11-2008

Contact With Nature, Sense of Humor, and Psychological Well-Being

Thomas R. Herzog
Grand Valley State University, herzogt@gvsu.edu

Sarah J. Strevey
Grand Valley State University

Environment and Behavior
Volume 40 Number 6
November 2008 747-776

10.1177/0013916507308524
http://eab.sagepub.com
hosted at
http://online.sagepub.com

Contact With Nature, Sense of Humor, and Psychological Well-Being

Thomas R. Herzog
Sarah J. Strevey
Grand Valley State University

We administered a questionnaire measuring contact with nature, sense of humor, and psychological well-being. Factor analysis of the humor items yielded four factors: humor production, humor appreciation, coping humor, and humor tolerance. Factor analysis of 14 well-being measures yielded three factors: emotional well-being, personal development, and effective functioning. The best sense-of-humor predictor of the well-being measures and factors was humor appreciation. Regression models for each of the well-being factors as dependent variables with humor appreciation and contact with nature as independent variables showed that additive models with both predictors were appropriate for personal development and effective functioning and that a simple model with humor appreciation as the sole predictor was sufficient for emotional well-being. Secondary analyses suggested that contact with nature was the better predictor of effective functioning, whereas sense of humor was the better predictor of personal development.

Keywords: *nature; humor; well-being; restoration*

In the past two decades, there has been a growing literature on psychological well-being, conceptualized not only as the avoidance of suffering, pain, and stress but also as a positive state. Variously operationalized as perceived happiness, life satisfaction, or flow, there has been increasing emphasis on achieving positive states and the variables that predict such achievement. Recent reviews provide an overview of mainstream theory

Authors' Note: This research was conducted while the first author was on sabbatical leave from Grand Valley State University, and the authors thank the University for its support. Correspondence concerning this article should be addressed to Thomas R. Herzog, Department of Psychology, Grand Valley State University, Allendale, MI 49401; e-mail: herzogt@gvsu.edu.

and research in this domain (e.g., Diener, 2000; Myers, 1992, 2000). For example, research on happiness indicates that certain objective factors are not very important (excessive wealth, perfect health, age, gender, ethnicity), whereas several psychosocial variables are significant predictors (self-esteem, feeling in control of one's life, optimism, extraversion, supportive friendships, a satisfying love life, challenging work, and a framework in which one's life makes sense).

Two areas of research are largely missing from the mainstream literature on psychological well-being but would seem to be clearly relevant. One of those areas is restoration research within the field of environmental psychology, and the other is the psychology of humor. Below we review current theories within each of these research areas, focusing on their predictions regarding psychological well-being. The discussion necessarily also includes theoretical perspectives on the concept of well-being itself and how it has been operationalized based on such perspectives. The discussion culminates in a consideration of why it makes sense to ask how a key predictor from each research area, contact with nature (from environmental psychology) and sense of humor (from the psychology of humor), might work together in enhancing well-being. We also describe various models of how the two predictors might work together.

Contact With Nature

In environmental psychology, a growing literature attests to the beneficial effects of nature on well-being (e.g., Kaplan & Kaplan, 1989; Kaplan, S., 1995, 2001; Ulrich, 1983). There have been two major theoretical approaches to the beneficial effects of nature. One, the psychoevolutionary theory (PET) of Ulrich and colleagues (Ulrich, 1983; Ulrich et al., 1991), emphasizes emotions and dwells on how nature reduces stress reactions. In this model, stress is a set of physiological responses to any situation that threatens well-being. The set of responses includes negative emotions and various physiological indicators of increased autonomic arousal. Recovery from stress can occur in settings that evoke moderate levels of interest, pleasantness, and calm. In such settings, positive affect replaces negative affect, negative thoughts are inhibited, and autonomic arousal decreases. Features of the setting responsible for recovery include moderate depth and stimulus complexity, a focal point, and the presence of appropriate content such as vegetation and water (Ulrich, 1983). Not surprisingly, natural settings tend to abound in the features thought to promote recovery from stress.

Support for the PET has come from a number of studies comparing emotional and physiological responses to natural and urban settings experienced after stress induction (e.g., Hartig, Evans, Jamner, Davis, & Garling, 2003; Ulrich, 1979; Ulrich et al., 1991; van den Berg, Koole, & van der Wulp, 2003). Exposure to the two types of settings was achieved either by experiences in the actual settings (e.g., walks in natural or urban settings) or by visual simulation (videotapes or slides). Stressors included course examinations, scary movies, videos of industrial accidents, and the drive to the study site. The uniform finding from these studies was that natural settings, compared to urban settings, led to a reduction in physiological indicators of autonomic arousal, as well as to an improvement in mood. The latter included both increased positive affect and decreased negative affect.

PET clearly predicts that contact with nature should decrease stress, enhance positive affect, and diminish negative affect. Thus, in addition to a measure of typical contact with nature, our study included a standard measure of perceived stress, as well as measures of positive and negative affect. The theory and supportive evidence led to the expectation that contact with nature should be negatively related to stress and negative affect and positively related to positive affect.

The second major theoretical approach to the beneficial effects of nature is attention restoration theory (ART). As promulgated by the Kaplans (Kaplan & Kaplan, 1989; Kaplan, S., 1995), ART focuses on directed attention, the kind of attention that requires mental effort and can be fatigued from overuse. Directed attention fatigue leads to the inability to focus and has several unfortunate consequences, including performance errors, inability to plan, social incivility, and irritability.

Settings that enable recovery from directed attention fatigue are known as restorative settings. ART proposes that an effective restorative setting should have all four of the following properties: (a) *fascination*, which includes either content or mental processes evoked by the setting that engage attention effortlessly, thus allowing fatigued directed attention to rest; (b) *being away*, which implies that the setting is physically or conceptually different from one's usual environment; (c) *extent*, which means that the setting should be sufficiently rich and coherent that it can engage the mind and promote exploration; and (d) *compatibility*, which implies a good fit between one's inclinations or purposes and the kinds of activities supported by the setting.

Kaplan (1995) also draws a distinction between hard and soft fascination. Hard fascination is very intense, riveting one's attention and leaving little room for thinking things over. By contrast, soft fascination is of moderate intensity, enough to hold attention, although still leaving room for reflection.

Settings with soft fascination also include an aesthetic component, which can help offset any pain that may accompany reflection. Both types of fascination can permit fatigued directed attention to rest, but settings with soft fascination enable the additional benefit of the opportunity for reflection. Based on the necessary properties of a restorative setting, and the distinction between hard and soft fascination, ordinary natural settings are generally expected to be better candidates for restoration than most typical urban settings (although certain built settings can be restorative; see Kaplan, Bardwell, & Slakter, 1993, and Ouellette, Kaplan, & Kaplan, 2005). Many peaceful natural settings are thought to be especially good sources of soft fascination.

A steady stream of studies has supported ART. The typical paradigm has been to compare people exposed to natural versus urban settings after inducing directed attention fatigue either naturally or by experimental manipulation. The typical finding has been relatively better performance on attention-demanding tasks by people exposed to natural settings. Early studies were reviewed by Kaplan (1995). More recent studies have continued to document improved functioning as a consequence of contact with nature (e.g., Berto, 2005; Kaplan, R., 2001; Taylor, Kuo, & Sullivan, 2001, 2002; Wells, 2000). Some studies (e.g., Kuo, 2001; Kuo & Sullivan, 2001) have used formal mediation analysis to demonstrate that a beneficial effect of nature was mediated by its effect on attentional capacity.

ART clearly predicts that contact with nature should in general alleviate directed attention fatigue and thereby improve any kind of functioning that depends on directed attention. We borrowed three self-report measures of attentional functioning from R. Kaplan's (2001) study of the effects of the view from the home: effective functioning, at peace, and distraction. In general, Kaplan found that natural views from the home tended to be positively related to effective functioning and feeling at peace and negatively related to distraction. We expected a similar pattern of results for our measure of contact with nature.

