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# Daily Well-Being: The Role of Autonomy, Competence, and Relatedness

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*Emotional well-being is most typically studied in trait or trait-like terms, yet a growing literature indicates that daily (within-person) fluctuations in emotional well-being may be equally important. The present research explored the hypothesis that daily variations may be understood in terms of the degree to which three basic needs—autonomy, competence, and relatedness—are satisfied in daily activity. Hierarchical linear models were used to examine this hypothesis across 2 weeks of daily activity and well-being reports controlling for trait-level individual differences. Results strongly supported the hypothesis. The authors also examined the social activities that contribute to satisfaction of relatedness needs. The best predictors were meaningful talk and feeling understood and appreciated by interaction partners. Finally, the authors found systematic day-of-the-week variations in emotional well-being and need satisfaction. These results are discussed in terms of the importance of daily activities and the need to consider both trait and day-level determinants of well-being.*

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Subjective well-being is a phenomenon that can be approached from many levels. Clearly, feelings of happiness, satisfaction, and vitality differ between individuals, as the voluminous literature on individual differences indicates (e.g., Myers, 1992; Ryff, 1995; Waterman, 1993), and even between groups of individuals, such as nations (e.g., Diener, Diener, & Diener, 1995). Yet, from the standpoint of the individual, there is another level of analysis that may, in fact, be most salient of all. This level of analysis concerns the extent to which one's own well-being fluctuates from day to day and from setting to setting. In our view, much of this within-person fluctuation

may be understood by examining how the ever-changing environment of daily life affords fulfillment of basic psychological needs (Reis, 1994; Ryan, 1995; Sheldon & Kasser, 1995).

## *The Independence of Traits and Days*

In an earlier article, we demonstrated that satisfaction of two basic human needs, competence and autonomy, relates to emotional well-being (Sheldon, Ryan, & Reis, 1996). Central to that research was the finding that need satisfaction was related to well-being both in trait variations among persons and in day-to-day within-person fluctuations. Between-persons analyses indicated that persons higher in the traits of autonomy and competence tended to report greater well-being on average. Independent within-persons analyses controlling for trait differences revealed that daily variations in felt competence and autonomy were associated with corresponding changes above and below one's personal baseline of well-being. Thus, fulfillment of competence and autonomy needs mattered in both state and trait processes.

Demonstrating daily covariation of need satisfaction and emotional states complements research that tends to focus on trait determinants of well-being. As summarized by Myers and Diener (1995; Myers, 1992), an extensive literature indicates that emotional well-being is reliably related to several personality traits, including

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self-esteem, extraversion, perceived personal control, and optimism. Such research conceptualizes well-being as a relatively stable characteristic of the individual, whereas day-to-day fluctuations are assumed to be secondary, or perhaps even irrelevant. Our work builds on the growing body of studies investigating daily variations in mood and subjective well-being, both because of the intrinsic importance of understanding momentary experience and because processes that govern momentary experiences may provide new insights into linkages between life experiences and emotions (Reis, 1994; Watson, 1988b).

It bears reiterating briefly that trait effects and daily variations are statistically and conceptually independent. Suppose that in a group of people, each person was to describe his or her well-being every day for 14 days. Statistically, the trait effect relates stable trait differences to average levels of well-being across the 14 days; in contrast, daily (or within-persons) effects identify systematic fluctuations of daily ratings above and below (i.e., controlling for) each individual's average level of well-being. More important than statistical decomposition of a rating, however, is the different conceptual perspective these two levels of analysis provide (Gable & Reis, 1999). Trait-level analyses ask why one person usually feels good when another does not and may be paraphrased as "What qualities are associated with dispositional happiness?" The within-persons or day-level effect instead asks "What qualities are associated with feeling better or worse than one's baseline?" If, as recently argued by Kahneman (1997), people assess their well-being at any given moment by examining the transition from the recent past to current circumstances, the latter question is likely to be more salient to the individual than the trait question. In other words, one's answer to the question "How are you?" may reflect temporal comparisons with recent personal experience rather than social comparisons of one's general status relative to others.

That these two levels of effect are not only statistically but also conceptually independent is underscored by studies demonstrating different patterns of relation between variables at different levels. For example, Larsen and Cutler (1996) found different patterns of intercorrelation among several indicators of emotion in trait ratings and daily reports. Similarly, David, Green, Martin, and Suls (1997) showed that traits and daily events have independent effects on daily mood. These findings support a more general argument: Processes evidenced at one level of analysis may not be the same as those operative at other levels of analysis (Emmons, 1991; Epstein, 1983). Consistent with this logic, Diener (1996) has noted the need to augment the well-established trait psychology of self-reported well-being

with accounts of situational and circumstantial influences.

### *Basic Needs and Well-Being*

In this study, we investigate variables that we expect to have direct effects on within-person changes in well-being. Specifically, we investigate the hypothesis, derived from Self-Determination Theory (Deci & Ryan, 1991; Ryan, 1995), that personal well-being is a direct function of the satisfaction of basic psychological needs.

According to Deci and Ryan (1991), needs are defined as nutriment essential to a living entity's growth, integrity, and health. They derive this definition of needs from biological and evolutionary approaches that determine organismic needs using functional criteria. For instance, a plant can be said to need water, sunlight, and specific minerals based on the observation that growth, health, and integrity are compromised when any one of these nutriment is withheld or is unavailable. Extending this reasoning to psychological systems, Deci and Ryan have argued that in humans, at least three types of nutriment are functionally essential to ongoing personal growth, integrity, and well-being. These are the needs for autonomy, competence, and relatedness. Factors in the person or situation that facilitate autonomy, competence, and relatedness are thus expected to enhance well-being, whereas factors that detract from fulfillment of these needs should undermine well-being. The need for competence is fulfilled by the experience that one can effectively bring about desired effects and outcomes, the need for autonomy involves perceiving that one's activities are endorsed by or congruent with the self, and the need for relatedness pertains to feeling that one is close and connected to significant others.

Ryan, Sheldon, Kasser, and Deci (1996) recently reviewed several lines of research supporting this framework. For example, Kasser and Ryan (e.g., 1993, 1996) have shown in a series of studies that investment in, or success at, so-called intrinsic goals (i.e., those closely related to basic needs) is associated with enhanced well-being, whereas investment in and/or success at extrinsic goals (i.e., those presumed to be unrelated to basic needs) does not enhance, and often detracts from, well-being. Relatedly, Sheldon and Kasser (1995) showed that people who pursue personal strivings (Emmons, 1991) that are congruent with organismic needs are higher on a variety of healthy personality characteristics. Other research has shown how need fulfillment is functionally related to intrinsic motivation, an important psychological growth process (Deci & Ryan, 1991), and to personality integration (Ryan, 1995).

The current study takes another approach to examining the three-need framework by predicting ongoing

within-person covariances between daily experiences of need satisfaction and psychological well-being. In its most extreme form, our view suggests that all three needs are implicated in daily well-being—that is, deprivation of any one of these needs should produce detectable functional costs. Put differently, because each of these needs describes a basic and yet distinct psychological nutriment, we hypothesize that each should have independent potential to influence daily well-being. In our model, therefore, it is not merely that persons dispositionally high in these traits should experience relatively high levels of well-being but it also follows that daily activities contributing to their attainment should enhance daily well-being, whereas activities that hinder realization should lessen daily well-being. Our first hypothesis, then, is that **feeling fulfilled in terms of autonomy, competence, and relatedness will be associated with emotional well-being at both trait and daily levels of analysis.**

The present study extends our prior research in two ways. First, we **sought to incorporate an important third need, relatedness.** Our previous study (Sheldon et al., 1996) investigated **autonomy and competence.** These two needs were found to have empirically distinguishable effects, demonstrating that they are not reducible to each other, as some have claimed (e.g., Bandura, 1989). Yet another fundamental and distinct human need discussed by the above and many other theorists concerns the need to feel related to others. In fact, nearly all theories of human motivation and development incorporate some sort of innate process by which people seek to establish and maintain satisfying connections with other persons (see the overview by Reis & Patrick, 1996). In general terms, Baumeister and Leary (1995) refer to the human tendency to form strong, stable interpersonal bonds as the “need to belong” and review extensive evidence testifying to its fundamental and central role in human motivation. That persons who are better integrated in social networks and who feel satisfyingly connected with others tend to live longer and possess better mental and physical health is well established in the psychological and medical literatures (for summaries, see Berscheid & Reis, 1998; Ryff, 1995).

