable, behavioral commitment, correlates .43 and —.39 with positive and negative attitudes, respectively. Katz and Hass (p. 898) did not establish significantly different correlations between, for example, humanitarianism-egalitarianism and pro-or anti-Black attitudes in the four samples they examined. Indeed, within each of their samples, the differences in absolute value tend to be minor. The correlations Diener and Emmons reported (p. 1113) between symptoms (a plausible dependent variable) and pleasant and unpleasant mood are said to differ in value but do not differ in absolute value across their two samples.

The same logic applies to findings from multiple regression analyses. Evidence that pleasant mood is a significant predictor whereas unpleasant mood is not (or vice versa) does not rule out the null hypothesis that $\gamma_p = —\gamma_u$. For example, if a sample of 500 observations generates an estimate of $\gamma_p = 2$ with a standard error of 1 and an estimate of $\gamma_u = —1$ with a standard error of 1, the former is significant at an alpha level of .05, but the latter is not. Yet, the difference in the absolute values of these coefficients (2 — 1 = 1; standard error of the difference = $[1 + 1]^{5} = 1.41$) is far

[8] This is different from finding that demographic predictors have differential effects on happy and sad affect. The latter could well be due to the way in which different groups respond to different stimulus adjectives or to their propensity to reveal moods. By the same token, it is not altogether surprising to find, as Diener and Emmons (1984) did, that measures of pleasant and unpleasant mood are each positively correlated with scales such as "productive" or "domineering." If the true correlation were zero, the observed correlations could be positive if all four indexes were based on the same response format. Given these concerns about spuriousness and response bias, we regard the correlational analyses to be much less persuasive than evidence about mood change based on experimental manipulations.

[9] Cacioppo and Gardner (1993, pp. 270-271) took evidence of an interaction between positive and negative moods to be evidence of asymmetry as well, noting that Parisi and Katz (1986) found that "subjects who had strong positive attitudes and weak negative attitudes were the most likely to sign donor cards, but that only when the score on the Negative subscale was low did it make a difference whether the Positive subscale was high or low" (pp. 270-271). This peculiar finding may, as Parisi and Katz admitted in footnote 3, simply reflect the ordinal nature of their dependent variable.

[10] For example, suppose health status and unpleasant mood correlate at –.4, with a standard error of .15. And suppose that health status and pleasant mood correlate at .2, also with a standard error of .15. On the basis of a 95% significance level and a large sample, we would pronounce the first coefficient significant and the latter not. But the difference between the absolute values of —.4 and .2 does not even approach significance, because the standard error of that difference is $[(2)(.15)^2]^{0.5} = .21$.

from significant. This statistical point is rather elementary, yet a great many studies purporting to show differential effects fall prey to this mistake. For example, some years ago, Abelson, Kinder, Peters, and Fiske (1982) published an influential study demonstrating that affective reactions to political candidates are better predictors of preferences for them than ascribed personality traits (see also Glaser & Salovey, 1998). Voters were more likely to support a presidential candidate because he evoked feelings of pride or happiness rather than because he was believed to be honest or knowledgeable. These investigators were also taken by what they believed to be the superiority of positive over negative affect as a predictor of preferences for candidates. They noted that “the positive affect coefficient typically exceeds the negative affect coefficient” (p. 625). We took a second look at these regression coefficients and were struck by the fact that the largest differences in beta weights for positive and negative affect across all political candidates and several samples were on the order of .6 (positive affect) versus — .4 (negative affect) or .4 (positive affect) and - .25 (negative affect), and many other absolute value differences were even smaller. It seems doubtful that these data would allow one to reject the null hypothesis that $\gamma_p = -\gamma_u$, a null hypothesis that was never tested directly in this work.

