

WEEKENDS, WORK, AND WELL-BEING: PSYCHOLOGICAL NEED SATISFACTIONS AND DAY OF THE WEEK EFFECTS ON MOOD, VITALITY, AND PHYSICAL SYMPTOMS

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We examine the effects of weekend versus weekday and work versus nonwork experiences on mood and other well-being indicators in a sample of 74 men and women employed in a wide variety of occupations. It was hypothesized that both weekends and nonworking times would be associated with enhanced well-being, and that these relations would be mediated by greater satisfaction of autonomy and relatedness needs. In addition, we hypothesized that much of the weekend effect would be accounted for by the work versus nonwork contrast, given that work activities are expected to be associated with a lower sense of autonomy and relatedness than nonwork activities. Results supported these hypotheses, showing that for both male and female workers, weekend and nonwork activities were associated with several indicators of well-being, and these relations were partially or fully mediated by basic psychological need satisfaction. The findings are discussed in terms of mood variability and the implications of free time and work for workers' well-being.

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The weekend is widely portrayed in North American culture as a time of respite and revitalization. From the lyrics of popular songs (e.g., *Everybody's Working for the Weekend*) to the names of restaurant chains (e.g., *T.G.I. Friday's*), the weekend represents for many a positive time of freedom and leisure. Conversely, the workweek, epitomized in terms like "blue Monday" (Stone, Hedges, Neale, & Satin, 1985) is often associated with constraint and unhappiness. Yet despite such cultural lore, there have been relatively few studies that have examined the impact of weekends and work on well-being in adults, and still fewer that have attempted to explain such relations in theoretical terms.

The present research was aimed at both identifying and explaining weekend effects on well-being in an adult working population. Most research examining the role of weekends on well-being has focused on college students, and the present study was designed to investigate this phenomenon among working adults. A primary delineator of weekdays versus weekends is work activity, and the present study was also designed to examine whether the presence or absence of work provides a full or partial account for the effects of weekends on well-being. Finally, in this study we attempt to explain both weekend and work effects on well-being by testing the mediational role of basic psychological need satisfaction, as detailed in *self-determination theory* (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000). Specifically, we examine whether enhanced satisfaction of basic psychological needs for autonomy and relatedness might mediate weekend versus weekday and work versus nonwork differences in mood.

WEEKLY MOOD PATTERNING: WAITING FOR THE WEEKEND, MOURNING MONDAYS, OR NEITHER?

Contemporary psychological research supports the existence of weekly cyclicity in mood (Cranford et al., 2006). Current findings specifically suggest two main patterns: The *weekend effect*, whereby mood is more positive and less negative on weekends than the rest of the week, and the *blue Monday phenomenon* (BMP), whereby Monday's mood is worse than that of other days of the week.

COLLEGE SAMPLE

Most studies of within-person variations in mood across the week have been done in college samples and in general, most lend support for the weekend effect and little support for the blue Monday phenomenon. For example, using once-daily assessments, Rossi and Rossi (1977) found that positive moods were higher on Friday through Sunday and that negative moods lower on Saturday and Sunday. This study lends support for a weekend effect, particularly if Friday is considered part of the weekend. McFarlane, Martin, and Williams (1988) also found support for a weekend effect in mood, measured once daily in terms of both valence (pleasantness-unpleasantness) and arousal among college students. No evidence for a blue Monday effect was found; Monday mood ratings were non-significantly different from other weekdays besides Friday. Both mood valence and arousal were highest on Fridays and Saturdays, followed closely by Sundays. Other studies offer similar conclusions, while also finding that the weekend effect extends to other indicators of well-being such as vitality (Sheldon, Ryan, & Reis, 1996) and vigor (Cranford et al., 2006).

Only one published study known to us found no evidence for a weekend or blue Monday effect. Clark and Watson (1988) found only a small decrease in negative affect on Sundays. However, this study used a small sample of Japanese students ($n = 18$) and data was collected over a period of time during which some of these students were not on regular school schedules or were in transition out of school and into employment.

ADULT SAMPLES

Studies examining day of the week effects on mood with adult samples are few, but are generally consistent with those focused on students in finding evidence for the weekend effect and inconsistent evidence for the blue Monday phenomenon. For example, in two studies with employed (albeit all-male) adults, Stone et al. (1985) found that positive mood was highest and negative mood lowest on Saturdays and Sundays, while Mondays did not dip any lower than the rest of the week. In two studies with adult males, Kennedy-Moore, Greenberg, Newman, and Stone (1992) again found evidence for the weekend effect, but with some variation according to the mood measure used, namely the Mood Adjective Checklist

(Nowlis, 1965) versus the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988). Specifically, Kennedy-Moore et al. (1992) found the typical weekend effect in MACL positive mood scores, whereas PANAS positive mood scores were lower on Sundays than other days of the week. Thus, the semantic properties of mood scales may have implications for the patterns found (see also Egloff, Tausch, Kohlmann, & Krohne, 1995).

Taken together, this research on day of the week effects suggests some patterning to weekly moods, with more consistent evidence for a weekend effect than the blue Monday phenomenon, although the precise form these effects take may differ as a function of the measures and diary collection techniques employed. Diary methods offer a variety of options about when and how to collect data that can significantly impact the clarity with which a phenomenon is disclosed (Reis & Gable, 2000). Most of the studies reviewed above used once-daily logs (with the exceptions of Cranford et al., 2006 and Egloff et al., 1995). More frequent assessments of mood and other psychological states can provide a closer, and therefore more accurate view of its dynamics over time (Brown & Moskowitz, 1998; Brown & Ryan, 2007).