Although the primary focus in ART is on attention-related variables, a case can be made for indirect effects of contact with nature on what might broadly be called personal development. We noted earlier that among the negative effects of directed attention fatigue are social incivility and irritability. It follows that if contact with nature relieves attentional fatigue, it might also improve interpersonal relations. Likewise, to the extent that contact with nature promotes reflection, it might enhance personal growth by aiding in such areas as setting priorities and achieving goals. In support of this line of thought, Kuo (2001) found that public-housing residents living in buildings with nature nearby had higher scores on several measures of

effectiveness in handling major life issues than did residents without nature nearby. Personal development must be measured for an evaluation of these speculations. Ryff (1989), after a review of the theoretical literature on well-being, produced a measure that provides scores on six aspects of well-being: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. We included the Ryff scales in our study and checked for positive relations between contact with nature and both personal growth and positive relations with others.

Sense of Humor

The second research area that is largely absent from the mainstream literature on well-being is the psychology of humor. In fairness, there has been passing reference to the potential benefit of humor in the mainstream literature on happiness (e.g., Myers, 1992), but the operative word is "passing." Yet ever since Cousins (1979) popularized the potential role of humor in dealing with physical illness, a constant theme in the literature on the psychology of humor has been the role of humor in enhancing both physical and psychological well-being (see Martin, 2001, for a review). For example, humor has been linked to improved immune functioning and to the reduction of either perceived stress or the impact of variables that produce stress (e.g., Abel, 2002; Lefcourt, 2001; Martin, 2001). It is clear that humor is seen as an important contributing factor for well-being. Preferring simple indicators, we focused on sense of humor, considered a personality trait or a set of traits. According to Martin (1998), *sense of humor* refers to "habitual individual differences in all sorts of behaviors, experiences, affects, attitudes, and abilities relating to amusement, laughter, jocularity, and so on" (p. 17). Numerous simple self-report measures have been devised to assess either the global trait or its many facets. There is considerable literature on the validity of such measures (e.g., Martin, 1996; Martin & Lefcourt, 1983, 1984; Martin, Puhlik-Doris, Larsen, Gray, & Weir, 2003; Ruch, 1998; Svebak, 1996; Thorson & Powell, 1993), as well as on their relation to physical (Martin, 2001) and psychological (Martin et al., 2003) well-being. Fortunately, that same literature also provides a useful theoretical background for the potential relations between sense of humor and well-being.

In discussing the effects of humor on health, Martin (2001) described four theoretical mechanisms that might involve humor. The first mechanism is physiological. Martin cited both theory and research indicating that laughter may produce changes in numerous physiological systems (musculoskeletal,

cardiovascular, endocrine, immunological, etc.) that have beneficial effects on physical health. If sense of humor inclines a person to laughter, it could contribute to such beneficial effects. Given that the emphasis in this mechanism is strictly on physical health, we do not consider it further.

The second mechanism relating humor to well-being is via positive emotional states accompanying humor. Here again sense of humor might produce "habitual amusement-related positive emotions or moods" (Martin, 2001, p. 506). Positive emotions may contribute to physical health in several ways (e.g., analgesic immune-enhancing effects), but they also directly affect psychological well-being by making people feel better emotionally. This conceptualization of sense of humor predicts that it should be positively related to measures of positive affect (including happiness) and negatively related to measures of negative affect (including depression).

If sense of humor inclines a person toward positive affect, then it might also contribute indirectly to enhanced performance on tasks that demand directed attention. Isen and her colleagues (e.g., Isen, Daubman, & Nowicki, 1987) demonstrated experimentally that positive affect, induced by several methods, including exposure to humorous material, enhanced problem-solving ability. Thus, the positive mood and flexible thinking associated with a good sense of humor could contribute to effective functioning in attention-demanding situations. This line of thinking provides a warrant for expecting modest positive relations between sense of humor and the measures of attentional functioning described in the previous section. It also provides a common set of well-being indicators thought to be affected by both sense of humor and the ART approach to mental restoration. Given that the beneficial effect is direct in ART and indirect for sense of humor, one might expect a stronger relation between contact with nature and measures of attentional functioning than between sense of humor and such measures.

Martin's (2001) third mechanism relating humor to well-being is stress. Martin dwells on the potential stress-moderating effect of humor (e.g., Lefcourt, 2001; Lefcourt & Martin, 1986; Lefcourt & Thomas, 1998). The basic idea is that humor might interact with stress by reducing the magnitude of the negative relation between stressful life events and well-being. Sense of humor is explicitly mentioned as a possible stress-moderating variable. The mechanism is thought to be cognitive in that a humorous outlook leads to positive interpretations or appraisals of stressful situations, thereby weakening the negative relation between stress and well-being. The emphasis in this approach is on sense of humor as a coping strategy, and thus, one might want to include a measure of sense of humor that focuses on its role in coping. As described below, our measure followed fairly

standard practice in containing several items aimed at the use of humor as a coping strategy.

Martin (2001) correctly notes that results from studies investigating the stress-moderating effect of sense of humor have been inconsistent. However, it is worth noting that some of the studies in this domain have found a main effect of sense of humor, a direct negative relation between sense of humor and self-reported stress (e.g., Abel, 2002; Kuiper, Martin, & Olinger, 1993; Svebak, Götestam, & Jensen, 2004; Trice & Price-Greathouse, 1986). Moreover, Dixon's (1980) seminal analysis of the theoretical relation between humor and stress clearly indicates that there should be a main effect: Humor should reduce stress. This may come about via the same cognitive mechanisms described by Martin, but in Dixon's view the effect is direct. The upshot is that we have some theoretical and empirical support for expecting a negative relation between sense of humor and perceived stress.

Martin's (2001) fourth suggested mechanism relating humor to well-being is social support. He notes that "individuals with a greater sense of humor may be more socially competent and interpersonally attractive . . . , resulting in greater intimacy . . . and potentially more numerous and more satisfying social relationships" (Martin, 2001, p. 506). He stresses that "this view focuses on tendencies to use humor in a socially facilitative manner" (p. 506). This approach predicts that the tendency to use humor for social facilitation should be positively related to measures of well-being involving social relations and social support. Our sense-of-humor measure contained a set of items aimed at measuring social uses of humor, and the Ryff scales, described earlier, can all be considered as directly involving either social relations or social support. The social interpretation is obvious in the case of the Ryff scale for positive relations with others. In addition, all the remaining scales (autonomy, environmental mastery, personal growth, purpose in life, and self-acceptance) can be seen as substantially dependent on an effective social-support network. Thus, we could check these predictions. The predictions described here involve a fairly direct effect of sense of humor, but the potential relation between contact with nature and personal development, described in the preceding section, was more tenuous and speculative. Thus, relations between sense of humor and measures of personal development might be stronger than similar relations involving contact with nature.

We conclude this theoretical review of sense of humor and well-being by making explicit what has heretofore been implicit. First, a number of different aspects of both sense of humor and well-being are involved in the various theoretical predictions and speculations. Thus, to assess the predictions, one must measure the various facets of each construct. Our sense of

humor measure contained sets of items aimed at social uses of humor, use of humor for coping, and general humor appreciation. We verified that we had measured the intended constructs by factor analysis. Likewise, the section of our survey on well-being measured 14 different facets of well-being, including all those involved in our theoretical review. Thus, we were able to assess whether different conceptualizations of sense of humor were related to different aspects of well-being, as implied by some of the theoretical models reviewed here. Second, to limit the scope of an already ambitious study, we made a conscious decision to omit negative conceptions of sense of humor, as described by Martin et al. (2003). We reconsider the wisdom of this decision in the Discussion section.