What of the studies that do provide properly constructed tests of the differential effects hypothesis? We could locate only one such study, Robinson-Whelen et al.’s (1997) analysis of pessimism and optimism. The rationale for this study was to determine whether the beneficial effects of optimism result from thinking optimistically, avoiding pessimistic thinking, or a combination of the two. Summarizing the results of a sophisticated structural equation analysis, the abstract included the claim that “pessimism, not optimism, uniquely predicted subsequent physiological and physical health” (p. 1345). The basis for this conclusion was discussed in the context of an analysis in which the authors demonstrated that pessimism, but not optimism, significantly predicts self-rated health, perceived stress, and anxiety. Later in the article, however, the authors conceded the pessimism path coefficients were not, however, significantly stronger in absolute value than the optimism path coefficients for models predicting anxiety, depression, perceived stress, and health.

On close inspection, evidence purporting to establish causal asymmetry proves chimerical. But can we dismiss all of the findings of asymmetry on the grounds of sampling error? Actually, we can dismiss them on other grounds as well. The detection of causal asymmetries is highly susceptible to bias. Suppose in the previous example that γ_1 were equal to $-\gamma_2$: Pleasant and unpleasant moods exert equal and opposite effects. Why might regression results suggest otherwise? One source of distortion is measurement error. If happiness and sadness are not measured with equal reliability, regression will produce coefficients of different magnitudes. Dissimilar factor loadings are another culprit. Tests of asymmetry are scale-dependent and only make sense if $\lambda_p = \lambda_u$

A telling example of these two problems in tandem showed up in the 1996 General Social Survey. We created an index of interpersonal trust by combining three items asking whether people can be trusted, tend to be helpful, and are generally fair.[11] When we regressed this index on the “felt happy” measure and the “felt sad” measure, the results suggest that happiness is a stronger predictor of trust than sadness (γ = .175 vs. -.077, *SE* of difference in absolute value = .055, t = 1.77, two-tailed p = .08, n = 912). When a question asking respondents whether they “felt [they] couldn’t shake the blues” replaces the “felt sad” measure, the results are reversed. Happiness now becomes the weaker predictor of trust (γ = .108 vs. —.205, SE of difference in absolute value = .060, t = 1.60, two-tailed p = .11, n = 912). Clearly, claims about differential effects hinge on the comparability of different measures.

To make matters worse, the analysis of asymmetrical effects is highly sensitive to certain kinds of nonrandom error. When errors of measurement associated with happiness measures are positively correlated with errors in the sad indicators, the biases tend not to be marked. The serious distortions occur when these response errors covary with the disturbance term, ξ. In other words, if acquiescence or other response biases plague measures of happiness, sadness, and the dependent variable, one may obtain results that show significant differences between $|\gamma_p|$ and $|\gamma_u|$ Asymmetric effects turn up where none exist. Weighing the slender evidence in favor of asymmetry against the methodological hazards associated with this line of research, we find ourselves unconvinced that treating opposite moods or evaluations as distinct unipolar dimensions has enhanced our understanding of psychological or behavioral outcomes.

Testing Causative Bipolarity Versus Bivariate Asymmetry

Still, there is a certain allure to the research agenda of teasing apart happiness and unhappiness, favorable and unfavorable evaluations, attraction and revulsion. As Cacioppo and Berntson (1994, p. 411) noted “a bivariate framework may be preferable to a bipolar framework,” and empirical researchers should be open to the possibility that the explanatory gains warrant the costs of data collection and diminished theoretical parsimony. What kinds of research designs would help guard against the various sources of bias described above? Clearly, one must start with a wide array of response formats and stimulus adjectives for both the independent and dependent variables. Granted, it may be possible to identify key parameters without resorting to this kind of extensive datagathering effort (cf. D. P. Green & Citrin, 1994), but a multiple-measure design makes the analysis much more robust against model misspecification and the vagaries of nonrandom error.