Conceptualizing daily well-being in terms of need satisfaction complements the established focus of daily diary studies on stressful events. A sizable literature has noted the impact of major and minor negative life events in producing “bad days” (e.g., David et al., 1997; Marco & Suls, 1993). Inasmuch as activated positive and negative affect are considered to be largely independent (Cacioppo, Gardner, & Berntson, 1997; Diener, Wolsic, & Fujita, 1995; Watson, 1988a; Watson, Clark, & Tellegen, 1988), it follows that “good” days may involve more than simply avoiding the negative effects of stress

and hassles. Indeed, Kanner, Coyne, Schaefer, and Lazarus (1981) found that daily hassles and uplifts were only moderately correlated and had clearly distinguishable effects, and David et al. (1997) found that positive and negative mood were predicted by different daily events. Moreover, daily fluctuations in positive moods are differentially predicted by such events as social activity (Watson, 1988b) and favorable performance feedback (Goldstein & Strube, 1994). **Our model goes beyond studies that examined the occurrence of specific events in suggesting that the psychological meaning of events for the individual also matters.** Sheldon and Kasser (1995, 1997) argue that well-being is likely to be enhanced when daily activities are congruent with presumed basic needs and long-term goals (Csikszentmihalyi, 1992). In other words, **subjective well-being may involve more than possessing positive personality traits and avoiding stress and conflict; it also may depend on finding personal value in everyday activities.**

#### *Relatedness and Social Experience*

The second general extension beyond our prior study was **to identify the particular social experiences that contribute to feeling interpersonally connected.** Although many studies show that people who feel satisfied with their interpersonal connections are happier and healthier than those who feel dissatisfied (Myers, 1992), it is unclear just what sort of social activities contribute to these perceptions. Various alternatives have been proposed—intimacy, shared or enjoyable activities, and avoiding conflict, for example—but empirical evidence concerning their relative roles has yet to be provided. These alternatives need not be mutually exclusive, of course; it seems plausible that close interpersonal bonds may involve all of them to varying extents (Duck, 1988; Hays, 1989). Nevertheless, **different forms of interaction seem likely to contribute differentially to feelings of connection with partners.**

We view it as important, therefore, to examine the association between types of social activities and resultant **feelings of relatedness (i.e., the feeling that relatedness needs are satisfied by one’s social activities).** In part, this is because many prior studies have construed relatedness as a global characteristic possessing trait or trait-like qualities. That is, researchers often view respondents’ accounts of the extent to which they feel related to others as an objective description of their social activity. However, because global assessments of this sort are known to be affected by cognitive and motivational biases (Reis & Wheeler, 1991; Ross, 1989; Schwarz & Sudman, 1996), the link between actual activity and feeling related needs closer empirical scrutiny. Other scholars also have called for such research. Duck (1988), for example, pointed out the need for better understanding

of how people “digest” interactions into general impressions of relationships. And Hinde (1995) noted the preponderance of studies examining psychological feelings about relationships, in contrast to the relative paucity of more literal descriptions of actual social activity within those relationships.

Our review of existing models identified the following seven major types of social activity that might plausibly contribute to a general sense of relatedness:

1. communicating about personally relevant matters (Parks & Floyd, 1996; Reis & Patrick, 1996),
2. participating in shared activities (Duck & Wright, 1993; Markman & Kraft, 1989; Tiger, 1969; Wood & Inman, 1993),
3. having a group of friends with whom one can spend informal social time (i.e., “hanging out”) (Newcomb, 1961; Rubin, 1983),
4. feeling understood and appreciated (Reis & Shaver, 1988; Swann, 1990),
5. participating in pleasant or otherwise enjoyable activities (Clark & Watson, 1988; Lott & Lott, 1972),
6. avoiding arguments and conflict that create distance and feelings of disengagement with significant others (Gottman, 1994; Notarius & Markman, 1993), and
7. avoiding self-conscious or insecure feelings that direct attention toward the self and away from others (Pyszczynski & Greenberg, 1987; Ryan, Plant, & Kuczowski, 1991; Wood, Saltzberg, Neale, Stone, & Rachmiel, 1990).

This list is certainly not exhaustive; however, diary protocols place pragmatic limits on the number of alternatives that can be studied. Some of these activities seem more likely to engender feelings of relatedness than do others. On the basis of existing research concerning processes inherent to intimacy and attachment, we expect that communication and feeling understood and appreciated (Items 1 and 4) should be particularly germane (Reis & Patrick, 1996). Our general hypothesis is that each of these activities will be associated with daily feelings of relatedness. We will compare their relative importance by examining the unique contribution of each activity, controlling for the prevalence of the other activities, to predicting feelings of relatedness.

#### *Waiting for the Weekend*

A final issue we examined concerned variability in need satisfaction and outcomes as a function of days of the week. Several investigations have shown that moods tend to fluctuate in a weekly cycle that, in one study, accounted for about 40% of the variance in daily mood variations (Larsen & Kasimatis, 1990). In general, positive mood tends to be higher, and negative mood lower, on weekends than on weekdays (Egloff, Tausch, Kohlmann, & Krohne, 1995; Kennedy-Moore, Greenberg, Newman, & Stone, 1992; McFarlane, Martin, & Williams,

1988; Stone, Hedges, Neale, & Satin, 1985). Among the aforementioned studies, only Larsen and Kasimatis (1990) and McFarlane et al. (1988) found a “blue Monday” effect—significant week-low moods on Mondays. On the other hand, in a study conducted in Japan, Clark and Watson (1988) did not find evidence for a day-of-the-week effect.

Weekly mood cycles may relate to the differing kinds of activities in which people engage on weekdays and weekends. Our model of daily need satisfaction may help explain the observed activity-mood covariation. For example, people are likely to experience more autonomy in their activities and more closeness with social partners on weekends, when activities are more likely to be chosen freely, than on weekdays (Kennedy-Moore et al., 1992). It is less likely that daily competence would peak on weekends, inasmuch as weekday work activities typically provide many opportunities for its manifestation.

#### THE PRESENT RESEARCH

Participants in this research provided daily reports for 14 days on three general sets of variables: well-being (moods, vitality, and symptoms), need satisfaction (autonomy, competence, and relatedness), and social activity (talk, activities, hanging out, understanding, enjoyment, self-consciousness, and conflict). Trait measures of self-determination, effectance, and connectedness were collected prior to the daily recording.<sup>1</sup> Our analyses will examine the independent contributions of trait and state need satisfaction to emotional well-being. Because of their conceptual independence, if relationships were to emerge only at either the person level or day level, our theorizing would necessarily be limited. On the other hand, finding effects at both levels of analysis would support the notion that need-fulfilling experiences in these particular domains play a broad and important role in well-being.

#### METHOD

##### *Participants*

The study consisted of 76 students from an introductory psychology class who took part in partial fulfillment of a class research participation option.<sup>2</sup> Data were incomplete from 9 participants, leaving 67 participants (29 men, 38 women). Ages ranged from 17 to 68, with 86% of the students being less than 26 years old. Most students (73%) were Caucasian, 12% were of Asian ancestry, and 9% were African American. Of the participants, 70% lived on campus. Nearly half (46%) of the participants were not currently dating, whereas 20%



were either married or in a committed monogamous relationship lasting more than 2 years.

### *Procedure*

The study was briefly explained during a class early in the semester as research examining the relationship between attitudes and daily activities. All students present were invited to participate. Those interested were given a packet of materials containing the trait measures and told they would begin the daily diary portion of the research when they returned the questionnaires.