Combining the Predictors

Given the omission of nature and humor from the mainstream literature on well-being, and further, given the fact that the two research domains have had virtually no conversation with each other, our main purpose was to see how nature and humor might work together in enhancing well-being. A prior issue is whether it is reasonable to pursue such a goal. We felt that because theoretical models from the two domains implicate identical psychological systems (e.g., stress, attention, affect), it was at least plausible that predictors from the two domains might combine their influences in ways that made theoretical sense. We briefly review plausible theoretical models of how they might combine. Because this is virgin territory with neither prior theory nor empirical results for guidance, our evaluation of the various models must be based on reasoned logic and plausibility. We stress that our general evaluations in the material that follows are not intended to rule out the possibility that different models might apply with different conceptualizations of either well-being or sense of humor. We also stress that a priori we did not have a single compelling theoretical model of how contact with nature and sense of humor might combine but rather several alternatives that we considered plausible. Our purpose was to find out which of them would be supported.

Moderation models. In moderation models, the independent or predictor variables interact, and changes in either independent variable alter the relation between the other independent variable and the dependent variable. In our case, the relation between well-being and contact with nature might vary at different levels of sense of humor. Equivalently, the relation between

well-being and sense of humor might vary at different levels of contact with nature. To assess whether moderation is occurring, one simply tests for the interaction between the independent variables.

Two versions of moderation seemed plausible to us. The first version can be thought of as an *AND* interaction because the beneficial effects of high levels of both predictors, contact with nature and sense of humor, are greater than one would expect from simply adding their separate effects. This could happen because a low level of the dispositional predictor, sense of humor, blunts or weakens the positive relation between contact with nature and well-being. Put simply, a situational or environmental influence, such as contact with nature, cannot fully manifest itself unless one has a positive disposition (sense of humor). The AND interaction has been supported in research on proenvironmental behavior (e.g., Gardner & Stern, 1996). The common finding has been that the strongest relation between external incentives and proenvironmental behavior occurs among people with proenvironmental attitudes. In a similar vein, Kaplan, S. (2001, pp. 498-502) notes that the effect of contact with nature is weakened, if one is unreceptive because of irritability or inattention.

The second version of moderation can be thought of as the *OR* interaction. In this model, a high level of either predictor produces a strong positive effect on well-being, but adding a high level of the other predictor produces only a small additional benefit. Thus, either contact with nature or a good sense of humor is highly beneficial, but combining the two produces substantially less benefit than one would expect from simply adding their separate effects. This type of interaction is illustrated by the stress-moderating studies in the humor literature reviewed earlier. In those studies, a good sense of humor reduced the magnitude of the negative relation between stressful circumstances and measures of well-being. The result was that either a good sense of humor or a low level of stress produced a high level of well-being, but adding either one to the other produced only a small additional benefit. Although this pattern reveals nothing about how contact with nature and sense of humor might interact, it does document the involvement of sense of humor in an OR interaction. We include the OR model because it rests on the plausible assumption that there may be an upper limit on the level of well-being that is attainable. If so, then a high level on either predictor might realize most of the benefit that can be achieved, with little room for additional benefit from a high level on the other predictor.

Note that the practical implications of the two moderation models are very different. In the AND model, one is well advised both to pursue contact with nature and to develop one's sense of humor. In the OR model, one

would do well to cultivate one predictor or the other, but not much is to be gained by pursuing both.

Additive models. A simpler model of how contact with nature and sense of humor could work together to influence well-being is that they might add their separate effects. As was the case with moderation models, there are two plausible versions of the additive approach. In the *dominance* model, one of the predictors has a stronger relation to well-being than the other predictor. When the two predictors are combined, only the stronger predictor is effective. This model requires that the two predictors be related to each other. If that condition is met, then the stronger predictor can dominate the weaker predictor when they are combined. There is a theoretical scenario in which these conditions are plausible. If our implicit conceptualization of contact with nature as a situational variable is incorrect, then perhaps our measure of typical contact with nature is instead getting at the disposition to seek or prefer high levels of contact. If so, what happens on any given occasion (e.g., handling mishaps in natural settings with humor or trading funny stories around the camp fire) might be irrelevant. The relevant question would be whether the two dispositions are both effects of a prior cause and thus related to each other. It seemed plausible to us that both dispositions might be reflections of a broader tendency to have a positive outlook on life, as illustrated by Seligman's (1991) much-researched construct of optimism. Although we could envision a positive outlook as leading to both increased contact with nature and a better sense of humor, we could not decide which predictor might have the stronger relation to well-being. Thus, we remained open to either predictor as the dominant one.

The other plausible additive model may be thought of as the *independence* model. In this model, there is no prior cause producing a relation between the two predictors. Instead, the two dispositions are relatively domain specific, with their effects on any target variable completely independent. In that case, contact with nature and sense of humor should each have a substantial impact on well-being but be uncorrelated with each other. Their combined influence would be roughly the sum of their separate influences. Given the lack of cross-talk between the two research domains, it is difficult to predict in advance whether contact with nature and sense of humor are as compartmentalized as the additive model implies.[1]

The practical implications of the additive models parallel those of the moderation models. The dominance model is similar to the OR model in that one can benefit from cultivating either predictor, but not much is to be gained by pursuing both. There is the additional proviso that if a choice is available,

then the dominant predictor should be preferred. The independence model is similar to the AND model in its implication that both contact with nature and sense of humor are worth pursuing.

In summary, we feel that the question of how contact with nature and sense of humor might combine to influence psychological well-being is well worth asking. Theories about both predictors implicate similar systems and constructs, and thus, the possibility of a theoretically and practically meaningful combination seems likely. We have reviewed four plausible models for how the two predictors might combine: the AND and OR interactions and the dominance and independence additive models. All these models were tested in our study. Finally, we note again that the same combination model need not apply to all conceptualizations of our variables.

Method

Participants

The sample of respondents consisted of 823 students at a university in the midwestern United States. Participation fulfilled a course requirement in introductory psychology. There were 272 males (33%), 544 females (66%), and 7 respondents who failed to provide information on gender. Most of the participants (85%) were below the age of 20, another 14% were in the age range of 20 to 29 years, and the rest were either above 30 years of age or failed to report their age. The breakdown by year in school was 75% freshmen, 16% sophomores, 5% juniors, 2% seniors, and 2% either "other" or failed to report. The vast majority of the respondents (91%) reported their marital status as "never married," another 2% as "married, living with spouse," 6% chose "other," and 1% were either "married but separated," "divorced or widowed," or failed to report. We collected no other personal information about the participants. We ran 37 sessions, each consisting of 7 to 35 participants.

Measures

The survey consisted of 259 objective self-report items.[2] The last four items assessed personal information: the respondent's age, gender, marital status, and year in school. The first 255 items were divided into three sections labeled "Self Description" (45 items), "Activities" (33 items), and "Feelings" (177 items). There were four versions of the survey, differing only in the ordering of these three sections. We used all possible orders with the Feelings section either preceding or following the other two sections.

The Self Description section measured sense of humor. The 45 items were obtained from various sources as follows: 18 from the sense-of-humor scale used by Herzog and Anderson (2000), 6 from the Coping Humor Scale (Lefcourt, 2001), 16 from the final version of Thorson and Powell's (1993) Multidimensional Sense of Humor Scale, and 5 from the Humor Styles Questionnaire (HSQ) of Martin et al. (2003). By our informal classification, the 45 items fell into the categories of Thorson and Powell as follows: humor production and social uses (14 items), coping humor (13 items), humor appreciation (10 items), and attitude toward humor (8 items).

The Activities section measured typical contact with nature (10 items) and four other categories of common activities: entertainment (10 items), chores (5 items), exercise (4 items), and grooming/appearance (4 items). The five categories as well as most of the items were borrowed from Herzog, Chen, and Primeau (2002). For the nature category, Kaplan, R. (2001) also provided inspiration. The order of the 33 items in this section was randomized. Our major interest was in the nature category; the other four categories were included to conceal our purpose.