At a minimum, one would like to examine how measures of pleasant and unpleasant mood correlate with both a supplementary mood measure and an outcome measure. It is interesting to note in this regard that telltale signs of causative asymmetry seem to be absent from large national surveys. For example, in the 1996 Genera] Social Survey data, one finds a correlation of —.22 between a two-item happiness scale and personal trust; the corresponding correlation for a two-item sadness scale is .21.[12] An alternative measure of happiness (“Taken all together, how would you say things are these days—would you say that you are very happy, pretty happy, or not too happy?”), which has the advantages

[11] The General Social Survey mnemonics for the variables we used are TRUST, HELPFUL, and FAIR. The predictor variables are SHAKEBLU, SAD, HAPFEEL, CONTENTD, and HAPPY.

[12] The sadness scale sums SHAKEBLU + LONELY; happiness sums HAPFEEL + CONTENTD.

Table 2
Means and Happy/Sad Correlations by Condition in Experiment 1 of Salovev and Birnbaum (1989)

Condition	*n*	*M* DES: Sad	*M* DES: Happy	*M* Difference: happy – sad	*M* Aches	*r* Happy/sad
Happy	22	2.0	5.2	3.3	1.0	–.61
Neutral	21	27	3.4	0.7	1.5	.23
Sad	23	5.4	2.3	-3.1	2.2	–.23
All	66	3.6	3.4	0.3	1.6	–.52

Note. DES = Differential Emotions Scale (Izard. 1971).

of a different wording and response format, correlates .38 with the happiness scale and —.38 with the sadness scale *(n* = 912). In the 1972 National Election Study, we find that a similarly constructed trust index correlates .17 with "feeling on top of the world" and —.22 with "feeling depressed or very unhappy." An alternative measure of happiness (the same one used in the 1996 General Social Survey) correlates .34 with "top of the world" and -.32 with "depressed or very unhappy" (n = 966). To be sure, these criterion correlations are attenuated by measurement error, but the fact that they are so similar in magnitude calls into question whether happiness and sadness are indeed distinct causativc forces in this domain.

Even stronger designs link experimentally manipulated moods to psychological or physiological outcomes. Salovcy and Birnbaum (1989, Experiment 1) induced happy, sad. and neutral moods using an autobiographical recollections procedure among 66 college students who were recruited for this experiment because they were experiencing severe colds or flu at the time of the study. A measure of sadness (a 7-point semantic differential scale ranging from *not sad* to *very sad)* and a measure of happiness *(not happy* to *very happy)* included among other items assessed mood immediately after the induction. Shortly afterward, participants completed a lengthy battery of questions about their current symptoms. Salovey and Birnbaum reported a significant association between mood induction and a scale of reported "aches and pains."[13] Means for some of the key variables in this experiment are described in Table 2. As anticipated by the preceding discussion of dynamic bipolarity, the means for levels of happiness and sadness "flipflop" as we compare groups experiencing happy and sad inductions. Computing the difference between happy and sad scores, one finds a strong correspondence between net happiness (happy minus sad) and the symptom inventory (aches).

From the standpoint of causal asymmetry, the question is whether happy and sad moods are equally strong predictors of symptoms. For the sample as a whole, the two regression coefficients are —.14 for happiness *(SE* = .099) and .22 for sadness *(SE* = .098; adjusted R^2 = *.17; n* = 66). The difference in absolute value of these coefficients is .08, whereas the standard error of the difference is .14; thus, we can in no sense reject the null hypothesis of equal and opposite effects. This result is not surprising given the low power of the test, but it does run afoul of studies that purport to show asymmetries. More telling is a regression model that focuses exclusively on the neutral induction condition, because here the usual concerns about power stemming from highly correlated latent moods are absent: We catch mood states in a moment of disequilibrium during which pleasant and unpleasant moods do not covary. As noted in Table 2, the observed correlation between happy and sad moods among participants within the neutral condition is weakly positive. Repeating the regression for the 21 neutral participants produces regression coefficients of —.31 *(SE* = .18) and .35 *(SE* = .20) for happiness and sadness. Clearly, the difference in absolute value is nonsignificant. More interesting is the implication that even when pleasant and unpleasant moods are uncorrelated across individuals, they may still exert equal and opposite effects (see Bradburn & Caplovitz, 1965, p. 56).