For the daily diary section of the study, participants were contacted by an experimenter, who explained the general procedure. Diary forms were distributed in 3- and 4-day packets so that each packet would have to be completed and handed in when the next was picked up. Research assistants staffed an office to allow participants to drop off and pick up forms at their convenience. Participants were instructed to fill out the diary log just prior to going to sleep each night. To minimize confounding due to unusual events, four waves of data were collected, with an approximately equal number of participants in each wave. All participants began keeping the daily records on one of four Thursdays in October and maintained them for exactly 14 days. This procedure was adopted to ensure that each participant had the same number of weekdays and weekend days.

### *Person-Level Measures*

*Self-determination.* Participants completed the Self-Determination Scale (Sheldon & Deci, 1996), which consists of 10 items asking respondents to describe the relative appropriateness of a matched pair of self-determined and non-self-determined alternatives. For example, one pair of alternatives was "A: What I do is often not what I'd choose to do" and "B: I am free to do whatever I decide to do." Nine-point rating scales were used, anchored at 1 (*only A feels true*), 5 (*both feel equally true*), and 9 (*only B feels true*). Internal consistency reliability ( $\alpha$ ) in the present data set was .75.

*Effectance.* Competence was assessed with the Multidimensional Self-Esteem Inventory (MSEI) (O'Brien & Epstein, 1988). This 9-item scale asked participants to rate items such as "How often do you approach new tasks with a lot of confidence in your ability?" along scales ranging from 1 (*not at all often*) to 9 (*extremely often*). The internal consistency coefficient was .82.

*Connectedness.* We employed two measures of social connectedness. First, we included a 15-item questionnaire measure of attachment style developed by Mikulincer, Florian, and Tolmacz (1990). This measure has three 5-item scales closely corresponding to the three attachment styles identified by Hazan and Shaver

(1987): secure (e.g., "I am comfortable depending on others"), avoidant (e.g., "I am nervous when anyone gets too close"), and anxious-ambivalent (e.g., "I often worry that my partner won't stay with me"). Seven-point rating scales were used, ranging from 1 (*not at all true*) to 7 (*very much true*). Internal consistency coefficients for these three subscales were .32, .67, and .77, respectively.

Participants also completed the UCLA Loneliness scale (Russell, Peplau, & Cutrona, 1980). This scale consisted of 20 items, 10 positively worded (e.g., "There are people I can turn to") and 10 negatively worded (e.g., "I feel isolated from others"), answered on scales ranging from 1 (*never*) to 5 (*very often*). Internal consistency was .93.

To represent these four scales more efficiently, we conducted a second-order principal components factor analysis using the four scale totals as entries.<sup>3</sup> A single factor emerged, composed of positive loadings with the secure scale and negative loadings with the avoidance and loneliness scales. The ambivalent scale loaded on a separate dimension whose eigenvalue was less than unity. Accordingly, we created a connectedness composite by standardizing the scales and subtracting the sum of the two negative valence scales from the positive scale. The ambivalence scale was dropped.

### *Day-Level Measures*

*Well-being.* As in our prior study, we used four measures of well-being. To represent positive and negative affect, we used the nine adjectives selected by Diener and Emmons (1984) to assess affect valence. For positive affect, the adjectives were joyful, happy, pleased, and enjoyment/fun; for negative affect, the adjectives were depressed, worried/anxious, frustrated, angry/hostile, and unhappy. The adjectives were randomly interspersed and rated on scales ranging from 1 (*not at all*) to 7 (*extremely*) in terms of the extent to which participants had experienced each emotion during that day. These adjective sets have been used in many studies (e.g., Coté & Moskowitz, 1998; Emmons, 1991; Sheldon et al., 1996).

Participants also completed a daily seven-item Psychological Vitality Scale (Ryan & Frederick, 1997). This measure assessed the degree to which participants felt physically and mentally vigorous and alert. Sample items include "At this moment I feel alive and vital" and "I feel energized." Responses were provided on a 7-point scale.

A nine-item symptom checklist developed by Emmons (1991) also was included. On each day, participants reported the degree to which they had felt symptoms such as runny nose, difficulty in breathing, and soreness.

To provide a convenient overall estimate of an individual's global sense of well-being, following the logic of

TABLE 1: Correlations Among Trait and Aggregated Daily Variables

	Self							Positive	Negative		
	Determination	Effectance	Connectedness	Sex	Autonomy	Competence	Relatedness	Mood	Mood	Vitality	Symptoms
Trait predictors											
Self-determination											
Effectance	.39***										
Connectedness	.31***	.40***									
Sex	-.09	-.17	-.12								
Daily needs											
Autonomy	.11	.10	.13	-.08							
Competence	.37***	.44***	.35***	.07	.30**						
Relatedness	.30**	.33***	.46***	.09	.13	.72***					
Daily well-being											
Positive mood	.29**	.21	.33***	.07	.28**	.52***	.53***				
Negative mood	-.17	-.35***	-.22	.06	-.23	-.37***	-.13	-.33***			
Vitality	.27**	.24	.15	-.05	.26**	.43***	.32***	.60***	-.40***		
Symptoms	-.18	-.30**	-.23	.29**	-.20	-.33***	-.14	-.06	.46***	-.19	
Well-being	.32***	.38***	.33***	-.12	.34***	.58***	.39***	.70***	-.77***	.77***	-.60***

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

subjective well-being research, we also created a composite measure of overall well-being by first standardizing each individual scale and then subtracting the sum of the two negative measures (negative affect and symptoms) from the sum of the two positive measures (positive affect and vitality). Thus, a score of 0 on this composite represents average well-being on an average day for the full sample. As shown in Tables 1 and 2, these measures were sufficiently correlated among themselves to warrant combination.

**Daily autonomy.** On each day, participants were asked to note the three activities at which they had spent the most time (excluding sleep). They then rated, on scales ranging from 1 (*not at all*) to 7 (*completely*), each of four different reasons why they might have done each activity. These scales tapped external ("something about your external situation forced you to do it"), introjected ("you made yourself do it, to avoid anxiety or guilt"), identified ("interesting or not, you felt that it expressed your true values"), and intrinsic ("you did it purely for the interest and enjoyment in doing it") reasons. Following past research on the perceived locus of causality for action (Ryan & Connell, 1989), a summary autonomy score was created for each activity with the following weights: intrinsic (+2), identified (+1), introjected (-1), and external (-2). A daily autonomy score was computed by averaging across each participant's three nominated activities.

**Daily competence.** For the same three activities rated for autonomy, participants rated, on a scale ranging from 1 (*not at all effective*) to 7 (*extremely effective*), how effective they felt in doing that activity. Daily competence scores were calculated by averaging across the three activities.

**Daily relatedness.** Participants were first asked to list the three social interactions that had taken the most time that day. They then rated the extent to which during the interaction they had felt "close and connected" with the people they were with. A 1 (*not at all*) to 7 (*extremely*) rating scale was used. Summary daily relatedness scores were computed by averaging across all three interactions.

**Daily social activity.** Participants described the extent to which the three listed interactions had involved each of the following activities: talking about something meaningful; participating in activities and concrete tasks; just hanging out with others; feeling understood and appreciated by others; doing things that are pleasant or fun; feeling self-conscious, judged, or insecure; and quarrelling, arguing, or having conflict. A scale ranging from 1 (*did not occur*) to 7 (*occurred a lot*) was used. Daily scores were computed by averaging activity ratings across each participant's three listed interactions.

## RESULTS

Before computing Hierarchical Linear Models to test our hypotheses, for simplicity we examined the pattern of correlation among the various predictor and outcome variables. For each participant, we created aggregate daily need satisfaction and well-being scores by summing across all 14 days' worth of data. Correlations among these variables, and with the trait measures, are reported in Table 1.