THE PRESENT STUDY

The current study was designed to advance our understanding of the weekend effect on well-being in several ways. First, as we noted there are very few examinations of weekend effects among working adults, and none that have included women, limiting the generalizability of the existing findings. The current study sample was comprised of both male and female adult workers in a wide variety of professions. Second, we used an experience sampling design in which mood assessments were collected several times a day. Most previous research has relied on once daily diaries. More frequent sampling permits a more fine-grained analysis of mood states, and a more exacting specification of the "weekend," because for most working people the subjective experience of the weekend begins some time on Friday afternoon and begins to end on Sunday afternoon. This is a pattern that appears to be generally supported by the findings we reviewed. To elaborate on this, Friday evening (in our case, between 5 and 9 p.m.) begins the period of free time for many working adults, whereas Sunday evening (again, assessed between 5 and 9 p.m.) is, like Monday through Thursday nights, an

evening that will be followed by work. Third, in this study we collected mood assessments during both work and nonwork times. A common belief about the weekend effect is that it can be accounted for by stresses associated with work, and within-day sampling of work versus nonwork experiences permitted a test of that largely untested assumption. Finally, as we shall subsequently discuss, we brought a theoretical account to mood effects by characterizing the satisfactions and frustrations that may account for both weekend/weekday and work/nonwork contrasts based on a *self-determination theory* conceptualization of basic psychological needs (Deci & Ryan, 2000; Ryan & Deci, 2000).

The first prediction of this study was that working adults, both men and women, would exhibit a weekend effect. Based on the review of the literature, it seemed plausible that the weekend effect would begin not on Saturday, but on Friday afternoon, and end some time on Sunday afternoon, as Sunday evening is essentially a "work night" for many. Thrice-daily, quasi-random recordings were designed to capture mood states in the morning, afternoon, and evening, so that a specific weekend effect could be tested, namely that pleasant affect will be higher, and unpleasant affect lower, from Friday evening through Sunday afternoon.

In a further extension of past research, we also explored weekend effects in both subjective vitality and physical symptoms. Vitality, a positive feeling of aliveness and energy (Ryan & Frederick, 1997) is distinct from but positively associated with positive mood states and inversely correlated with negative mood (Nix, Ryan, Manly, & Deci, 1999; Ryan & Deci, 2008). Physical symptoms are also an important indicator of wellness, and have been associated with negative mood, and to a degree may even represent a somatic manifestation of negative mood. Inclusion of these indicators allowed us to explore whether the weekend effect is related to a more general subjective experience of well-being.

A second prediction of this study was that we would identify a relation between work and well-being, such that work experiences will be associated with lower pleasant mood and with higher unpleasant mood than nonwork experiences. Surprisingly, there is scant literature on the effects of work on well-being in heterogeneous samples of working adults, but there is indication of lower moods at work for many people (Alliger & Williams, 1993; Geurts, Kompier, Roxburgh, & Houtman, 2003). We further expected that

day of the week changes in well-being can be understood, at least in part, by the presence or absence of work activities.

WHAT EXPLAINS WEEKEND AND WORK EFFECTS? A SELF-DETERMINATION THEORY PERSPECTIVE

For many people, the weekdays are a time for scheduled or assigned work, typically with colleagues rather than friends or family. Whether student or employee, it is generally during the weekdays that one reports to classes or a job, and works on assigned tasks. In contrast, the weekend is a time that is traditionally associated with self-direction, close relations, and leisure (Rybczynski, 1991). The Oxford English Dictionary defines *leisure* as “time which one can spend as one pleases.” Leisure has also been described in terms of the activities it comprises, namely, those that provide intrinsically rewarding experiences (Iso-Ahola, 1980). Thus, insofar as they are associated with leisure, weekends are a time when people can more frequently choose activities and social interactions that offer intrinsic satisfactions.

Self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000) offers a potential theoretical account for the weekend among working adults. SDT is an approach to human motivation that assumes that all people have innate tendencies toward growth and integration that, with sufficient support, promote the individual’s healthy functioning and wellness. Central to the theory has been the identification of three basic psychological needs—autonomy, competence, and relatedness—that are considered essential to optimal functioning. In the SDT view, satisfaction of these needs directly promotes well-being, while their neglect or frustration exerts a negative effect (Ryan, 1995; Ryan & Deci, 2001). Since we will consider these basic needs as mediators of weekend and work effects, we briefly discuss each.

AUTONOMY

According to SDT, autonomy is a basic psychological need that concerns the experience of self-endorsement or volition in behavior. Autonomous actions, in other words, are those perceived as freely or willingly enacted (Ryan, 1995). The relation between autonomy and well-being has been established at both an individual differ-

ence or between-person level of analysis (Deci & Ryan, 2000) and, particularly relevant here, at a daily within-person level of analysis (e.g., Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Sheldon et al., 1996). Greater satisfaction of the need for autonomy has been linked to greater positive affect, vitality, and self-esteem and to less negative affect and fewer somatic symptoms in working adult samples in the U.S. (Baard, Deci, & Ryan, 2004; Ilardi, Leone, Kasser, & Ryan, 1993) and elsewhere (e.g., Deci et al., 2001). Thus, if as we suppose, people experience greater autonomy on weekends than during the week, then according to SDT one would expect to find evidence for greater well-being on the weekends.

Some support for this claim comes from two experience-sampling studies with college students. Sheldon et al. (1996) found that, across persons, the mean level of autonomy was higher on weekends than on weekdays. Prompted by these findings, Reis et al. (2000) hypothesized and found that the need for autonomy, as well as relatedness, was more likely fulfilled on the weekend than during the week in a separate sample of college students. These findings lend support to our hypothesis that autonomy may in part mediate the weekend-well-being relation. The same explanation for the work-well-being relation is also plausible, given that the work/leisure pattern closely parallels the weekday/weekend pattern for many workers, and because many people report feeling nonautonomous at work (Kasser, Cohn, Kanner, & Ryan, 2007; Terkel, 1974).