The Feelings section of the survey included 14 measures of psychological well-being as follows:

- The first 31 items (16 phrases, 15 adjectives) measured R. Kaplan's (2001) attention-related factors (effective functioning, at peace, and distraction) and were drawn primarily from the "Feelings" section of her survey.
- The next 20 items (all adjectives, presented in a random order) were based on the PANAS scale (Watson, 1988) and were intended to measure positive and negative affective states.
- The next three blocks of items measured perceived stress (14 items), depression (20 items), and happiness (8 items), respectively. For stress, we used the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983), and for depression, the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). Our happiness scale was based on items from the Memorial University of Newfoundland Scale of Happiness (MUNSH; Kozma & Stones, 1980).
- The last 84 items consisted of Ryff's (1989) Scales of Psychological Well-Being. Ryff's scales were designed to measure six aspects of well-being (14 items for each scale): autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance.

In general, we used the original wording of the items borrowed from our sources. However, there were several instances where items were reworded or replaced. This was done to replace duplicate items, improve face validity, or to make the items compatible with our step scales for responding.[3]

Responses to all items except those assessing personal information involved a 5-point step scale. Items were scored so that 1 was the lowest score and 5 was the highest score. Thus, negatively worded items were reverse scored compared to positively worded items.[4] Time frames to be considered in responding to items varied across measures as specified by the original measuring instruments. The time frame was either unspecified (the humor items and the Ryff scales) or varied as follows: the last few days (the attention-related and PANAS items), the past week (depression and happiness), a typical week (the Activities items), and the last month (stress).

We performed four factor analyses[5] on sets of items from different sections of the survey. The purpose was to either discover the constructs being measured or to support our prior intuitions. The first analysis was performed on the 45 humor items and yielded four factors. The pure-loading items in Appendix A indicate that the first factor deals with humor production and social uses of humor (hence named "humor production"), the second factor involves appreciation of humor in general (named "humor appreciation"), the third is about using humor to cope (named "coping humor"), and the fourth factor seems to be concerned with tolerance for taboo or "off-limits" topics (named "humor tolerance").

The other three factor analyses served primarily to confirm our intuitions. Factor analysis of the Activities items confirmed that we had a coherent nature category. Solutions in four to six factors all contained a nature factor. The pure-loading nature items from the four-factor solution are listed in Appendix B. Factor analysis of the attention-related items in the Feelings section of the survey yielded three factors. Pure-loading items are listed in Appendix C. The intent was to see if we could replicate R. Kaplan's attention-related factors. Our first two factors were readily interpretable as "distraction" and "effective functioning," respectively. The third factor consisted of four items from the a priori category of "at peace" and three from the a priori category of "effective functioning." The three effective-functioning items all appear to contain a heavy dose of positive affect: "satisfied with how things have been going lately," "on top of the world," and "positive." Thus, this factor is a mixture of contented-relaxed-at peace and positive feeling. For short, we refer to it with Kaplan's name, "at peace," although its overlap with her at-peace items is only modest. Finally, a factor analysis of the PANAS items recovered as pure loaders 19 of the 20 adjectives, each in its appropriate category. The only adjective that failed to load on either factor was "vigilant," originally intended for the positive-affect category.[6]

In summary, our 19 original measures included factor-based scores for the four sense-of-humor factors, the contact-with-nature factor, and the

following well-being factors: effective functioning, distraction, at peace, positive affect, and negative affect. The remaining well-being measures (stress, depression, happiness, and the six Ryff scales) were composite scores based on well-established scales and following original scoring protocols. Reliability coefficients for the sense-of-humor and contact-with-nature measures are in Appendices A and B, respectively. Reliability coefficients for the 14 well-being measures are in the last column of Table 1.

Because there were substantial correlations among the well-being measures,[7] we sought to discover the underlying constructs by factor-analyzing the correlations among the 14 well-being measures. The default solution (initial eigenvalues greater than 1) yielded three factors. Pure loaders on the first factor consisted of happiness as a positive loader and negative affective states, depression, and distraction as negative loaders. Given the connotation of emotional distress conveyed by most of the items measuring distraction, this factor can be interpreted as an "emotional well-being" factor. The second factor consisted of all the Ryff well-being scales except environmental mastery, all with positive loadings. The Ryff scales can be broadly interpreted as measures of personal development, and so we refer to this factor as "personal development." The third factor had two positive pure loaders: positive affective states and effective functioning. A quick scan of the nine adjectives measuring positive affective states reveals that most of them also seem to have something to do with effective functioning (interested, intent, proud, active, inspired, strong, excited, determined, enthusiastic). Thus, we see this as an "effective functioning" factor. Reliability coefficients for the three well-being factors are in the last column of Table 2.[8]

Procedure

After obtaining informed consent, and going over instructions on how to fill out the survey, the researcher passed out copies of the survey and allowed participants in each session to work at their own pace. Responses were entered on computer forms for scanning into a data file. Within each session, the booklets containing the four versions of the survey were passed out to different columns (from front to back of room) of seats. The purpose was that anyone looking to either side would see a participant with a different version of the survey and also to insure that a roughly equal number of each version was used within each session. Most participants required from 40 to 75 min to complete the survey.

Table 1
Correlations Between Predictor Variables and Well-Being Measures

	Predictor Variables					
Well-being Measures	Humor Production	Humor Appreciation	Coping Humor	Humor Tolerance	Contact With Nature	Coefficient Alpha
Distraction	.07	–.09*	.06	–.02	.03	.84
Negative affect	–.01	–.12**	–.05	–.08	.05	.85
Stress	–.10*	–.19**	–.13**	–.09*	–.12*	.86
Depression	–.10*	–.22**	–.11*	–.10*	.00	.91
Effective functioning	.01	.12*	.07	.01	.21**	.81
At peace	.14**	.18**	.16**	.12*	.14**	.81
Positive affect	.18**	.15**	.18**	.04	.23**	.84
Happiness	.14**	.27**	.17**	.04	.05	.90
Positive relations	.15**	.29**	.08	–.06	.06	.89
Autonomy	.16**	.18**	.14**	.12*	.09	.87
Environmental mastery	.10*	.22**	.13**	.02	.08	.86
Personal growth	.19**	.29**	.18**	–.03	.12**	.86
Purpose in life	.06	.24**	.04	–.13**	.09	.88
Self-acceptance	.16**	.29**	.14**	.02	.07	.90

Note: $N = 823$. The internal-consistency reliability measure, coefficient alpha, is given for each well-being measure in the last column.
*$p < .01$. **$p < .001$.

Results

Predicting Well-Being

Original well-being measures. Table 1 presents correlations between the five predictor variables (four humor measures and one contact-with-nature measure) and the original measures of well-being. Although generally modest in magnitude, the pattern of the correlations allowed us to assess the construct validity of our measures. This is so because we derived numerous predictions from prior theory and results (see the introduction). If those predictions are generally supported, then so is the construct validity of our measures too, as well as the theories that produced the predictions. Failed predictions present a less-clear picture: Either the theories or the construct validity of the measures may be at fault.

Table 2
Correlations Between Predictor Variables and Well-Being Factors

	Predictor Variables					
Well-being Factor	Humor Production	Humor Appreciation	Coping Humor	Humor Tolerance	Contact With Nature	Coefficient Alpha
Emotional well-being	.06	.21**	.08	.07	–.01	.87
Personal development	.18**	.32**	.14**	–.02	.10*	.77
Effective functioning	.11*	.15**	.14**	.03	.24**	.77

Note: $N = 823$. The internal-consistency reliability measure, coefficient alpha, is given for each well-being factor in the last column.
*$p < .01$. **$p < .001$.

As described in the introduction, the PET model predicts that contact with nature should have a negative relation with stress and negative affect and a positive relation with positive affect. Two of the correlations (with stress and positive affect) were in the predicted direction, but only the one with positive affect was significant at $p < .001$. (Given the number of correlations examined, a more stringent value of alpha for significance testing seems appropriate.) ART directly predicts that contact with nature should be positively related to the effective-functioning and at-peace measures and negatively related to distraction. The first two predictions were clearly supported, but the third was not. By the extension of the ideas of ART, we also speculated that contact with nature might be positively related to two of the Ryff well-being scales, positive relations with others and personal growth. The two correlations were positive, but only the one with personal growth was significant at $p < .001$. The pattern of correlations for contact with nature provided some support for the core predictions of both the PET and ART models. We interpret this pattern of results as providing modest support for the construct validity of the new contact-with-nature measure.