The three trait measures demonstrated reasonable divergence, correlating between .31 and .40. Correlations among the three aggregated daily need satisfaction measures were more variable. The autonomy-competence correlation was significant,  $r(67) = .30$ ,  $p <$

TABLE 2: Averaged Within-Person Correlations Among Daily Variables

	<i>Autonomy</i>	<i>Competence</i>	<i>Relatedness</i>	<i>Positive Affect</i>	<i>Negative Affect</i>	<i>Vitality</i>	<i>Symptoms</i>
Daily needs							
Autonomy							
Competence	.23 <sup>†</sup>						
Relatedness	.14 <sup>†</sup>	.10***					
Daily well-being							
Positive affect	.28 <sup>†</sup>	.25 <sup>†</sup>	.19 <sup>†*</sup>				
Negative affect	-.17 <sup>†</sup>	-.22 <sup>†</sup>	-.09***	-.58 <sup>†</sup>			
Vitality	.13****	.18 <sup>†</sup>	.14 <sup>†</sup>	.45 <sup>†</sup>	-.35 <sup>†</sup>		
Symptoms	-.06	-.14 <sup>†</sup>	-.05	-.14 <sup>†</sup>	.21 <sup>†</sup>	-.23 <sup>†</sup>	
Overall well-being	.25 <sup>†</sup>	.30 <sup>†</sup>	.16 <sup>†</sup>	.80 <sup>†</sup>	-.80 <sup>†</sup>	.74 <sup>†</sup>	-.48 <sup>†</sup>

NOTE: Significance tests are based on meta-analyses conducted across individuals (Rosenthal, 1984).

\*\*\* $p < .01$ . \*\*\*\* $p < .001$ . <sup>†</sup> $p < .0001$ .

.05, but relatedness and autonomy were not significantly related,  $r(67) = .13$ , *ns*. The correlation between satisfaction of daily relatedness and competence needs was unexpectedly high,  $r(67) = .72$ ,  $p < .001$ . To ensure that the correlation among these measures does not inflate findings, hypothesis tests for each predictor control for all other predictors, as specified below.

To establish construct validity, we also computed correlations between the corresponding trait and daily need satisfaction variables. Two of these correlations were significant: trait effectance with daily competence,  $r(67) = .44$ ,  $p < .001$ , and trait connectedness with daily relatedness,  $r(67) = .46$ ,  $p < .001$ . The correlation between trait self-determination and daily autonomy was not significant,  $r(67) = .11$ , indicating lower construct validity for either or both of these measures. It also may be that autonomy experiences in daily life among college students differ qualitatively from the more general types of self-determination needs addressed by the trait measure.

The two positive indicators of daily well-being (positive affect, vitality) correlated significantly with each other, as did the two negative indicators (negative affect, symptoms). Symptoms did not relate significantly to positive affect but negative affect did,  $r(67) = -.33$ ,  $p < .001$ . This pattern is the same as reported by Emmons (1991) and Sheldon et al. (1996), among others.

The well-being composite correlated significantly with all three trait variables and all three daily need scores. Although all correlations with individual outcome variables were in the predicted direction, not all were significant (two-tailed,  $p < .05$ ). On the trait side, self-determination was significantly correlated with positive mood and vitality, effectance was significantly correlated with negative mood and symptoms, and connectedness was significantly correlated with positive mood. As for daily needs, autonomy correlated significantly with positive mood and vitality, competence correlated significantly with all four well-being measures, and relat-

edness correlated significantly with positive mood and vitality. The divergent correlations for trait self-determination and effectance—that self-determination relates to positive outcomes, whereas effectance relates to negative outcomes—replicates a differential effect also found by Sheldon et al. (1996).

One other person-level variable, sex, also was examined. There was only one significant difference among the outcome variables. On average, women reported more daily symptoms than did men,  $F(1, 65) = 5.98$ ,  $p < .05$ ; means were 1.98 for women and 1.60 for men. There were no significant sex differences on any trait or daily need variables.

We examined univariate associations at the day level by computing correlations between daily need satisfaction and well-being, one participant at a time, and then meta-analyzing the results, in essence treating each participant as an independent replication with 14 cases. Within-person correlations were averaged using Fisher's  $r$ -to- $z$  transformation, and significance levels were established via meta-analysis across the 67 participants (Rosenthal, 1984). These correlations, displayed in Table 2, revealed that all three needs were consistently related to overall well-being and to three of the four individual outcomes.

To determine whether the three needs were relatively independent of each other at the day level, we computed averaged within-person correlations among daily ratings of autonomy, competence, and relatedness. These meta-analytic correlations were significant, although the effect sizes are modest: autonomy-competence,  $r = .23$ ,  $p < .001$ ; autonomy-relatedness,  $r = .14$ ,  $p < .001$ ; and competence-relatedness,  $r = .10$ ,  $p < .005$ , supporting our assumption that these three needs represent distinct motivational systems and indicating reasonable levels of discriminant validity.

There was somewhat greater overlap in the within-person correlations among well-being variables. All were correlated, as expected; however, the correlation

between positive and negative affect was somewhat greater ( $r = -.58, p < .001$ ) than is typical in other within-person analyses of daily ratings that use the same measure (ranging from  $-.31$  to  $-.54$ ) (Diener & Emmons, 1984; Emmons, 1991; Watson, 1988b). In an analysis of several affect measures, Watson (1988b) concludes that this particular measure is most susceptible to a positive-negative affect correlation; nevertheless, he suggests that these (and other) scales discriminate well enough "to demonstrate the usefulness of measuring PA [positive affect] and NA [negative affect] separately" (1988b, p. 133).

#### *Daily Well-Being: Traits and States*

We used hierarchical linear modeling (HLM) (Bryk & Raudenbush, 1992) for our primary tests. HLM exploits the hierarchically nested design of our data set, in which a lower level unit, days, is nested within a higher level unit, persons (for a discussion on the advantages of this approach, see Kenny, Kashy, & Bolger, 1998). HLM treats person as a random, rather than fixed, effect, thereby permitting generalization of the findings to the population. Unlike within-persons ANOVA and regression models, this analysis allows for the possibility that the within-person slopes may differ significantly from one person to another.

The three person-level predictors were the trait measures of self-determination, effectance, and connectedness; the three corresponding day-level predictors were daily ratings of autonomy, competence, and relatedness. The prior day's value for each well-being variable also was entered to control for possible carryover effects from one day to the next that have been shown in some studies (e.g., Marco & Suls, 1993; Sheldon et al., 1996). Only the last 13 days of each participant's data could be used because there was no prior day for the 1st day of recording.

HLM estimates day-level and person-level effects simultaneously. Thus, trait effects are statistically independent of one another and of day-level effects. Similarly, day-level effects control for one another, prior day's well-being, and the three trait variables. Following recommendations by Bryk and Raudenbush (1992), all day-level variables were centered on the individuals' means, and all person-level variables were centered on sample means.

Day-level well-being was estimated by the following equation:

$$WB_{ij} = \beta_0 + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \beta_3 X_{3ij} + \beta_4 X_{4ij} + e_{ij} \quad (1)$$

where  $\beta_0$  refers to the intercept (i.e., the person's well-being on an average day);  $\beta_1$  to  $\beta_4$  represent maximum likelihood estimates of the population slopes estimating

daily well-being from daily autonomy, competence, relatedness, and the prior day's outcomes, respectively;  $X_{1ij}$  to  $X_{4ij}$  represent the value on each day (i) for each participant (j) of autonomy, competence, relatedness, and the prior day's outcomes, respectively; and  $e_{ij}$  is error.

Person-level effects were estimated as follows:

$$\beta_{0j} = G_{00} + G_{01} X_{1j} + G_{02} X_{2j} + G_{03} X_{3j} + u_{0j} \quad (2)$$

where  $G_{00}$  refers to the day-level intercept for an average person;  $G_{01}$  to  $G_{03}$  represent maximum likelihood estimates of the population slopes estimating average levels of well-being across all days from trait self-determination, effectance, and connectedness, respectively;  $X_{1j}$  to  $X_{3j}$  represent trait self-determination, effectance, and connectedness scores for each person (j), respectively; and  $u_{0j}$  is error.

Results of this analysis are reported in Table 3. For convenience, it is appropriate to think of day-level coefficients as the average within-person slope predicting daily well-being from daily need satisfaction and the person-level coefficients as the between-persons slope predicting average well-being from traits.