RELATEDNESS

SDT describes relatedness as the basic psychological need for feeling close and connected to others (Baumeister & Leary, 1995; Ryan, 1995). Relatedness thus refers to something beyond simply being around other people. For example, in a workplace, one may be surrounded by others, yet not feel closely connected to them. The "free time" on weekends and off-work hours may allow people to engage in more self-selected and meaningful social relationships than at work, and a larger percentage of close others, and social events, may be available on weekends. A higher sense of relatedness, in turn, could be expected to promote greater well-being, as considerable SDT research indicates (see review by Ryan & Deci, 2000). The findings of Reis et al. (2000) offer indirect support for both hypotheses in college students: relatedness, independent of autonomy, was higher on weekends, as was pleasant mood.

COMPETENCE

SDT's third basic need, *competence*, refers to feeling effective in one's activities, as well as having opportunities to utilize one's capacities (Deci, 1975). Reis et al. (2000) reported that competence satisfaction was relatively stable throughout the week for students, showing no significant difference between the week and the weekend. Like autonomy and relatedness, competence has not been examined in a working adult sample, but we suggest that as in college samples, adults may have opportunities in both work and weekend settings to experience competence, so satisfaction of this need was not expected to mediate the relations between the weekend effect and work on the one hand, or well-being on the other.

SUMMARY OF HYPOTHESES

The research findings to date on both mood and need satisfaction provide a basis for four hypotheses, as follows:

1. For both men and women, experience-sampled pleasant mood will be higher, and unpleasant mood lower, on weekends (operationalized as Friday evening through Sunday afternoon) than during the rest of the week (i.e., a weekend effect will be found). Exploratory analyses will also be performed for vitality and physical symptoms.
2. The relations between weekday/weekend and well-being indicators will be independently mediated by satisfaction of the needs for autonomy and relatedness.
3. Participants will experience lower pleasant mood and higher unpleasant mood in work than nonwork situations. Exploratory analyses will also be performed for vitality and physical symptoms.
4. Need satisfaction of autonomy and relatedness will independently mediate the relationship between work/nonwork experiences and well-being.

This series of hypotheses has not yet been tested, even in the aforementioned college samples. Herein we test these hypotheses in a sample of working adults in a diverse array of occupations who

completed records of their current activities, need satisfaction in those activities, and mood state three times a day on a quasi-random schedule over a three-week period. This methodology permitted a reasonably close analysis of day-to-day activity and experience, thereby ameliorating a number of problems inherent in retrospective report methods.

METHOD

PARTICIPANTS

Participants were recruited from newspaper and poster advertisements. From approximately 200 phone calls in response to the ads, 83 persons met the requirements for the study, including being at least 18 years of age and working 30 or more daytime hours each week.¹ Of the 83 who enrolled, data from 9 were excluded: 8 due to failure to complete the experience-sampling data collection, and 1 due to excessive time lags between pager signals and responses. Thus 74 participants successfully completed the study. They received \$50 and a personalized report of their trait and experience-sampled behavior after completion of the study.

Of these 74, 40 (54%) were female and 34 male; ages ranged from 18 to 62 ($M = 37.6$, $SD = 11$). Most described themselves as Caucasian (87.8%), 2.7% were Asian, 2.7% African American, 4.1% Native American, and 2.7% reported another ethnicity. Most participants were married (39.2%) or cohabitating (18.9%), with 23% being single and 18.9% separated, divorced, or widowed. Educationally, 26% were high school graduates, 46% college graduates, and 27% had postgraduate degrees. The sample included workers across a wide socioeconomic spectrum (e.g., construction worker, secretary, educator, physician, lawyer). The average annual personal income was \$33,681.39 ($SD = \$19,330$, range = \$3,000 to \$110,000). More information on this sample and the study procedure to follow can be obtained elsewhere (e.g., Brown & Ryan, 2003).²

1. There were two other inclusion criteria set for purposes of another study (Brown, Kasser, Ryan, & Konow, 2007): Participants were the primary spender of their household's money, and they spent money at least three times per week.

2. Data from this sample has been reported in Brown and Ryan (2003). All the questions addressed in the present report are novel.

PROCEDURE

Participants were trained in small groups of up to 12 people. At this meeting, participants were asked to complete demographic and trait psychological measures. They were also instructed in the use of the paper-based experience-sampling forms and electronic pagers. To better test day of the week effects, training sessions were always conducted on Monday or Tuesday, and experience sampling began on the Wednesday immediately following. Participants monitored their experiences 3 times daily for 21 consecutive days using forms designed to take no longer than 1–2 minutes to complete. Pager signals were sent according to software-generated quasi-random schedules. Specifically, days were divided into three 4-hour time blocks: 9 a.m.–1 p.m., 1–5 p.m., and 5–9 p.m., with one signal sent randomly per time block per day. To control for retrospective memory biases, participants recorded the record completion time on each form; after the elapsed time between pager signal and record was calculated, records completed more than 60 minutes after the signal were eliminated. Participants returned completed forms through prestamped, addressed envelopes on a daily basis, allowing for quick detection of protocol deviations, in which case a telephone call was made to the participant to rectify any difficulties. All participants were telephoned 2–3 days into the sampling period, and again at 14 days to check for problems and encourage adherence. At the end of the 3-week sampling period, participants returned to the lab for debriefing and payment.

MEASURES

Between Person-Level Measures

Demographics. Information was collected on a variety of attributes, including sex, age, race/ethnicity, hours worked per week, and both personal and family annual income.

Baseline Mood. Diener and Emmons' (1984) 9-item emotion adjective scale was used to assess pleasant and unpleasant mood. The adjectives representing the positive affect subscale were *happy*, *pleased*, *enjoyment/fun*, and *joyful*; the adjectives representing unpleasant affect were *worried/anxious*, *frustrated*, *angry/hostile*, *unhappy*, and *depressed/blue*. Participants rated each emotional state "over the past

week" on a 7-point scale from 0 (not at all) to 6 (extremely). Cronbach alphas (α) for pleasant and unpleasant mood were .85 and .79, respectively.