With respect to sense of humor, it is clear that humor appreciation was the strongest measure ($p < .001$ for 12 of 14 correlations) and humor tolerance was the weakest ($p < .001$ for only one correlation). The various theoretical models relating sense of humor to well-being led to strong predictions that sense of humor would be positively related to positive

affect, happiness, and measures of personal development (the Ryff scales) and negatively related to negative affect, depression, and stress. All these predictions were supported ($p < .001$) for humor appreciation, and many of them were also supported for humor production and coping humor. Indirectly, the sense-of-humor theories also suggested the possibility of positive relations with attentional functioning. The correlations with the attention-related measures (distraction, effective functioning, at peace) were inconsistent. In general, the pattern of correlations supported the construct validity of all the humor measures except humor tolerance, with the strongest and most consistent support for the humor-appreciation measure.

Well-being factors. Table 2 presents the correlations between the predictor variables and the three well-being factors. Clearly, appreciation was the best humor predictor, tolerance was completely ineffective, and nature was a relatively strong predictor only of effective functioning. Humor appreciation was the only significant predictor of emotional well-being.

In the introduction, we developed two predictions regarding the relative effectiveness of contact with nature and sense of humor as predictors of well-being. The first was that contact with nature might be the better predictor of attentional functioning, and the second was that sense of humor might be the better predictor of personal development. Using the best humor measure, humor appreciation, we see in Table 2 that both predictions were supported. Contact with nature had the greater correlation with effective functioning, whereas humor appreciation had the greater correlation with personal development. For both these well-being factors, we tested the difference in their correlations with contact with nature and humor appreciation (using one-tailed tests because we had made directional predictions). Personal development had a greater correlation with humor appreciation (.32) than with contact with nature (.10; $p < .001$ for the difference), and effective functioning had a greater correlation with contact with nature (.24) than with humor appreciation (.15; $p < .001$ for the difference).

Combining the Predictors

In the introduction, we described four models of how contact with nature and sense of humor might work together in predicting well-being. There were two moderation (interaction) models and two additive models. The two moderation models consisted of the AND interaction, which posits that high values of contact with nature and sense of humor produce an effect on well-being that is greater than would be expected from the sum of their separate

effects, and the OR interaction, which posits a combined effect that is less than the sum of the separate effects. The two additive models consisted of the dominance model, which posits simple relations among all three variables (the two predictors and well-being) but only one effective predictor when they are combined additively, and the independence model, which posits unrelated predictors both of which are effective when combined. To test these models, we performed regression analyses with each of the well-being factors as dependent variables. To limit the number of analyses, we used the best of the humor measures, humor appreciation and contact with nature, as the independent variables.

The moderation model demands that the two predictors should interact. When we included an interaction term in our regression analyses, we found that for all three well-being factors the interaction term was not significant ($p > .05$). Thus, no version of the moderation model was supported.

Results for the additive model are summarized in Table 3. Humor appreciation was the only effective predictor of emotional well-being, but both humor appreciation and contact with nature predicted the other two well-being measures. Thus, for personal development and effective functioning, the independence additive model seems to be an appropriate description of how contact with nature and sense of humor combine their influences. For emotional well-being, the dominance model is ruled out for two reasons: Contact with nature had no simple relation with emotional well-being (Table 2) and was also unrelated to humor appreciation ($r = –.07$, $p > .05$). Thus, for emotional well-being, a simple model with humor appreciation as the only predictor is sufficient.[9] As was the case with simple correlations (Table 2), the partial correlations in Table 3 suggest that humor appreciation may be a somewhat better predictor of personal development, whereas contact with nature might have a slight edge in predicting effective functioning.

Discussion

Conclusions and Theoretical Implications

We feel that two major conclusions are tentatively supported. The first is that contact with nature and sense of humor are independent and additive predictors of certain aspects of psychological well-being. The second is that the relative influence of the two predictors varies with the aspect of well-being considered. The primary evidence for the first conclusion is that for the personal-development and effective-functioning well-being factors, both predictors

Table 3
Regression of Well-Being Factors on Humor Appreciation and Contact With Nature

	Emotional Well-being		Personal Development		Effective Functioning	
Predictor	*B*	Partial *r*	*B*	Partial *r*	*B*	Partial *r*
Humor appreciation	.24	.21**	.30	.32**	.19	.17**
Contact with nature	.00	.01	.09	.13**	.23	.26**

Note: *B* is the raw-score regression weight, $N = 823$. For emotional well-being; Adjusted $R^2 = .04$, $p < .001$; for personal development, Adjusted $R^2 = .11$, $p < .001$; for effective functioning, Adjusted $R^2 = .08$, $p < .001$.
*$p < .01$. **$p < .001$.

were effective, and we were able to rule out moderation models of their combined influence. The primary evidence for the second conclusion is that only sense of humor, as represented by humor appreciation, was an effective predictor of the emotional well-being factor, but both predictors were effective for the other two well-being factors. Moreover, the relative magnitudes of the correlations suggested that humor appreciation was the better predictor of personal development, whereas contact with nature was the better predictor of effective functioning. Thus, the results suggest that the profile of prediction differs for different aspects of well-being.

Regarding the latter conclusion, we can even make some sense of the specific profiles of prediction for the three aspects of well-being. For effective functioning, we noted that ART posits a relatively direct effect of contact with nature on functioning because it restores the ability to direct attention. In contrast, sense of humor has a theoretical link to functioning only because it produces positive affect, which may aid in problem solving. Given the more tenuous link for sense of humor, it is perhaps not surprising that contact with nature was the stronger predictor of effective functioning. For personal development, one of the theoretical mechanisms for sense of humor was a direct positive effect on social relations for positive uses of humor (and our study avoided negative conceptualizations of sense of humor). In contrast, ART provided only a relatively indirect link to personal development: Restored directed attention should reduce social incivility, and reflection may enhance personal growth. Here, the more direct link favors sense of humor as the stronger predictor of personal development.

Finally, both sense of humor and contact with nature have strong theoretical links with emotional well-being. However, the link for contact with nature in the PET model depends on stress, whereas one of the models for sense of humor posits a direct link with affect without recourse to stress. Given that stress was not part of the emotional well-being factor (it was not a pure loader on any of the well-being factors), we can see why sense of humor was the only effective predictor.

Our conclusions are tentative because of one potentially serious problem. Although neither statistical power ($N = 823$) nor reliability of measurement (coefficients generally greater than .80) were problematic, evidence regarding validity of measurement was mixed. On the plus side, as discussed in detail in the next section, the results generally confirmed prior predictions about contact with nature and sense of humor, and factor analyses generally supported the construct validity of our measures. On the minus side, some prior predictions involving contact with nature were not supported, and there were some surprises in the factor analyses. Perhaps the most telling indication of possible measurement validity problems was the small magnitude of relations in this study (Table 1). Martin et al. (2003) reported 44 correlations between sense-of-humor measures and well-being measures, with 11 of them exceeding .30.[10] In this study, validity may have been reduced because we altered the wording of items and even replaced some items from previous measures. Likewise, one can question the wisdom of choosing items from several existing humor measures, even though we were careful to sample constructs that had figured prominently in previous research on sense of humor (humor production and social uses, humor appreciation, and humor for coping). Given the good psychometric properties of the Martin et al. (2003) HSQ, we might have done better if we had simply used their instrument. In addition, the HSQ would have allowed us to examine negative conceptualizations of sense of humor (see below). Given potential limitations on validity of measurement, our conclusions regarding how contact with nature and sense of humor combine their influences on well-being must remain tentative, pending replication.