The overall well-being composite related positively to all three person-level predictors, although only effectance was significant. **For the individual well-being variables, self-determination was significantly and positively associated with vitality, with a similar trend for positive affect.** Effectance related significantly and negatively to negative affect, with a corresponding trend for symptoms. Connectedness related significantly to positive affect. These effects are quite similar to the zero-order correlations shown in Table 1, although the  $p$  values are somewhat higher due to the modest intercorrelation among the trait predictors (the  $r$ s ranged from .30 to .40).

On the day level, composite well-being related significantly to all three predictors. For the two positive outcomes, positive affect and vitality, higher levels of satisfaction in all three needs were associated with greater well-being (although the slope for autonomy was not quite significant). For the two negative outcomes, negative affect and self-reported symptoms, increases in autonomy and competence significantly predicted decreased well-being; slopes for relatedness were not significant.<sup>4</sup>

*Trait Day interactions.* We also scrutinized these data for Trait  $\times$  Daily Need interactions, which would indicate that the day-level relationship between need satisfaction and well-being varied systematically as a function of traits. These effects allow us to evaluate two competing conceptualizations. A deprivation model posits that higher levels of daily satisfaction should have relatively greater value to the extent that one's trait levels are low. That is, because low trait levels signify relatively chronic



TABLE 3: Predicting Daily Well-Being From Person- and Day-Level Variables

	<i>Well-Being Composite</i>		<i>Positive Affect</i>		<i>Negative Affect</i>		<i>Vitality</i>		<i>Symptoms</i>	
	B	t	B	t	B	t	B	t	B	t
Person-level variables										
Self-determination	.074	1.39	.168	1.65*	-.017	<1	.218	1.97**	-.048	<1
Effectance	.108	2.00**	-.006	<1	-.184	2.03**	.114	1.01	-.135	1.79*
Connectedness	.120	1.54	.329	2.20**	-.185	1.42	.044	<1	-.100	<1
Day-level variables										
Yesterday's outcome	.187	5.22****	.133	4.00****	.203	5.73****	.097	2.46**	.348	8.02****
Today's autonomy	.017	4.98****	.046	6.39****	-.023	3.34****	.015	1.93*	-.007	2.13**
Today's competence	.143	6.92****	.250	5.17****	-.232	4.71****	.209	4.21****	-.059	3.15****
Today's relatedness	.055	2.46**	.147	2.53**	-.053	1.04	.116	2.39**	.004	<1

\* $p < .10$ . \*\* $p < .05$ . \*\*\* $p < .01$ . \*\*\*\* $p < .001$ .

deficiencies in the relevant qualities, a given daily “dose” should provide relatively greater incremental benefits. On the other hand, a sensitization model proposes that the higher an individual’s trait level, the more he or she values that quality and the more likely he or she is to benefit from such experiences. Only the three interactions representing construct-matched, trait-state pairs were considered (i.e., Self-Determination  $\times$  Autonomy, Effectance  $\times$  Competence, and Connectedness  $\times$  Relatedness).

These effects were assessed by adding product terms to the model previously specified. The Connectedness  $\times$  Relatedness slope was significant for overall well-being ( $B = .059$ ,  $t = 2.17$ ,  $p < .05$ ) and negative affect ( $B = -.149$ ,  $t = 2.40$ ,  $p < .02$ ), with a trend for positive affect ( $B = .135$ ,  $t = 1.88$ ,  $p < .06$ ). Examination of the slopes indicated that for all three variables, the higher one’s trait connectedness, the more positive the slope between daily relatedness and well-being.<sup>5</sup> In other words, for persons whose trait score was 1 standard deviation below the mean, the daily relatedness–overall well-being slope was .02, indicating that each unit increase in relatedness was associated with .02 more units of overall well-being; for persons 1 standard deviation above the mean in trait connectedness, the slope was .11, indicating .11 units of gain in overall well-being for the same increase in relatedness. The pattern was similar for positive affect. Interestingly, for negative affect, the relatedness slope was positive ( $B = .05$ ) for persons 1 standard deviation below the mean in connectedness, indicating that greater daily relatedness was associated with more negative affect; the same slope was negative ( $B = -.18$ ) for persons 1 standard deviation above the trait connectedness mean.

The Effectance  $\times$  Competence interaction was significant for positive affect ( $B = .254$ ,  $t = 1.99$ ,  $p < .05$ ). The higher one’s trait effectance score, the greater the relationship between daily competence and positive affect. The slope was .16 for persons 1 standard deviation below the trait effectance mean and .35 for persons 1 standard

deviation above the same mean. The Self-Determination  $\times$  Autonomy slope was significant for vitality ratings ( $B = .014$ ,  $t = 2.33$ ,  $p < .05$ ). For persons 1 standard deviation below the trait self-determination mean, the daily autonomy–well-being slope was essentially flat ( $B = .00$ ); for those 1 standard deviation above the mean, the slope was positive ( $B = .03$ ). These interactions clearly support the sensitization model over the deprivation model.

Finally, although the initial correlation matrix revealed only one main effect involving sex, we also modified the model to examine Sex  $\times$  Trait and Sex  $\times$  Daily Need interactions. These results do not qualify interpretation of the results described above.<sup>6</sup>

#### *Determinants of Relatedness*

To identify social activity correlates of daily relatedness, we conducted HLM analyses in which the seven activity ratings were used to predict the extent to which participants felt “close and connected” to interaction partners on that day. Trait connectedness was also included in the model to control for individual differences in the extent to which persons generally feel closely related to others. Table 4 presents results of this analysis. Each slope refers to the within-person variation across 14 days of data around one’s own baseline; thus, individual differences in connectedness are not involved in the obtained effects. Each slope coefficient controls for the effects of the six other activity predictors. Because these variables used the same 7-point scales, the slopes can be compared with one another and interpreted as unit increases in relatedness attributable to a one-unit increase in each listed activity.

As hypothesized, talking about meaningful matters and feeling understood and appreciated were strongly related to daily relatedness. The more participants engaged in meaningful talk, and the more they felt understood and appreciated, the more related they felt to social partners. Hanging out and doing pleasant or fun things also were significantly and positively associ-

**TABLE 4: Predicting Daily Relatedness From Social Activities**

	<i>Slope</i>	<i>t</i>	<i>p</i>
Person-level predictor			
Trait connectedness	.394	4.34	<.001
Day-level predictors			
Talking about something meaningful	.117	4.23	<.001
Activities and concrete tasks	.025	1.36	<i>ns</i>
Hanging out with others	.066	3.29	<.001
Feeling understood and appreciated	.370	10.07	<.001
Doing pleasant or fun things	.066	2.59	<.01
Feeling self-conscious or insecure	-.129	-3.83	<.001
Quarrels, arguments, or conflict	.002	<1	<i>ns</i>

ated with relatedness. Feeling self-conscious or insecure was negatively linked to relatedness, as expected. Two variables were not significantly correlated with relatedness: conflict and concrete activities/tasks.

We also examined these data for sex differences, particularly interactions between sex and the seven activity variables in predicting relatedness. Such interactions, if significant, would indicate that one or more of the seven social activities relates more strongly to feelings of relatedness for one sex than for the other, a hypothesis of considerable ongoing debate in the literature (Baumeister & Sommer, 1997; Burlison, Kunkel, Samter, & Werking, in press; Cross & Madson, 1997; Reis, 1998; Wood & Inman, 1993). Seven terms representing the cross-products of sex and the seven activity variables were entered into a new hierarchical model, controlling for the main effects of sex and the seven activity variables. None of these interaction terms approached significance, however. In other words, the predictors of relatedness were largely the same for women and for men.

#### *Predicting Well-Being From Social Activity*

Another way of addressing the hypothesized link among relatedness needs, social activities, and well-being considers the question of mediation. The model explored to this point implicitly assumes that feelings of relatedness are responsible for the association between social activity and emotional well-being, such that appropriate social activities (as indicated in Table 4) predict greater feelings of relatedness, which in turn predicts greater well-being. It is possible, however, that social activity may predict well-being independently of relatedness need satisfaction. For example, some types of interaction may promote well-being without enhancing feelings of closeness per se, and others, such as conflict with significant others, may impair well-being even while being experienced as relatively close.