Baseline Subjective Vitality. The seven-item Subjective Vitality Scale (Ryan & Frederick, 1997) assessed baseline feelings of energy and vitality. Based on a validity study by Bostic, Rubio, and Hood (2000), one negatively-worded item of the original seven was not included in the calculation of vitality scores. A 7-point scale was used, ranging from 1 (strongly disagree) to 7 (strongly agree). The internal consistency of this scale was $\alpha = .87$.

Physical Well-Being. A measure of common physical symptoms that was adapted from Larsen & Kasimatis (1991). The measure assessed the previous week's level of four broad categories of physical symptoms (*aches, eating/digestion problems, respiratory problems, and low energy*). The scale ranged from 0 (not at all) to 6 (extremely). Cronbach's alpha was .56.

WITHIN-PERSON (EXPERIENCE SAMPLING)-LEVEL MEASURES

State Affect was measured using the same Diener and Emmons (1984) nine emotion items used to assess baseline mood. *State vitality* was assessed using four of the original seven Subjective Vitality items (Ryan & Frederick, 1997). *Physical symptoms* were rated using the same Larsen and Kasimatis (1991) items used in the baseline assessment.

State Relative Autonomy. This six-item adaptation of the Perceived Locus of Causality scale (PLOC; Ryan & Connell, 1989) measured the extent to which an individual felt controlled versus autonomous in his or her activity at the time of the pager signal. Participants provided a brief description of their activity at the time of signal, and then answered six questions pertaining to "why were you engaged in this activity?" on a 7-point Likert-type scale. This method has been used in other diary studies (e.g., Reis et al., 2000; Sheldon et al., 1996).

State Relatedness and Competence. State relatedness and competence were each assessed by one question: "If other(s) were present, how close to them did you feel?" and "How competent did you feel

in doing this activity?" Both questions were answered on a 7-point scale.

STATISTICAL ANALYSES

Multilevel modeling (MLM; e.g., Raudenbush & Bryk, 2002) was used to test the hypotheses and exploratory questions. MLM, which was designed to statistically take into account nested data structures, is well-suited to handle diary data given its intrinsically nested sets of observations within persons. Two-level models were used, wherein diary experiences (level 1) were nested within persons (level 2). Benefits of MLM include its ability to effectively manage unbalanced data structures (e.g., unequal numbers of diary forms across persons) and the inherent nonindependence of within-person data.³ MLM also uses a random coefficient modeling approach that allows the level 1 variables to be treated as random effects. This means that results are more easily generalizable to the population from which the sample is drawn and allows for modeling of individual differences in IV-DV relations (i.e., different slopes between persons).

Multilevel models were constructed around four dependent variables: pleasant mood, unpleasant mood, vitality, and physical symptoms. Along with the weekday/weekend and work/nonwork contrast predictors, several control variables of theoretical and methodological relevance were included in each model: gender, age, the trait-level (level 2) equivalent of each diary-based dependent variable, and several variables relevant to time serial data, including day of study, time of day, and serial autocorrelation in each dependent variable. The latter modeled the correlated residuals of the dependent variable using a spatial covariance (power) structure (Littell, Milliken, Stroup, & Wolfinger, 1996).

To enhance interpretability of the model intercept parameters (Bryk & Raudenbush, 1992; Schwartz & Stone, 1998), the predictor variables were pretreated: Demographic variables that did not include a meaningful zero value in the original scaling (e.g., gender, age) were re-scaled to include zero. Other, continuous between-person (level 2)

3. Multilevel models do not require that data be missing at random and indeed they provide a better mechanism for handling missing values than in standard general linear models (Wolfinger & Chang, 1995).

variables were centered around the sample mean, while within-person (level 1) variables was person-centered. For contrast purposes, weekday records were coded as zero and weekend records were coded as 1. Similarly, for the work contrast, work was coded zero and nonwork 1. Finally, to control for inflated Type I error due to multiple tests (i.e., 4 well-being outcomes), the criterion for statistical significance was adjusted to $p < .01$.

RESULTS

COMPLIANCE WITH EXPERIENCE SAMPLING

Compliance with procedures and timely completion of forms was good; 4,260 (91.4%) of 4,662 possible forms (74 participants \times 63 signals) were returned. The number of minutes from signal to form completion was $M = 11.04$, $SD = 26.57$. Most (83.8%) were completed within 15 minutes of the pager signal. A small percentage (3.3%) was completed after 60 minutes; data from these forms were excluded from analyses to avoid retrospective biases. This left 4,118 data points for analysis (M per participant = 56, range = 30 to 63).

TESTS OF THE WEEKEND–WELL-BEING RELATIONS

Preliminary MLM Analyses. Initial analyses showed that there were no sex \times weekend interactions on any outcome (all $ps > .01$), indicating that the weekend effect on well-being was apparent for both men and women. Also, in all four models, trait well-being did not modify the extent of the weekend effect (i.e., no trait well-being \times weekend interactions), all $ps > .01$. The potential effects of weekly total hours of work and (log) annual income were also tested, both as main effects on each well-being outcome and in interaction with the weekend. No effects were found, all $ps > .01$. These terms were therefore removed from the models before beginning the primary analyses.