Taken as a whole, what do these results imply about the value of measuring pleasant and unpleasant affect as distinct dimensions'' Although we agree with Cacioppo and his colleagues (e.g., Ito et al. 1998) that one should not rule out a priori the possibility that pleasant and unpleasant moods play different causative roles, in many circumstances it will be impractical—and perhaps counterproductive—for researchers to treat them as distinct independent variables. Seldom do mood researchers work with sample sizes adequate to overcome the low power of the statistical test necessary to distinguish the two effects. Seldom do they have access to the multiple measures needed to offset the effects of random and nonrandom error. And seldom do they have occasion to examine the effects of mood in a state of disequilibrium, when pleasant and unpleasant moods are momentarily uncorrelated. Only special datasets and analytic techniques are equal to the challenge of assessing causal asymmetiy. In most cases, researchers studying the effects of pleasant and unpleasant affect using regression or kindred statistical techniques will be better off simply creating a single variable made up of the difference between these two scales (see Greene, 1997, pp. 408-410, for a discussion of mean-squared error comparisons of models with highly correlated latent rcgressors).

Our view, therefore, departs from the position articulated by Cacioppo and his colleagues (1997). Cacioppo counseled researchers to treat pleasant and unpleasant mood as distinct dimensions, suggesting that an agnostic view allows for the possibility that these moods behave in ways that depart from a bipolar model. This theoretical stance has much to recommend it when researchers work with multimeasure data and latent variable models that take random and nonrandom measurement error into account. However, in the more typical case, where investigators rely on monomeasure data and ordinary regression or correlation techniques. the risks of statistical artifact typically offset the advantages of theoretical nuance. Before one may hunt for subtle asym-

[13] This scale ranges from 0 to 4. with the value of 1 assigned to each report of (a) headaches, (b) neck aches and pains, (c) aches and pains in arms-legs, and (d) muscular tension.

metries in the effects of semantically opposite moods, one must be armed with data and methods equal to the task.

Conclusion: The Many Facets of Bipolar Affect

One aim of this essay has been to distinguish among different aspects of bipolar affect. Although we believe that a compelling case can be made for the proposition that pleasant and unpleasant mood states often bear strong negative correlations with one another, static bipolarity is but one lens through which to view mood structure. Another is dynamic bipolarity, the tendency for pleasant and unpleasant mood to change in opposite fashion in response to happy or sad stimuli. Whereas static bipolarity characterizes happier people as less unhappy, dynamic bipolarity comes closer to addressing the question of the functional interrelationship between mood states as experienced by a given individual: To what extent does an increment in pleasant affect produce a decrement in unpleasant affect? In addition to studying the ways in which mood states relate to one another over time or across individuals, we may inquire about the effects of mood states on behavioral or psychological outcomes. Do pleasant and unpleasant moods, for example, have equal and opposite effects on dependent variables such as symptom reports or interpersonal trust'.

Although we have offered an assortment of evidence and methodological arguments to suggest that all three bipolarity claims hold, this essay is best viewed as an attempt to open a new research agenda in which these hypotheses are tested much more extensively. Because methodological nuance looms so large in this research agenda, let us describe how we envision this next generation of mood research.

Adequate testing requires special attention to measurement error, which in turn requires special approaches to data gathering. Convenient though it may be to present survey respondents with a single battery of mood questions sharing the same wording and response format, the analyst of such data then faces the difficult task of disentangling genuine mood variance from systematic- response bias and random response error in a statistically robust manner. Much more tractable are data gathered using a variety of survey measures, each flawed but flawed in different ways. Some response formats entice respondents into noncommittal answers in the middle of a response continuum; others elicit mood reports from those with a tendency to acquiesce to yes-or-no questions; still others draw responses from all but the very bashful. The process by which respondents translate their affective states into survey responses is subject to a range of social psychological distortions, but a multiple-measure design enables researchers to hedge their bets against any one set of distortions.