To explore this alternative, we modified the analyses reported in Table 3 to make them equivalent to a standard test of mediation (Baron & Kenny, 1986). At the

first step, the model was estimated exactly as in Table 3, that is, entering prior day's outcome plus all three need predictors at the trait and daily level. In the next model, the seven social activity predictors were added to the equation.<sup>7</sup> Effects emerging for the activity variables control for other variables already in the equation, indicating associations with well-being not mediated by autonomy, competence, or relatedness.

Results of this analysis are listed in Table 5. The first-step models are omitted for clarity but are nearly identical to those reported in Table 3.<sup>8</sup> Two effects emerged consistently across the well-being composite and all four outcome variables: participating in enjoyable social activities related to higher daily well-being and quarrels, arguments, and conflict related to poorer daily well-being. It is noteworthy that the latter variable was not significantly related to relatedness earlier (in Table 4), implying that participants may have felt relatively close and connected while engaging in conflicts that nevertheless were emotionally detrimental. This analysis also provided further evidence that the predictors of positive and negative outcomes are discriminably distinct (Watson, 1988a, 1988b). The two positive outcomes were predicted best by the extent of participation in enjoyable social activities, whereas the two negative outcomes were predicted more clearly by arguments and conflict. Overall, these findings suggest that social activities contribute to daily emotional well-being in more ways than simply enabling people to feel close and connected with others. We discuss implications of this result in the Discussion section.

#### *Day-of-the-Week Variations*

A final question concerned day-of-the-week variations in the primary variables of this research. Because each participant's records included exactly two instances of each day of the week, we created average scores for each day for each participant. These averages were then analyzed by repeated measures analyses of variance (because day of the week is nested within participants). Because omnibus significance tests may be misleading (Rosenthal & Rosnow, 1991), and because there were specific comparisons in which we were interested, six planned orthogonal contrasts were used to represent the variability associated with 7 days of the week. The first contrast, our primary interest, compared weekend days (Saturday and Sunday) with the remaining five weekdays. The second contrast contrasted Saturday with Sunday. The remaining four codes compared the five weekdays among themselves (i.e., Friday with Monday through Thursday; Monday with Tuesday through Thursday; Tuesday with Wednesday and Thursday; and Wednesday with Thursday). Because we used  $k - 1$

TABLE 5: Predicting Daily Well-Being From Day-Level Social Activity

	<i>Well-Being Composite</i>		<i>Positive Affect</i>		<i>Negative Affect</i>		<i>Vitality</i>		<i>Symptoms</i>	
	B	t	B	t	B	t	B	t	B	t
Step 2: Day-level variables										
Meaningful talk	.017	<1	.006	<1	-.009	<1	.007	<1	-.012	<1
Activities, tasks	.025	1.84*	.034	1.10	-.051	-1.71*	-.006	<1	-.021	-1.73*
Hang out with others	.002	<1	.033	<1	-.005	<1	-.052	-1.36*	-.001	<1
Understood/appreciated	.039	1.75*	.111	2.05**	-.046	<1	.092	1.67*	-.008	<1
Pleasant/fun things	.089	4.44****	.183	4.21****	-.087	-2.30**	.191	4.23****	-.021	-1.30
Self-conscious	-.042	-1.61	.015	<1	.113	1.90*	.004	<1	.017	<1
Arguments, conflict	-.151	-4.32****	-.145	-1.69*	.466	6.04****	-.157	2.32**	.062	2.34**

NOTE: At Step 1, trait variables, daily variables, and prior day's outcome from Table 3 were entered in the models. Thus, tabled effects control for these variables. Parameter values are similar to those reported in Table 3 (slight differences are due to missing data) and are omitted for clarity.

\* $p < .10$ . \*\* $p < .05$ . \*\*\*\* $p < .001$ .

orthogonal contrasts, these six coded variables incorporate all between-days variance.

Mean values for the three daily need variables are depicted in Figure 1. Autonomy was significantly higher on weekends than on weekdays, on Saturdays than on Sundays, and on Fridays than on Mondays through Thursdays, all  $t(66) > 2.86$ ,  $p < .01$ . Also, autonomy was significantly lower on Mondays than on other weekdays,  $t(66) = 2.10$ ,  $p < .05$ . As predicted, relatedness was greater on weekends than on weekdays,  $t(66) = 2.57$ ,  $p < .02$ ; none of the other days differed. There were no significant day of the week effects for effectance.

Figure 1 also displays mean values for daily positive and negative emotions (upper left-hand corner). Average levels of positive affect were higher on weekends than weekdays, on Saturdays than on Sundays, and on Fridays than on other weekdays, all  $t(66) > 3.20$ ,  $p < .005$ . Mondays had the lowest level of positive affect,  $t(66) = 2.17$ ,  $p < .05$ . Negative emotions were significantly lower on Saturdays than on Sundays,  $t(66) = 2.12$ ,  $p < .05$ , and marginally lower on Fridays than on other weekdays,  $t(66) = 1.85$ ,  $p < .07$ . There were no significant day-of-the-week effects for vitality and symptoms; consequently, these variables are not graphed.

Finally, we examined the seven social activity variables for systematic differences across the weekly calendar. Two activities, doing enjoyable things and hanging out with others, were significantly more common on weekends than on weekdays, on Saturdays than on Sundays, and on Fridays than on other weekdays, all  $t(66) > 3.27$ ,  $p < .002$ . No other contrasts were significant.

## DISCUSSION

The primary goal of this study was, first, to extend our model of need satisfaction and daily well-being to include relatedness, a fundamentally social need, and second, to explore sources of relatedness in everyday social activity. Our findings provide clear support for the

relevance of three basic needs—autonomy, competence, and relatedness—to emotional well-being. In day-level analyses, which control for both average levels of well-being and the prior day's outcomes, all three needs were significantly associated with well-being. Higher levels of autonomy and competence were associated with more favorable outcomes on all four measures of well-being, replicating findings reported by Sheldon et al. (1996). Interestingly, relatedness was significantly predictive only of the two positive outcomes, positive affect and vitality, and not the two negative outcomes, negative affect and symptoms.

That relatedness was correlated primarily with variations in positive outcomes is consistent with existing research and theory. Reviewing several studies, Watson and Clark (1994) concluded that positive affect is elevated when people are socializing, whereas negative affect is primarily a function of stressful or aversive events. The results reported in Table 3 provide clear demonstration of this distinction at the within-person level of analysis, unconfounded by dispositional factors. Moreover, the fact that negative affect was essentially unaffected by relatedness at the day level is all the more striking in light of the relatively large correlation between positive and negative affect. Although daily positive and negative moods may be somewhat linked on the particular measure used in this research—we note that other measures tend to produce somewhat lower correlations—their differential effect on relatedness confirms the conceptual independence noted by several researchers (e.g., Diener et al., 1995; Watson, 1988a; Watson & Clark, 1984).