Primary MLM Analyses. Our first hypothesis was that PA would be higher and NA lower from Friday afternoon until Sunday afternoon than the rest of the week. This was a test of the basic weekend effect. Exploratory tests of a weekend effect for vitality and physical symptoms were also conducted. The results of the MLM analyses are presented in Table 1. The coefficients for the weekday/week-

TABLE 1. Predictions of Day-to-Day Affect, Vitality, and Physical Symptoms from Weekday-Weekend Contrast and Control Variables

Predictor	Pleasant Affect Estimate	Unpleasant Affect Estimate	Vitality Estimate	Symptoms Estimate
Intercept	0.31	0.11	0.72	0.54
Sex	0.20	0.23	0.31	-0.03
Age	-0.01	0.00	-0.01	0.01
Trait term equivalent	0.54****	0.18***	0.48****	0.46****
Time of day	0.19****	-0.07****	-0.13****	0.04***
Day of study	0.00	0.00	0.01	0.01**
Autocorrelation	0.62	0.95****	1.00****	1.00****
Weekday-weekend	0.41****	-0.10****	0.21****	-0.09**

Note. $N = 74$. Time of day = morning, afternoon, evening; weekday = Sunday evening through Friday morning (coded as 0; weekend coded as 1); values are unstandardized parameter estimates. ** $p < .01$; *** $p < .001$; **** $p < .0001$

end contrast were significant for all four well-being outcomes ($ps < .0001$), supporting the existence of the weekend effect on PA, NA, and related indicators of well-being. Several control variables were also significant predictors of day-to-day well-being. As could be expected, higher trait well-being predicted higher day-to-day well-being (all $ps < .01$). There was a diurnal cycle in well-being, such that as the day progressed from morning to afternoon to evening, PA increased, NA and vitality decreased, and perceived physical symptoms increased (all $ps < .001$). There were no main effects of sex or age on the outcomes, $ps > .05$.

NEED SATISFACTION MEDIATION OF THE WEEKEND–WELL-BEING RELATIONS

To investigate whether satisfaction of the needs for autonomy and relatedness would mediate the weekend—well-being relations, the three step procedure outlined by Baron and Kenny (1986) was followed. The first step, already completed, established a significant path between the relevant predictor (weekend vs. nonweekend) and the outcome(s). The second step establishes a path between the predictor and the putative mediator(s), which in the present case, was autonomy and relatedness need satisfaction. The third step establishes a significant path between the mediator(s) and the

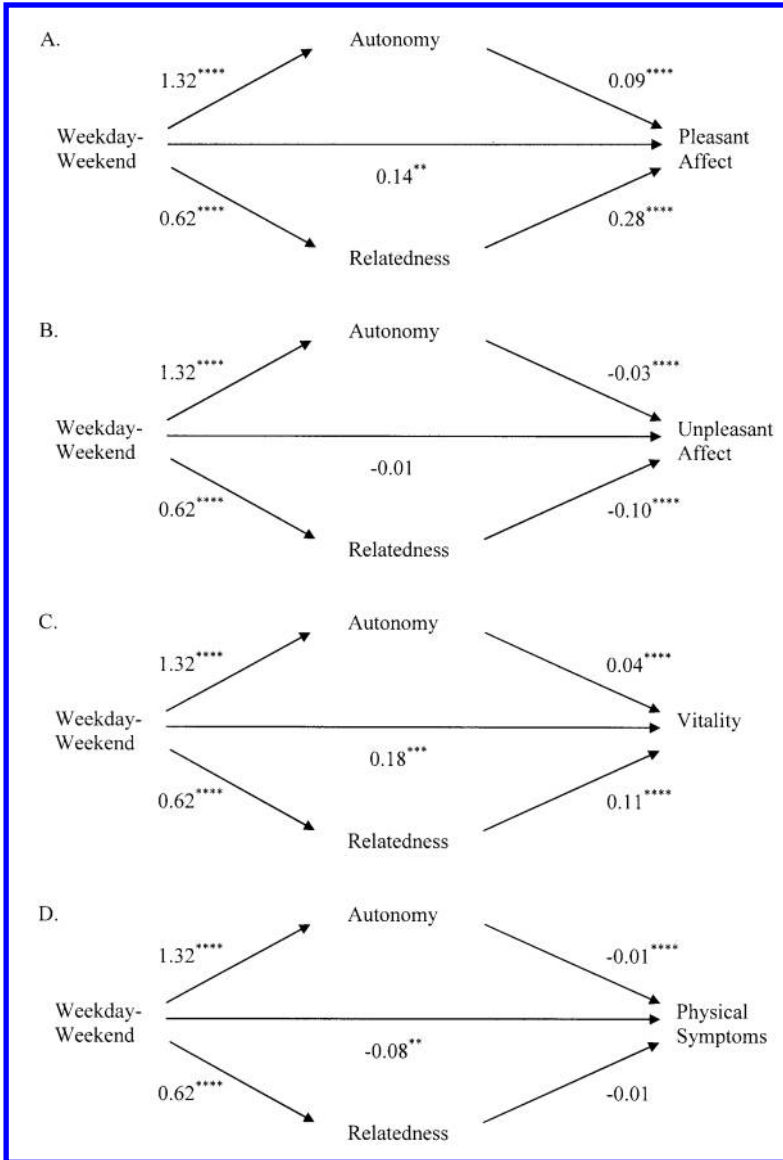


FIGURE 1. Path diagrams, with unstandardized regression estimates, of the mediational pathways from the weekday-weekend contrast to need satisfaction to well-being outcomes (A = pleasant affect; B = unpleasant affect; C = vitality; D = physical symptoms). For presentation clarity, only theoretically central variables are shown. Tests supporting the mediation interpretation are presented in the text. ** $p < .01$ *** $p < .001$ **** $p < .0001$.

outcome(s) after accounting for the effect of the predictor. In this step, the relation of the predictor and the outcome(s) is smaller than found in the first step. If the strength of the relation between the predictor and the dependent variable is either significantly reduced or eliminated, partial or full mediation, respectively, is in evidence.

Mediation analyses were performed using MLM, with modifications to account for the hierarchical structure of the data in which random effects are present (Kenny, Korchmaros, & Bolger, 2003). As already noted, the first step in mediation was established in showing a direct relation between weekends and each well-being outcome. To test the relation of the weekend effect to the putative mediators, three separate models were tested, each including the weekday/weekend contrast as the predictor (along with demographic and time series control variables) and autonomy, relatedness, and competence as separate dependent variables. These analyses showed that relative to weekdays, weekends were associated with higher levels of autonomy ($b = 1.32, p < .0001$) and relatedness ($b = 0.62, p < .0001$), but not competence ($b = 0.01, p > .89$).