Strengths and Weaknesses

A major strength of this study was the sample size, which afforded ample statistical power and allowed us to detect relations of small magnitude as statistically significant. A second strength was that we had an adequate number of items to measure each construct. The smallest number of items for any of the 19 original variables was four for humor tolerance. A

third strength was the inclusion of nonnature activity categories in the Activities section of the survey to conceal our interest in nature activities and thereby reduce demand characteristics. Unfortunately, there was no room in the survey to do the same for sense of humor.

A final strength of this study is that our measures proved to be generally reliable, and there was some support for their validity as well (although, as noted above, the validity evidence was mixed). The only reliability coefficients below .80 were for humor tolerance (.69) and the effective-functioning factor (.77). The first part of the Results section reviews the evidence for the numerous theoretically based predictions involving our measures. In general, the results (Table 1) supported the construct validity of all the humor measures except humor tolerance and indicated that humor appreciation, the humor measure used in our modeling analyses, was the strongest of the humor measures. The results also generally confirmed the core predictions from both major theories about contact with nature, although support for more speculative predictions was less consistent. With a few notable exceptions, factor analysis reinforced our confidence in the construct validity of our measures. Three of the four humor factors (humor tolerance was the exception) corresponded to those of Thorson and Powell (1993). Among the Activities items, nature-related activities formed a separate factor. From the Feelings section of the survey, we isolated roughly the same attention-related factors as did Kaplan, R. (2001), and our analysis of the affect items yielded distinctive factors for positive and negative affect, also in accord with previous research. Our factor analysis of the 14 original well-being measures yielded three factors that made sense and led to useful insights in subsequent analyses.

There were a few surprises in the way that individual well-being measures loaded on the well-being factors. Three of the original well-being measures (stress, at peace, and environmental mastery) were not "purely" associated with a single well-being factor. Nonetheless, these measures had relations with the predictors that made sense. In contrast, the original distraction measure loaded on the "wrong" factor, emotional well-being instead of effective functioning, as expected. The distraction items apparently had more to do with distress over distraction than with distraction itself. Perhaps as a result the distraction measure was not related to the predictors as expected. Finally, as noted earlier, the positive-affect measure loaded on the effective-functioning factor rather than the emotional well-being factor (which is where negative affect loaded). Although this provided confirmation that the two kinds of affects are distinctive, it also made interpretation of the positive-affect measure challenging, as discussed earlier.

Our study had several limitations. The two most serious limitations were sampling and measurement method. Sample bias was undoubtedly a problem. Our sample can be considered representative only of unmarried college undergraduates, primarily freshmen and sophomores, and also females. Generalizations to other demographic groups must await further research. In addition to concerns about validity of measurement discussed above, measurement via retrospective self-report in a university classroom also raises concerns about ecological validity. Would similar patterns of results be obtained with more realistic behavioral measures in a more realistic setting? We acknowledge this concern. In our defense, we point out that the results generally made sense from the perspective of prior theory and from our reasoned conjectures about how contact with nature and sense of humor might combine their influences. Nonetheless, we affirm that the external validity of our findings can be determined only by appropriate future research.

Three further weaknesses of our study are worth noting. First, because we limited our analyses of how contact with nature and sense of humor might combine to the best of the humor measures, appreciation, we have no firm basis for conclusions about the other humor measures. From Tables 1 and 2, we can suggest that humor tolerance probably has little to do with well-being. Second, as noted earlier, we altered the wording of items from previous measures and even replaced some items. This was always done for a good reason, but it carries the disadvantage that validity of measurement may have been reduced, and that we cannot readily interpret differences between our findings and previous findings involving such measures. Third, the time frames for our measures varied substantially, as described in the Methods section. In allowing varied time frames, we adhered to the instructions for the original measures, but it seems likely that this source of variation may have attenuated some of our relations between variables.

Future Research and Practical Implications

Two major issues remain for future research. The first priority is replication with improved measures. Our modest nine-item measure of contact with nature demonstrated the promise of this construct in predicting well-being, but improvement of the measure could proceed in two directions. One is simply expanding the sampling of nature situations for measuring contact. Another is to explore other dimensions of involvement such as feelings of connectedness with nature (Mayer & Frantz, 2004). As noted above, improved measurement of sense of humor could be achieved by using the HSQ of Martin et al. (2003). In addition, use of the HSQ would allow for

further exploration of the different facets of sense of humor. Our findings provided some support for the differential effectiveness of different measures of sense of humor. All the humor measures, except tolerance (which had marginal reliability), were significant predictors of personal development and effective functioning, but only humor appreciation predicted emotional well-being (Table 2). Use of the HSQ would enable us to see how negative versions of sense of humor, such as aggressive and self-defeating humor (Martin et al., 2003), relate differentially to well-being. The work of Martin et al. (2003) suggests that negative facets of sense of humor might be more effective in predicting emotional well-being and perhaps personal development than in predicting effective functioning. Improvement of well-being measures would also be helpful. As noted earlier, three of our measures (stress, at peace, and environmental mastery) were factorially impure and a fourth (distraction) loaded on the "wrong" factor. Close examination of item content and/or reconceptualizing the target construct may be necessary to achieve pure measures of the intended constructs.

The second major issue for future research is generality of results. Our sampling limitations could be addressed by research with other demographic groups. Likewise, it would be useful to assess the external validity of our findings by using behavioral and observational measures where possible and seeing how such measures of nature contact and sense of humor combine their effects.

Finally, consider the practical implications of our results. We are well aware that correlation does not imply causation, and there is little experimental research supporting a causal connection between our predictors and well-being. Two exceptions are the experimental studies of Hartig, Mang, and Evans (1991) and Berto (2005) showing that involvement with nature following a mentally fatiguing task restored performance on an attention-demanding task. Despite the dangers of causal inference, it seems irresponsible to avoid the issue of causation. Bearing in mind that this can only be speculation, it seems reasonable to us that the causal flow between our predictors and well-being is probably bidirectional. Sense of humor enhances well-being, which in turn enhances sense of humor; contact with nature enhances well-being, which in turn makes one more likely to seek contact with nature. If these assumptions are sound, and further research replicates our findings about how contact with nature and sense of humor combine, then useful advice could be offered. (If the assumptions are not sound, the advice may not work, but little harm is likely.) The advice is simple: Seek contact with nature, and develop your sense of humor. As to the latter, there are formal programs to develop one's sense of humor (e.g.,

McGhee, 1994) although we are not aware that they have been rigorously evaluated. (For an exception, see Nevo, Aharonson, & Klingman, 1998.) However, our results suggest that simply trying to expand one's appreciation of humor might have a beneficial impact, and presumably most people could pursue that goal on their own. As to the former, the news is even brighter. Ordinary natural settings are widely and easily available, and no formal training is required to realize their benefits. The best news of all is that these two promoters of well-being do not seem to overlap. Their beneficial effects on personal development and effective functioning (but perhaps not on emotional well-being) may be additive. So make time for both.