Why is relatedness linked primarily to positive outcomes and not to negative outcomes? The activity analyses detailed in Tables 4 and 5 suggest one explanation. Although relatedness was enhanced by several types of social activity, note the near-zero coefficient predicting relatedness from arguments and conflict. Arguments, and particularly emotionally significant arguments, are

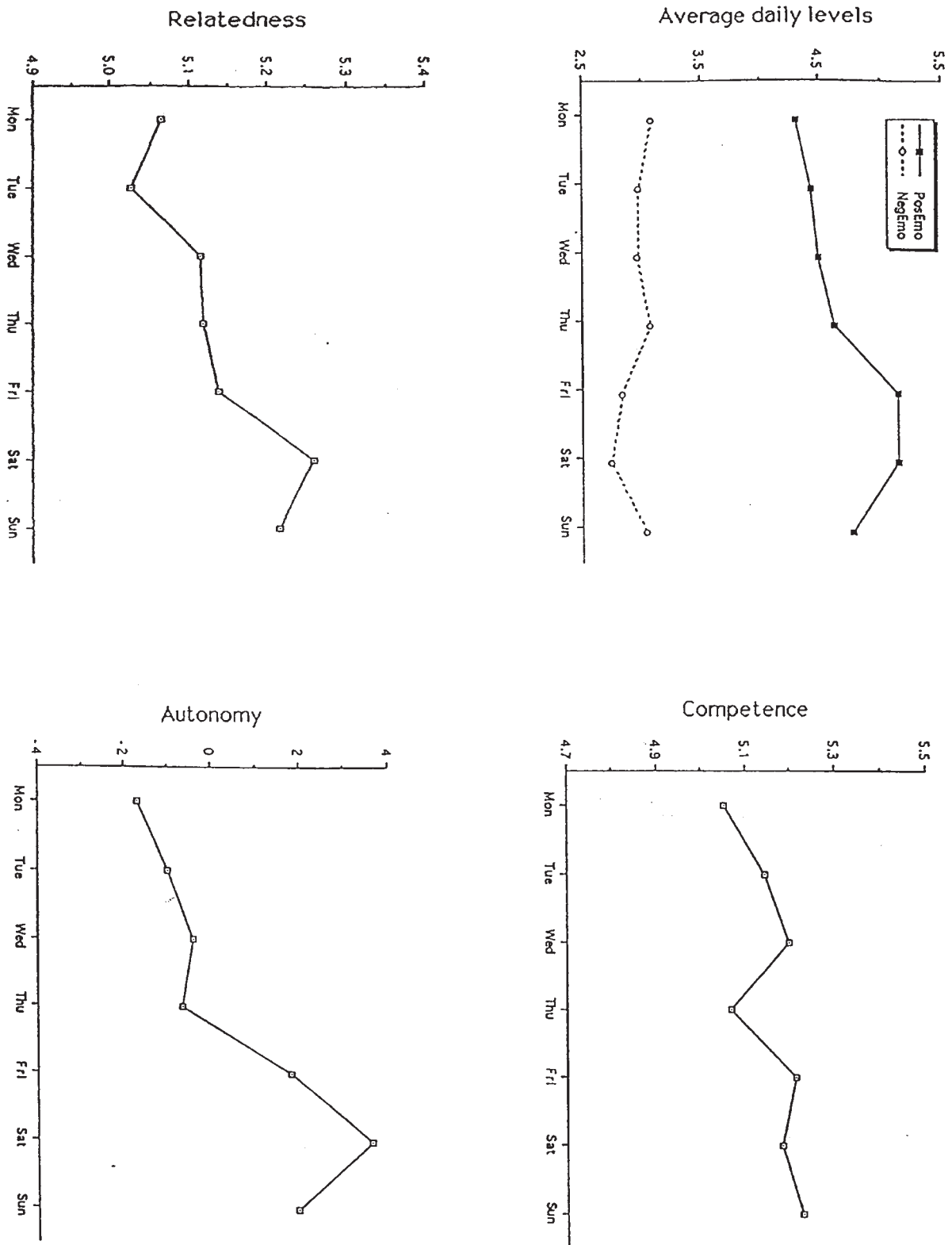


Figure 1 Day-of-the-week variations in affect, autonomy, competence, and relatedness.



more likely to involve close relationship partners than strangers and consequently may sometimes occur in the context of feeling close and connected (especially when arguments contribute to the resolution of interpersonal difficulties). Thus, experiencing conflictual interactions on a given day need not imply lesser feelings of relatedness. However, because interpersonal conflict is usually very stressful, negative consequences should be evident on days characterized by relatively more arguments. This is what we found in Table 5. Over and above the effects of relatedness, conflict predicted significant increases in daily negative affect and symptoms. In other words, **feelings of relatedness are not the only means by which interpersonal relations may influence emotional well-being.** It also may be that social relations produce negative affect primarily when people are alone but thinking about others. Our design would not have captured such moments in that participants described their feelings during three social interactions.

Relatedness was associated with several forms of social activity that enhance intimate involvement with others. The two activities that best covaried with relatedness were those predicted by intimacy theory (Reis & Shaver, 1988): On days in which participants reported feeling understood and appreciated, and talking about meaningful matters during their three most time-consuming social interactions, they also felt most closely connected with others. Hanging out with others, doing pleasant or fun things, and avoiding self-consciousness also went along with relatedness. Task-focused interaction did not increase relatedness in general, or specifically for men, contradicting the assertion by several authors that men tend to feel close through such activity (e.g., Duck & Wright, 1993; Tiger, 1969). This finding is, however, consistent with our own theorizing (Reis, 1998).

The mediational tests summarized in Table 5 also showed that one type of social activity, doing things that are pleasant or fun, significantly predicted three of the four daily well-being measures over and above the mediating role of relatedness. Enjoyable social activity may contribute directly to the overall emotional positivity of a given day in much the manner that any positive event, social or otherwise, would (David et al., 1997). This finding suggests that relatively close psychological involvement with others, as is implied within the construct of relatedness, is not the only vehicle for beneficial effects of social relations. For example, in the social support literature, participation in social networks has been shown to correlate with morbidity and mortality beyond effects attributable to perceived emotional support and similar processes (Stroebe & Stroebe, 1996). More generally, emotional well-being tends to be greater among persons who participate in more intrinsically motivated activity,

often defined as those activities enacted purely for one's interest and enjoyment in the activity itself (Csikszentmihalyi, 1992; Deci & Ryan, 1985; Ryan, 1995). Although our results show that **fun in social activity does enhance relatedness feelings**, it also may be beneficial in its own right.

Although the three trait measures did relate positively to mean levels of well-being, as hypothesized, results for these variables were somewhat weaker than for the day-level predictors. Consistent with Sheldon et al. (1996), trait self-determination predicted positive affect and vitality, whereas trait effectance predicted negative affect and symptoms. New to this study is the finding that connectedness was significantly related to positive affect. Just why these predictors were weaker than in our prior study is unclear. Nevertheless, the overall pattern of findings seems clear: At both the level of traits and day-to-day fluctuations, higher satisfaction in all three needs is associated with greater emotional well-being. With regard to the latter, our study adds to existing studies demonstrating the impact of various activities (e.g., social and work activities, exercise, performance, weather) in indicating that the meaning of activities to the person, in terms of fulfilling important personal needs, also matters.

We also found some evidence for interactions between the state and trait versions of the same general needs, particularly relatedness and competence. Although Deci and Ryan (1985) posit these needs as universal, this does not preclude the possibility that some persons are dispositionally more responsive to daily variations than are others. Our data supported a sensitization interpretation of this interaction over a deprivation alternative: Persons with higher scores on the trait variable showed greater increases in daily well-being as a function of each unit of increment in that need. This finding implies that high scores on a dispositional variable may reflect heightened concern about, or sensitivity to, a given process and, consequently, a relatively stronger reaction to environmental events relevant to that process. On the other hand, low scores may indicate relative indifference or insensitivity, so that environmental events have correspondingly less impact. Bem and Funder (1978) describe this interaction in terms of "template matching"—that individuals respond to situations to the extent that its features match important dispositional templates. Further support is provided by the behavioral concordance model of Côté and Moskowitz (1998), who found that individuals high in agreeableness and neuroticism experienced more positive affect when engaging in behaviors consonant with those traits. Many personality researchers have discussed the importance of studying dispositions in dynamic terms—that is, as a reaction to circumstances—rather than as static

qualities (Diener, 1996; Sheldon, Ryan, Rawsthorne, & Ilardi, 1997). Daily diary studies seem particularly well-suited toward investigating state-trait interactions of this sort (Gable & Reis, 1999).

Finally, we briefly note one implication of the pattern of daily variation that we found. Participants' mood states were best (i.e., most positive and least negative) on Fridays and Saturdays and worst on Mondays. This pattern supports the weekly cycle identified by several researchers (Egloff et al., 1995; Kennedy-Moore et al., 1992; Larsen & Kasimatis, 1990; McFarlane et al., 1988; Stone et al., 1985). Perhaps more important, an essentially parallel weekly cycle was found for autonomy and relatedness but not for competence. Similarly, our prior study (which included only autonomy and competence needs) showed that autonomy accounted for the preponderance of the weekend effect. It seems likely that this pattern reflects normative activity patterns in the life of university students. Thus, daily differences in need satisfaction, brought on by the varying sorts of activities that different days of the week typically entail, may underlie the better-known mood cycle. It is not just that weekends involve more desirable activities (Kennedy-Moore et al., 1992). Weekends typically involve fewer scheduled, obligatory activities such as classes and work assignments, allowing greater opportunities for rewarding social interaction and autonomous activities. On the other hand, competence was relatively stable across the weekly cycle, indicating that classes and work provide important contexts for competence to be experienced.