The third step of mediation testing examined the relations between autonomy and relatedness and each well-being variable after controlling for the weekend effect and control variables (sex, age, trait well-being, and time series variables). Results of the MLM analyses are displayed in Figure 1. Both autonomy and relatedness were positively associated with PA and vitality, and inversely associated with NA (all $ps < .0001$). Autonomy was related to lower symptoms ($p < .0001$) while relatedness was not ($p > .33$).⁴

To test these mediation effects statistically, we used two methods recently recommended by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002). In z' tests, mediation by autonomy was significant in all four models: PA $z' = 5.50$; NA $z' = -4.47$; vitality $z' = 4.74$; symptoms $z' = -3.64$, all $ps < .01$. Mediation by relatedness was significant in the PA ($z' = 6.81$), NA ($z' = -4.85$), and vitality ($z' = 4.86$) models, all $ps < .01$. These mediation results were similarly significant using the products test method. Figure 1(B) shows that with autonomy and relatedness in the models, the relation between the weekend effect and NA dropped to nonsignificance, which combined with the MacKinnon et al. (2002) test results, indicates full mediation by need satisfaction. Figure 1(A, C, and D) show that the weekend ef-

4. In these models, autonomy and relatedness were treated as random effects, with the exception that relatedness had to be treated as a fixed effect in the vitality and symptoms models due to model convergence difficulties.

fect's relations to PA, vitality, and symptoms remained significant, though the parameter estimates were smaller than in the unmediated models presented in Table 1. Combined with the MacKinnon et al. (2002) test results, these MLM results indicate partial mediation by autonomy and relatedness for the relations between the weekend effect and both PA and vitality, and partial mediation of the weekend effect—symptoms relation by autonomy alone.

Following Kenny et al. (2003), the percentage of the direct, unmediated variance in the weekend effect—well-being relations accounted for by the need satisfaction mediators was calculated. Autonomy and relatedness together mediated 66% of the explainable weekend effect variance in PA, 90% of the effect variance in NA, and 14% of the effect variance in vitality. Autonomy mediated 11% of the explainable weekend effect variance in physical symptoms.

RELATIONS OF WORK TO WELL-BEING

Earlier we suggested that the weekend effect might be partially explained by work experiences, which more often occur on weekdays, and may be associated with both lower need satisfaction and well-being. Our tests of this hypothesis parallel our analyses of weekend effects on mood.

Of the experiences sampled, participants reported $n = 1,727$ work-related activities, or 43% of all coded records. In this category we included behavior at a job, commuting to and from one's job, as well as having meals or breaks while on the job. Nonwork experiences ($n = 2,285$, or 57% of coded records) included such activities as household chores, leisure pursuits, and education-related activities. Records that were not clearly classifiable as work- or nonwork-related were omitted from these analyses ($n = 248$). Of all work experiences, 86.1% occurred on weekdays; 61% of nonwork experiences took place on weekdays. Over half (51%) of all weekday experiences occurred at work, whereas 21% of weekend experiences were work-related. Thus the work/nonwork and weekday/weekend contrasts share considerable variance.

MLM results (Table 2), as expected, showed that work experiences were linked to lower levels of PA and higher NA. Work experiences were not, however, related to vitality ($p > .09$) or physical symptoms ($p > .42$). As in the weekend effect models, several control variables

TABLE 2. Predictions of Day-to-Day Affect, Vitality, and Physical Symptoms from Work-Nonwork Contrast and Control Variables

Predictor	Pleasant Affect Estimate	Unpleasant Affect Estimate	Vitality Estimate	Symptoms Estimate
Intercept	0.18	0.16	0.76	0.51
Sex	0.23	0.21	0.31	-0.03
Age	-0.01	0.00	-0.01	0.01
Trait term equivalent	0.55****	0.18***	0.48****	0.46****
Time of day	0.06**	-0.02	-0.15****	0.04***
Day of study	0.00	0.00	0.01	0.01**
Autocorrelation	0.61	0.95****	1.00****	1.00****
Work-nonwork	0.61****	-0.23****	0.07	-0.02

Note. $N = 74$. Time of day = morning, afternoon, evening; work = work activities (coded as 0; nonwork coded as 1); values are unstandardized parameter estimates. ** $p < .01$; *** $p < .001$; **** $p < .0001$.

predicted day-to-day well-being. As Table 2 shows, higher trait PA predicted higher day-to-day PA ($p < .0001$) and higher trait NA predicted higher experience-sampled NA ($p < .001$). Similar results were found in the vitality and symptoms models ($ps < .0001$). In all models except NA, the diurnal cycle in well-being was again found, $ps < .01$. There were no main effects of sex or age on the outcomes, $ps > .05$.

NEED SATISFACTION MEDIATION OF THE WORK–WELL-BEING RELATIONS

To test whether autonomy and relatedness need satisfactions mediated work effects on PA and NA, the same procedure used to examine weekend effect mediations was employed. Having shown significant direct paths between work activities and both PA and NA, we next tested whether the work contrast was significantly related to autonomy and relatedness, and on an exploratory basis, competence. Three models were constructed, with the work contrast predicting the three need satisfaction variables. As shown in Figure 2, work experiences were, as expected, associated with lower satisfaction of autonomy ($p < .0001$) and relatedness ($p < .0001$). Unexpectedly, work experiences were also related to a lower sense of competence ($p < .01$).