Appendix A
Pure-Loading Items for the Sense of Humor Factors

Item	Loading
Factor: humor production (coefficient alpha = .90)	
People look to me to say amusing things.	.72
I am regarded as something of a wit by my friends.	.69
I often crack people up with the things I say.	.67
I can say things in such a way as to make people laugh.	.66
I use humor to entertain my friends.	.64
I initiate or start humor more than others.	.62
Other people tell me that I say funny things.	.61
My clever sayings amuse others.	.58
I like to clown around or act silly.	.48
I seldom tell jokes.	–.40
Factor: humor appreciation (coefficient alpha = .86)	
People who tell jokes are a pain in the neck.	–.71
Calling somebody a "comedian" is a real insult.	–.67
I dislike comedians.	–.65
I like a good joke.	.64
I don't often joke around with my friends.	–.62
I love to hear jokes.	.55
I appreciate those who generate humor.	.52
I laugh a lot.	.50
I usually don't laugh or joke around much with other people.	–.49
Factor: coping humor (coefficient alpha = .86)	
Humor helps me cope.	.73
It has been my experience that humor is often a very effective way of coping with problems.	.65
Use of wit or humor helps me master difficult situations.	.64
I often use humor to help me cope with difficult situations.	.58
I can usually find something to laugh or joke about even in trying situations.	.58

I usually look for something comical to say when I am in tense situations.	.55
I have often found that my problems have been greatly reduced when I try to find something funny in them.	.52
I have often felt that if I am in a situation where I have to either cry or laugh, it's better to laugh.	.47
I can often see the light side of bad experiences.	.40
Factor: humor tolerance (coefficient alpha = .69)	
People should avoid joking about delicate or sensitive matters.	–.67
There is no topic that is "off-limits" for humor.	.63
Some things are too depressing to be joked about.	–.56
I tend to be offended by tasteless jokes.	–.41

Appendix B
Pure-Loading Items for the Contact With Nature Factor (Coefficient alpha = .82)

Item	Loading
Enjoy nature	.69
Watch squirrels, birds, or other animals	.67
Walk or hike in a nature setting	.65
Relax in a shady spot	.61
Visit a park	.54
Have a picnic outdoors	.51
Gardening	.48
Spend time outdoors	.45
Camping	.43

Appendix C
Pure-Loading Items for the Attention-Related Well-Being Factors

Item	Loading
Factor: distraction (coefficient alpha = .84)	
Disorganized	.59
Forgetful	.59
You were losing or misplacing things	.58
Making decisions is difficult	.56
You were making mistakes	.55
It's hard to make up your mind	.51
Dazed and confused	.50
You acted without thinking things through	.50
Out of control	.50
Distracted	.48

It's difficult to finish things you have started	.43
Impulsive	.41
Factor: effective functioning (coefficient alpha = .81)	
Attentive	.67
Focused	.65
Effective	.62
Alert	.57
You can keep your mind on what you are doing	.54
Able to get really absorbed in a task	.52
You have a good sense of where you are going	.42
Factor: at peace (coefficient alpha = .81)	
Positive	.69
Satisfied with how things have been going lately	.62
Relaxed	.59
Comfortable	.59
Irritable	–.51
On top of the world	.47
Everything was an effort	–.40

Notes

1. Mediation models for the combined influence of contact with nature and sense of humor are also logically possible (Baron & Kenny, 1986; Evans & Lepore, 1997). However, mediation models require that one of the predictors must have a causal influence on the other one: Either contact with nature causes a tendency to seek out humor or vice versa. We could see no compelling reason to believe that either predictor might have a causal influence on the other one and, thus, did not pursue mediation models.

If we omit the prior causal variable from the dominance model, it is structurally equivalent to the mediation model with the dominant predictor variable corresponding to the mediating variable. An important difference between the two models is that one specifies a mediating variable in advance, but in the other model one need not know which variable is dominant in advance.

2. A copy of the complete survey is available from the first author.

3. For sense of humor, we slightly reworded two of the items from the Thorsen-Powell scale. Instead of "I can often crack people up with the things I say," we omitted the word "can" in our item, and instead of "I dislike comics," our item was "I dislike comedians." In the Activities section, we slightly modified the wording of two of the items from Herzog, Chen, and Primeau (2002). Their "watch television" became our "watch TV," and their "read a good book" became our "fun reading." We also supplemented the eight items in their entertainment category with two brand new items of our own making: "attend parties or other social events" and "hobbies." In the Feelings section, for the attention-related items, we replaced three of Kaplan's phrases and two of her adjectives, which failed to survive her factor analysis. The new phrases were "dazed and confused" (replacing Kaplan's "not sure what's important any more"), "out of control" (replacing Kaplan's "like you are not getting much accomplished"), and "you acted without thinking things through" (replacing Kaplan's "you were jumping to conclusions"). The new adjectives were "distracted" (replacing "refreshed") and "impulsive" (replacing "clear"). We also replaced three PANAS items (attentive, alert, and irritable) with

synonyms (intent, vigilant, and cranky) because they were identical to three of the attention-related adjectives from the Kaplan scales. We slightly altered the wording of the items in the Perceived Stress Scale so that the items were completions to the lead-in "During the last month, how often have you: . . . ." For happiness, we used six of the Memorial University of Newfoundland Scale of Happiness items with slight rewording so that they were more clearly focused solely on happiness. For example, "depressed or very unhappy" became "very unhappy" and "generally satisfied with the way your life has turned out" became "generally happy with life." We added two completely original items: "that life is great" and "down in the dumps." Finally, Ryff's item 81 was slightly reworded so that it would make more sense for college students. Ryff's version of item 81 was "I have been able to build a home and a life style for myself that is much to my liking"; our version was "I have been able to build a life style for myself that is much to my liking."

4. For the humor items and the Ryff scales, the step scale ranged from "A = *strongly agree*" through "E = *strongly disagree*." For the Activities items, the 16 phrases measuring attention-related functioning, and all the items for stress, depression, and happiness, the step scale ranged from "A = *never or rarely*" to "E = *very frequently*." For all the attention-related adjectives and the PANAS items, the step scale ranged from "A = *not at all*" to "E = *extremely*." Negative items for scoring purposes were distributed as follows: 15 humor items, 3 attention-related items, 7 stress items, 4 depression items, 4 happiness items, 6 items each from the Ryff scales for environmental mastery and personal growth, and 7 items from each of the remaining Ryff scales.

5. All factor analyses reported in this article used principal-axis factoring and a varimax (orthogonal) rotation. To interpret factors, we defined a "pure loader" as an item with a rotated factor loading of .40 or greater on one factor only. Factor-based scores were obtained by averaging the item scores for pure-loading items after reverse scoring the negatively worded items.

6. The four-factor solution for the humor items and the three-factor solution for the attention items were both suggested by scree tests. For the humor items, the four-factor solution accounted for 39% of the variance in the items and had communalities ranging from .08 to .60 after factor extraction. Correlations among the factor-based scores for the humor factors were all positive and ranged from .16 (humor appreciation and humor tolerance) to .60 (humor production and coping humor). For the attention items, the three-factor solution accounted for 35% of the variance in the items and yielded communalities ranging from .16 to .62 after factor extraction. Correlations among the factor-based scores for the three factors ranged from –.45 (distraction and at peace) to .56 (effective functioning and at peace). For the PANAS items, the correlation between the factor-based scores for positive and negative affect was –.27.

7. Some of the correlations among the 14 well-being measures were substantial, with 10 of the 91 correlations above .70 and one (between happiness and depression, $r = –.82$) above .80 in absolute value. This was to be expected because many of these constructs were quite similar, and they were not generally developed to be independent of each other. We also examined descriptive statistics for all 19 of our original measures. There was no evidence of restricted-range problems. The narrowest range of scores was 3.6 out of a possible 4. There were no average scores less than 2 and only one more than 4 (4.35 for humor appreciation).

8. The three-factor solution accounted for 66% of the variance in the 14 well-being measures and yielded communalities ranging from .34 to .82 after factor extraction. The measures of stress and at peace had high loadings (negative and positive, respectively) on both the emotional well-being and effective-functioning factors. Likewise, Ryff's environmental-mastery scale loaded highly on both the emotional well-being and personal-development factors. Correlations among the factor-based scores for the three factors ranged from .42 (personal development and effective functioning) to .54 (emotional well-being and effective functioning).

Factor analysis of the ratings for the original 177 well-being items produced the same three factors plus three additional smaller factors. Two of the additional factors were dominated by items from two of the Ryff scales, autonomy and personal relations. The third additional factor consisted of seven items dealing with the common theme of distraction. In the factor analysis of the 14 well-being measures, the autonomy and personal-relations scales were subsumed into the personal-development factor, whereas distraction was included in the emotional well-being factor. We preferred the more compact set of factors produced by the analysis of the 14 well-being measures.

9. Although we had no theoretical interest in mediation models, we note that such models were also not supported. For either contact with nature or sense of humor to serve as a mediating variable for the other predictor, a precondition is that the two variables must be related to each other. The correlations between contact with nature and the four factor-based sense-of-humor measures ranged from –.07 to .07 ($p > .05$).