Although at present we have only studied the weekend effect in university students, we speculate that similar patterns may extend to older, working populations. Weekends and vacations offer opportunities to spend time with intimate partners (relatedness) and to freely pursue interests and valued activities (autonomy). An interesting hypothesis, however, is that persons who experience less alienation (i.e., more autonomy) and more satisfying social relations (i.e., more relatedness) in their work environments may show less of a weekend effect. Indeed, the general impact of work life on well-being seems to be related to the extent to which basic needs are satisfied at work (Baard, Deci, & Ryan, 1997).

There is an important methodological implication of the weekend effect. If not controlled, day of the week effects may add error variance to measures of these and related variables. Researchers should take steps to ensure that data are collected from all participants on the same day of the week. Similarly, in daily event and experience sampling studies, data collection should be balanced across weekly cycles so that the full range of natural variation embodied in this cycle is represented.

#### LIMITATIONS AND CONCLUSIONS

A number of limitations to this work should be underscored. First, generalizability is limited by the fact that we have studied only students, as noted above. Second, because our focus was on subjective well-being, we did not obtain objective ratings of health status or observer reports of emotional well-being. Finally, although the daily diary approach is superior to retrospective accounts that span longer time periods, they are still subject to some degree of distortion. Techniques such as experience sampling that use randomized sampling of representative moments could provide more contemporaneous on-line reports of activities and the psychological experiences that accompany them (Reis & Gable, 2000). For example, Csikszentmihalyi and Figurski (1982) used this method to show that voluntariness of ongoing activities is associated with more positive affective states. These are issues that should be addressed in future studies to better assess the generalizability of our conceptual model.

Another limitation concerns the possibility of the reverse causal ordering—that subjective well-being influences judgments of need satisfaction and activities. Correlational analyses of the sort we conducted cannot rule out this possibility; in fact, some authors have argued for bidirectional models—that moods may serve as both causes and effects (e.g., Watson, 1988b). Nevertheless, there are design and conceptual reasons why we find the activity-to-mood pathway more plausible within this data set. By including yesterday's well-being value as a predictor in all analyses, the outcome variable becomes day-to-day change in well-being rather than sheer level (Cohen & Cohen, 1982). Need satisfaction and activity ratings were not residualized, however, so for the mood-to-activity pathway to apply herein, mood change would, in effect, have to account for sheer levels of need satisfaction and activities, which seems unlikely. Another important reason is the nature of the need-satisfaction ratings. Recall that participants rated their three most time-consuming activities and interactions, which we then aggregated. Mood is more likely to influence global impressions than ratings of specific features of concrete events; in fact, the rationale of event-sampling methods is precisely to minimize such bias (Reis & Gable, 2000; Stone, Shiffman, & deVries, 1999). Finally, we note that the full version of a bidirectional model is entirely consistent with our theorizing, that is, the possibility that transitory shifts in mood may affect actual engagement in activities and interactions, which in turn may alter subsequent assessments of subjective well-being. Further research is needed to clarify these alternative models.

The fact that we found evidence of similar processes operating at both the person level and day level should not obscure a major contribution of this and similar studies in demarcating independent effects of these levels of analysis in a statistically and conceptually unfounded way. The traditional dispositional analyses in personality research have provided a rich base of data concerning individual differences in emotional well-being. However, as argued earlier, many important self-referential assessments build on within-person comparisons. Just as people may evaluate their current circumstances against those of other persons, they may also compare their present state to other times and settings. Thus, Kahneman (1997) proposed that emotional well-being may depend less on one's current condition than on whether one perceives that the trend is improving or declining. If Kahneman is correct, then studies of temporal fluctuations in well-being, both over relatively short periods of time (as in the present research) and somewhat longer intervals (e.g., Suh, Diener, & Fujita, 1996), may prove to be critical.

Documenting the role of daily activities in emotional well-being provides an important counterpoint to recent studies demonstrating that mean levels of well-being may be genetically determined. For example, using data from the Minnesota Twin Registry, Lykken and Tellegen (1996) concluded,

If the transitory variations of well-being are largely due to fortune's favors, whereas the midpoint of these variations is determined by the great genetic lottery that occurs at conception, then we are led to conclude that individual differences in human happiness—how one feels at the moment and also how happy one feels on average over time—are primarily a matter of chance. (p. 189)

Genetic factors may well account for individual differences in average levels of well-being, but it seems unlikely that genetic factors would explain day-level effects—the systematic fluctuations around one's baseline that occur in response to everyday events. Our study has shown how daily variations in well-being involve more meaningful psychological processes than “fortune's favors.” The satisfaction of three inherent human needs—autonomy, competence, and relatedness—may influence emotional well-being, needs that are ever dependent on social contexts for their expression and fulfillment. Further research is needed to build an understanding of how specific everyday activities, and one's reasons for engaging in those activities, contribute to a dynamic model of motivation, social activity, and emotional well-being.

## NOTES

1. For simplicity, we use the terms “self-determination,” “effectance,” and “connectedness” to refer to trait-level variables and “autonomy,” “competence,” and “relatedness” to refer to day-level variables. No conceptual differences beyond the trait/day distinction are implied.

2. There was no overlap between this sample and that used by Sheldon, Ryan, and Reis (1996). This study was conducted more than 1 year after that one.

3. We explored several other options to deal with the disappointingly low internal consistency of the secure scale. Internal consistency of the three-item composite was .68 (respectable for a three-item measure) and did not improve when any of the three subscales were dropped. The three subscales all correlate between .77 and .79 with the composite and between .39 and .44 with each other, suggesting roughly equivalent roles. Finally, when we repeat our main analyses omitting the secure or avoidant scales, results were analogous, albeit somewhat weaker. Because attachment security is an important part of our definition of connectedness, we chose to include it within the main analyses.

4. Hierarchical Linear Modeling (HLM) assumes that day-level variances are homogeneous. This assumption was met for the well-being composite but not the four individual outcomes. Bryk and Raudenbush (1992) note that heterogeneity does not affect point-estimates of the person-level coefficients but may yield biased standard errors (p. 207). The results of such significant tests are likely to be overly conservative, so that none of our significant results are affected by this concern. In addition, we examined the day-level data for model misspecification, which they note is the “principle concern” (p. 209) about heterogeneity. We saw no evidence of this.

5. Because the data were centered prior to analysis, the product-term slopes are properly interpreted as the increase in the relatedness-well-being slope for persons scoring one unit above the mean on trait connectedness (cf. Aiken & West, 1991).

6. At the trait level, sex interacted significantly with effectance for the well-being composite ( $t = 2.55, p < .02$ ), positive affect ( $t = 2.02, p < .05$ ), negative affect ( $t = 2.72, p < .01$ ), and vitality ( $t = 2.28, p < .05$ ). In each instance, this effect was attributable to steeper slopes (i.e., stronger correlations) for men than for women. In all cases, the direction of the slope was the same for both sexes. Two other trait effects emerged: Higher trait connectedness was associated with greater negative affect among men, whereas the effect among women was essentially nil ( $t = 1.98, p < .052$ ); and higher self-determination was related to more positive affect among women, as expected, but to less positive affect among men ( $t = 2.29, p < .05$ ). Only one Sex  $\times$  Daily Need effect was significant. Increases in daily autonomy were associated with greater increases in vitality among men than among women ( $t = 2.80, p < .01$ ).

7. Prior to entering these terms, we tested the random effects to be sure there was sufficient random variance remaining to be estimated. There was.

8. There were slight differences due to cases that had missing data on the activity variables, but none of the findings varied meaningfully.

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