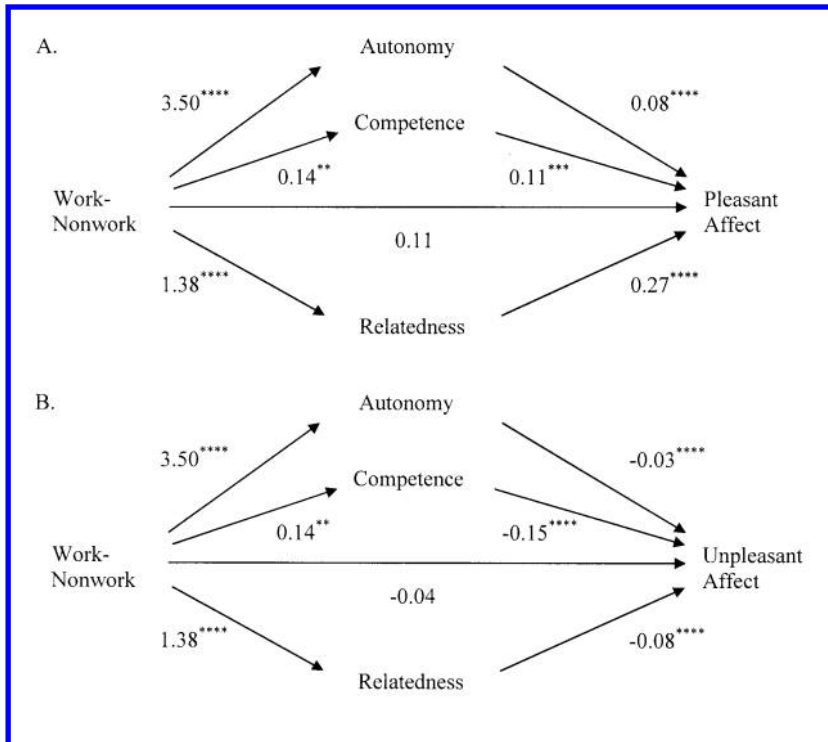


FIGURE 2. Path diagrams, with unstandardized regression estimates, of the mediational pathways from the work-non-work contrast to need satisfaction to well-being outcomes (A = pleasant affect; B = unpleasant affect). For presentation clarity, only theoretically central variables are shown. Tests supporting the mediation interpretation are presented in the text. ** $p < .01$ *** $p < .001$ **** $p < .0001$.

To determine whether satisfaction of SDT's three basic needs mediated the work-mood relations PA and NA were separately regressed on the work/nonwork contrast and the three need satisfaction predictors. The results, depicted in Figure 2, indicated that all three needs continued to significantly predict PA and NA in the expected directions (all $ps < .001$), while the relation between work and both well-being variables dropped to nonsignificance. Follow-up MacKinnon et al. (2002) tests supported this interpretation, in that using the z' test, all three needs were significant mediators of the work-mood (PA, NA) relations, particularly autonomy (PA $z' =$

5.49; $NA z' = -6.03$, $ps < .001$) and relatedness ($PA z' = 6.55$; $NA z' = -4.52$, $ps < .001$), and also competence ($PA z' = 2.32$; $NA z' = -2.78$, $ps < .01$). Similarly significant mediation results were found using the products test.

The percentage of the total explainable variance in the work–well-being relations accounted for by the mediators was calculated. It was found that the 3 needs together accounted for 82% of the explainable variance in the work–PA relation and 83% of the explainable variance in the work–NA relation.

WEEKEND AND WORK RELATIONS TO WELL-BEING: A COMPETING PREDICTOR ANALYSIS

Having identified both weekend and work effects on PA and NA, we sought to determine which of these factors held the stronger relation to day-to-day mood states. To test this, the weekend and work contrasts were entered together into MLM models as predictors of PA and NA, separately. The results indicated that both weekday ($p < .0001$) and work ($p < .0001$) times were associated with lower PA. Only work time was associated with higher NA ($p < .0001$); the weekday/weekend contrast was not related to NA in this model ($p > .30$). In general, findings indicated that day-to-day unpleasant affect was predicted by work experiences while pleasant affect was predicted by both nonwork and weekend experiences. Day-to-day variations in vitality and physical symptoms were predicted only by the weekday/weekend contrast.

DISCUSSION

The results of this study provided support for the hypotheses that day-to-day fluctuations in several well-being indicators—emotional state, vitality, and physical symptoms—were associated with regular variations both day of the week, and work activity itself. Well-being was significantly higher from Friday evenings (5–9 p.m.) through Sunday afternoon, as reflected in better moods (higher PA and lower NA), a higher sense of vitality, and fewer physical symptoms. These weekly fluctuations were found in both men and women, and were not conditioned by trait levels of well-being. Further, these effects were, as predicted, mediated by the satisfaction of the psychological needs for autonomy and relatedness, supporting

our view that weekends are beneficial in so far as they afford both greater volition and connectedness.

As predicted, this study also revealed associations between work and well-being, though these effects were restricted to pleasant and unpleasant mood states. People had less positive and more negative moods when at work than when not working. Vitality was equally high across work and nonwork situations, and physical symptoms also did not vary according to whether or not participants were at work. The absence of a vitality effect may represent the fact that work requires energy, and may even catalyze it, and nonwork times are comprised of both high energy activities as well as relaxation or restoration-focused activities. The absence of a physical symptoms effect may be due to timing in the appearance and persistence of symptoms. For example, if headaches were instigated during work (or nonwork) hours, symptoms may not appear in full form until some time later.

When tested together with the weekday/weekend predictor, work activity alone accounted for day-to-day variations in unpleasant affect, while both the weekend and work contrasts accounted for variation in pleasant affect. In this study, work/nonwork and weekday/weekend contrasts were highly overlapping; that is, for most participants in this study, as is true among many working adults in the Western world, weekdays tended to be workdays and most leisure activity occurred on weekends. Thus, it is difficult to disentangle which of these two features (work and weekend contrasts) was the primary predictor of well-being fluctuations. But together the findings indicate that the weekly shifts in activity examined here are associated with a significant, regular rise and fall in well-being.

We also found evidence in support of hypotheses that both weekday and work associations with well-being were partially or fully explained by the satisfaction of SDT's basic psychological needs. The higher well-being people experience on weekends was in considerable part accounted for by greater feelings of autonomy or volition, and feeling closer to others, in weekend activities. This was also the case for nonwork activities whenever they occurred, which were accompanied by higher levels of autonomy and relatedness than activities at work.