Better still are measurement approaches that go beyond survey- based self-reports. Our earlier study (D. P. Green et al., 1993) and those like it (e.g., Feldman Barrett & Russell, 1998) are best described as multiple-measure as opposed to multiple-method research. The sole method was self-administered questionnaire. Studies such as those conducted by Hubert and de Jong-Meyer (1991) or Diener, Smith, and Fujita (1995) are properly described as multiple-method, in that they gather psychophysiological data or reports from collateral raters. The more dissimilar these ratings mechanisms are from the survey-based measures, the less likely it is that distortions affecting one kind of measure will affect another. Even if these auxiliary measures have inferior reliability, they nonetheless contribute greatly to the consistency and robustness of the statistical analysis.

if researchers are to understand how mood states evolve over time, panel data become essential. The Diener et al. (1995) study represents path-breaking efforts to track mood states at many points in time using various methods of measurement. Additional studies are needed that also assess many different moods over time using multiple-measure or multiple-method approaches, at least for some subset of the assessments. The same logic holds for experimental studies of mood, in which baseline affect is compared with postinduction affect. Data collected with a single response format reveal how the mean level of mood changcs across different treatment conditions, but to understand the correlation between pleasant and unpleasant mood change at the individual level researchers need redundant indicators in order to come to grips with measurement error. Only in this way will it be possible to discern the degree to which, for any given individual, changes in one mood state coincide with changes in others.

Finally, it is necessary that study design emphasize outcome measures. Here, work by Cacioppo and Gardner (1993; Gardner & Cacioppo, 1995, 1997) has paved the way, examining, for instance, the relationship between affective reactions and willingness to donate organs and blood or use condoms. Especially attractive are those studies that examine the consequences of mood by manipulating it experimentally, bccause one can then gauge the effects of an exogenous change in an individual's mood state. Again, however, response biases must be taken into account. If, for example, the dependent variable is the self-reported severity of one's cold symptoms (Salovcy & Birnbaum, 1989), it may be that individual differences in propensity to disclose complaints affect both scores on the dependent variable and ratings of unpleasant affect as Watson and Pennebakcr (1989) noted.

The way forward, then, is to meld the best features of existing mood research into a more comprehensive research design, one that can address a wide array of different hypotheses while guarding against statistical artifact. This kind of research design would put scholars in this field in the position to address a much broader question, broached in the cross-national works of several of the contributors to this special section as well as its editor: Under what conditions and for whom does one observe functional interdependence between mood states or between mood and other kinds of physiological or behavioral outcomes? As we leave the world of correlational analysis—the study of static bipolarity that has to date dominated the literature—and examine the causal parameters linking mood to its causes and effects, do we find that mood functions differently in different contexts?

To address such questions will require fresh supplies of data. Although it is fashionable in most social science precincts to assert that scientific progress hinges on theoretical innovation, we believe that advances in mood research are likely to be empirically driven. There can be no doubt, as Cacioppo et al. (1997) suggested, that the most theoretically appealing conceptions of mood place a minimum number of constraints on the range and function of mood constructs. Pleasant and unpleasant moods need not be diametric opposites; arousal need not be the opposite of calm. Nor do we dispute that in principle, as Watson and Tellegen (1985) suggested, pleasant activation may be something other than the simple combination of pleasant and aroused mood. Or, indeed, certain moods, such as jealousy or anger, may not be reducible to blends of adjectives that define the poles of the circumplex. But here, as in all science, the question is whether the empirical payoff from the proposed theoretical nuances is sufficiently large to warrant a departure from more parsimonious ways of approaching the subject matter. If semantically opposite mood states do not, as once claimed, behave in markedly asymmetrical fashion, researchers will seldom detect these asymmetries reliably in mood research. And if asymmetries are so subtle as to evade easy detection, perhaps the field should accept symmetry as a workable first-order approximation and move on to other, more palpable empirical regularities.

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