10. The relations for contact with nature were generally even smaller in magnitude, but there is no direct comparison benchmark for the nature correlations because Kaplan, R. (2001) reported regression coefficients rather than correlations. However, given the magnitude of her regression coefficients, we have the impression that the magnitude of her reported relations between nature and well-being is roughly comparable to those we found.

References

Abel, M. H. (2002). Humor, stress, and coping strategies. *Humor: International Journal of Humor Research*, *15*, 365-381.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182.

Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. *Journal of Environmental Psychology*, *25*, 249-259.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*, 385-396.

Cousins, N. (1979). *Anatomy of an illness*. New York: Norton.

Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national index. *American Psychologist*, *55*, 34-43.

Dixon, N. F. (1980). Humor: A cognitive alternative to stress? In I. G. Sarason & C. D. Spielberger (Eds.), *Stress and anxiety* (Vol. 7, pp. 281-289). Washington, DC: Hemisphere.

Evans, G. W., & Lepore, S. J. (1997). Moderating and mediating processes in environment-behavior research. In G. T. Moore & R. W. Marans (Eds.), *Advances in environment, behavior, and design* (pp. 255-285). New York: Plenum.

Gardner, G. T., & Stern, P. C. (1996). *Environmental problems and human behavior*. Boston: Allyn & Bacon.

Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Garling, T. (2003). Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology*, *23*, 109-123.

Hartig, T., Mang, M., & Evans, G. W. (1991). Restorative effects of natural environment experiences. *Environment and Behavior*, *23*, 3-26.

Herzog, T. R., & Anderson, M. R. (2000). Joke cruelty, emotional responsiveness, and joke appreciation. *Humor: International Journal of Humor Research*, *13*, 333-351.

Herzog, T. R., Chen, H. C., & Primeau, J. S. (2002). Perception of the restorative potential of natural and other settings. *Journal of Environmental Psychology, 22*, 295-306.

Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology*, *52*, 1122-1131.

Kaplan, R. (2001). The nature of the view from home: Psychological benefits. *Environment and Behavior*, *33*, 507-542.

Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. New York: Cambridge University Press.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*, 169-182.

Kaplan, S. (2001). Meditation, restoration, and the management of mental fatigue. *Environment and Behavior, 33*, 480-506.

Kaplan, S., Bardwell, L. V., & Slakter, D. B. (1993). The museum as a restorative environment. *Environment and Behavior*, *25*, 725-742.

Kozma, A., & Stones, M. J. (1980). The measurement of happiness: Development of the Memorial University of Newfoundland Scale of Happiness (MUNSH). *Journal of Gerontology*, *35*, 906-912.

Kuiper, N. A., Martin, R. A., & Olinger, L. J. (1993). Coping humor, stress, and cognitive appraisals. *Canadian Journal of Behavioral Science*, *25*, 81-96.

Kuo, F. E. (2001). Coping with poverty: Impacts of environment and attention in the inner city. *Environment and Behavior*, *33*, 5-34.

Kuo, F. E., & Sullivan, W. C. (2001). Aggression and violence in the inner city: Effects of environment via mental fatigue. *Environment and Behavior, 33*, 543-571.

Lefcourt, H. M. (2001). *Humor: The psychology of living buoyantly*. New York: Plenum.

Lefcourt, H. M., & Martin, R. A. (1986). *Humor and life stress: Antidote to adversity*. New York: Springer.

Lefcourt, H. M., & Thomas, S. (1998). Humor and stress revisited. In W. Ruch (Ed.), *The sense of humor: Explorations of a personality characteristic* (pp. 179-202). New York: Mouton de Gruyter.

Martin, R. A. (1996). The Situational Humor Response Questionnaire (SHRQ) and Coping Humor Scale (CHS): A decade of research findings. *Humor: International Journal of Humor Research*, *9*, 251-272.

Martin, R. A. (1998). Approaches to the sense of humor: A historical review. In W. Ruch (Ed.), *The sense of humor: Explorations of a personality characteristic* (pp. 15-60). New York: Mouton de Gruyter.

Martin, R. A. (2001). Humor, laughter, and physical health: Methodological issues and research findings. *Psychological Bulletin*, *127*, 504-519.

Martin, R. A., & Lefcourt, H. M. (1983). Sense of humor as a moderator of the relation between stressors and moods. *Journal of Personality and Social Psychology*, *45*, 1313-1324.

Martin, R. A., & Lefcourt, H. M. (1984). Situational humor response questionnaire: Quantitative measure of the sense of humor. *Journal of Personality and Social Psychology*, *47*, 145-155.

Martin, R. A., Puhlik-Doris, P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the Humor Styles Questionnaire. *Journal of Research in Personality*, *37*, 48-75.

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, *24*, 503-515.

McGhee, P. E. (1994). *How to develop your sense of humor*. Dubuque, IA: Kendall/Hunt.

Myers, D. G. (1992). *The pursuit of happiness: Who is happy and why*. New York: William Morris.

Myers, D. G. (2000). The funds, friends, and faith of happy people. *American Psychologist*, *55*, 56-67.

Nevo, O., Aharonson, H., & Klingman, A. (1998). The development and evaluation of a systematic program for improving sense of humor. In W. Ruch (Ed.), *The sense of humor: Explorations of a personality characteristic* (pp. 15-60). New York: Mouton de Gruyter.

Ouellette, P., Kaplan, R., & Kaplan, S. (2005). The monastery as a restorative environment. *Journal of Environmental Psychology*, *25*, 175-188.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*, 385-401.

Ruch, W. (1998). *The sense of humor: Explorations of a personality characteristic*. New York: Mouton de Gruyter.

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*, 1069-1081.

Seligman, M. E. P. (1991). *Learned optimism*. New York: Alfred A. Knopf.

Svebak, S. (1996). The development of the sense of humor questionnaire: From SHQ to SHQ-6. *Humor: International Journal of Humor Research*, *9*, 341-361.

Svebak, S., Götestam, K. G., & Jensen, E. N. (2004). The significance of sense of humor, life regard, and stressors for bodily complaints among high school students. *Humor: International Journal of Humor Research*, *17*, 67-83.

Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2001). Coping with ADD: The surprising connection to green play settings. *Environment and Behavior*, *33*, 54-77.

Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2002). Views of nature and self-discipline: Evidence from inner-city children. *Journal of Environmental Psychology*, *22*, 49-63.

Thorson, J. A., & Powell, F. C. (1993). Development and validation of a multidimensional sense of humor scale. *Journal of Clinical Psychology*, *49*, 13-23.

Trice, A. D., & Price-Greathouse, J. (1986). Joking under the drill: A validity study of the CHS. *Journal of Social Behavior and Personality*, *1*, 265-266.

Ulrich, R. S. (1979). Visual landscapes and psychological well-being. *Landscape research*, *4*, 17-23.

Ulrich, R. S. (1983). Aesthetic and affective response to natural environment. In I. Altman & J. F. Wohlwill (Eds.), *Behavior and the natural environment* (Vol. 6, pp. 85-125). New York: Plenum.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, *11*, 201-230.

van den Berg, A. E., Koole, S. L., & van der Wulp, N. Y. (2003). Environmental preference and restoration: (How) are they related? *Journal of Environmental Psychology*, *23*, 135-146.

Watson, D. (1988). The vicissitudes of mood measurement: Effects of varying descriptors, time frames, and response formats on measures of positive and negative affect. *Journal of Personality and Social Psychology*, *55*, 128-141.

Wells, N. M. (2000). At home with nature: Effects of "greenness" in children's cognitive functioning. *Environment and Behavior, 32*, 775-795.

Thomas R. Herzog is a professor of psychology at Grand Valley State University in Allendale, Michigan. His current research focuses on environmental preferences, restorative environments, and the psychology of humor.

Sarah J. Strevey received her bachelors degree in psychology from Grand Valley State University.