These effects could be explained by the fact that for many people, the working week is replete with activities involving external controls, time pressures, and demands on behavior related to work,

child care, and other constraints on daily life in modern Western societies. The work week also often provides fewer opportunities for meeting relatedness needs, insofar as it can involve solo activities or work with colleagues with whom there is little closeness. This is of course not so for everyone, and some individuals may actually feel close and connected to work colleagues (see Dutton & Ragins, 2007), more typically, outside work, and on weekends, people have more latitude to choose affiliates, and are more likely to choose those who better fulfill relatedness needs and/or support their autonomy (La Guardia, Ryan, Couchman, & Deci, 2000; Ryan, La Guardia, Solky-Butzel, Chirkov, & Kim, 2005). Moreover, close friends and family may also be freer and more available on weekends.

Unexpectedly, perceptions of competence were also lower in work relative to nonwork situations. In apparent contrast, Csikszentmihalyi and LeFevre (1989) used an experiential sampling method to examine the "flow" experiences of 78 workers for one week. Findings showed that the flow experience was more prevalent while people were working than in unstructured leisure settings. Yet there are two points to consider in comparing such findings. First, flow as classically defined concerns "high skill/ high challenge" experiences, and one can feel quite competent, even if not excited, in the lower challenge activities often engaged in leisure time. Second, although flow, when defined in terms of skill/challenge balance, can be associated with positive experiences, that is so mainly when activities are also volitional. For example, Mannell, Zuzanek, and Larson (1988) examined the relations among freely chosen activities, positive affect, potency, and concentration. They found that intrinsically motivated activities generally provided greater relaxation and lower tension. They also noted that leisure experiences, generally characterized by freedom of choice and intrinsic motivation, were not associated with the most intense flow experiences. Thus perceived competence, flow, and positive experience are not identical constructs. That said, although all three psychological needs were found to be independent mediators of the work-mood relations, competence was the weakest of the three mediators.

These results offer one of the first substantive and theory-based explanations for why well-being tends to be more favorable on weekends: People experience greater autonomy and relatedness, which are, in turn, related to higher wellness (Ryan & Deci, 2001). It is noteworthy that these needs independently accounted for variance in well-being when tested as mediators, which identify them

as distinct mediators of the relation between weekly context and well-being.

The findings of this study also provide further demonstration of the important role that basic psychological need satisfaction plays in wellness, both in general terms (Ryan & Deci, 2004) and in specific contexts such as the workplace (Baard et al., 2004; Stone, Deci, & Ryan, 2009). From an SDT standpoint basic need satisfaction, whether it occurs within or outside of work, is essential to wellness. In accord with that assumption the results suggested that to a considerable extent, both daily and weekly variations in well-being are attributable to variations in need satisfaction. These satisfactions bear, we suspect, not only on weekly and daily patterns, but even within-day effects such as those recently studied by Stone et al. (2006) in women's workdays. This suggests that to the extent that daily events, including those occurring during one's work, afford a sense of autonomy, relatedness, and competence, well-being may be higher and more stable. In contrast, a strong positive difference in wellness between nonwork and work times may be indicative of job risk or stress, and contribute to ill being.

LIMITATIONS AND FURTHER RESEARCH

This study had several limitations worth noting. First, since weekdays were also workdays for many participants in the study, research that includes participants working a variety of schedules across all seven days of the week will be needed to more fully test the role of work to well-being independent of days. In addition, it would be important in future studies to examine how workers in different occupations and work conditions may vary in need satisfactions and their associations with wellness. For example, differences in worker status or education may be associated with different patterns of need satisfaction at work, and thus in the strength of any weekend effects. Further research is also needed to probe more deeply into the nature of nonwork time to better understand its role in well-being. For example, time outside of work can be spent in leisure or "self-maintenance" activities (e.g., grocery shopping, grooming, meal preparation) that may affect well-being differently than leisure or "free time." Maintenance tasks may be more intensified for working parents, whose wellness patterns could also be clarified relative to nonparent workers. If available nonwork time during the week is more likely spent on self-maintenance while available nonwork

time on weekends is more likely spent in leisure pursuits, then the circumscribed role of work/nonwork activities on well-being found in this study may be an underestimate, and exploring the quality of nonwork activities may provide a clearer understanding of their role in wellness.

This study found that weekends and nonwork activities were strongly associated with increased experiences of autonomy and relatedness, and these satisfactions were associated, in turn, with greater well-being. The findings highlight the potential importance of free time in allowing people to satisfy basic psychological needs and to revitalize (de Graaf, 2003; Ryan & Deci, 2008). The findings also make salient the need to further explore the role of work in individuals' well-being, and especially the ways work life can limit opportunities for need satisfaction and dampen emotional well-being. It is not likely that such findings were driven by global perceptions of work life, as the experience-sampling method used in this study gathered experiences as they occurred. Moreover the broad occupational representation in this study suggests these findings are not due to specific occupations that were more or less likely to promote well-being. Further research will be needed, however, to test for the moderating effects of occupation and other demographic factors. But nonetheless, the present findings raise serious concerns about work climates, and about what can be done to foster work activities and contexts more conducive to wellness and health.

Weekends are a cultural construction, originally built around ritual religious observations, and then further institutionalized through a patterned organization of labor activities. For most persons in mainstream western cultures weekends are thus a time of more freedom and autonomy and opportunities for selective affiliation. Our results show that these affordances of autonomy and relatedness are associated with higher vitality and positive mood, and lower negative mood and somatic symptoms. Much of this enhanced wellness is associated with a release from the constraints of work. Thus these results point to possibilities for improving wellness both through enhancing need satisfactions at work (Stone et al., 2009) and providing more time for adults that is free from work (de Graaf, 2003). These results also support the framework of self-determination theory, and its account of wellness in terms of basic psychological need satisfactions. In that viewpoint, wellness and optimal experience are a function of opportunities to experience autonomy, competence and relatedness both when, and wherever, they are afforded.

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