For over two million years, humans have strived to live harmoniously with nature. Early ancestors found that being outdoors often requires high physical endurance and labor such as chasing after prey, traveling across mountain ranges, and cultivating farms (Bramble & Lieberman, 2004). Heinrich (2001) described the evolutionary pressure to travel farther and faster in his book, *Why We Run.* “For millions of years, our ultimate form of locomotion was running” (p. 9). However, modern advances in technology and urban living provide people with resources such as bicycles and motor vehicles, so they no longer have to depend on their physical skills for survival.

Over the past 20 years, there has been a dramatic increase in a sedentary lifestyle and a decrease in overall physical activity (Ernersson, Lindström, Nyström, & Frisman, 2010). Instead of hunting or cultivating land for food, people drive to grocery stores and consume high-caloric meals at restaurants. Although modern living is beneficial and desirable for many, it may diminish the opportunity for an active and healthy lifestyle.

**Physical and Psychological Well-Being**

Exercise and an active lifestyle contribute to physical and emotional health and well-being (World Health Organization, 2005). Nevertheless, many people fail to incorporate exercise into their daily routines: National statistics have indicated that...
less than 20% of American adolescents and adults participate in sports or exercise activities on a daily basis (Bureau of Labor Statistics, 2008). Physical inactivity can lead to serious health consequences such as obesity, heart disease, Type 2 diabetes, musculoskeletal disease, and breast cancer (Bauman & Miller, 2004; Singh & Purohit, 2012). Sedentary behaviors may also increase the risk for depression (Teychenne, Ball, & Salmon, 2010).

Outdoor physical activity contributes to physical and emotional well-being (Brinkerhoff & Jacob, 1999; Howell, Dopko, Passmore, & Buro, 2011; Reese & Myers, 2007, 2012; Roszak, 2001; Roszak, Gomes, & Kanner, 1995; Totton, 2003). Sometimes people do not realize that there is a disconnect from nature that poses serious physical and psychological health risks. The lack of time spent outdoors in a natural environment has contributed to poor psychological well-being, emotional problems, and ill health (Kavetsos, 2011; Kuhn, 2001; Pilisuk & Joy, 2001; Roszak, 2001).

Immersion in nature has been found to increase vitality and happiness (Fredrickson, 2009; Joye, 2007; Ryan et al., 2010). Ecopsychology is a growing field that emphasizes that a reconnection with nature is essential to happiness and well-being (Roszak, 2001; Roszak et al., 1995; Totton, 2003). Time spent in a natural environment has been found to buffer stress and enhance mood (Davis, Lockwood, & Wright, 1991; Maller, Townsend, Pryor, Brown, & St. Leger, 2006; Passmore, 2011; Wells & Evans, 2003). In contrast to those who live in urban neighborhoods, those who live close to nature are more mindful, find life more meaningful, and have greater well-being (Brinkerhoff & Jacob, 1999; Howell, Passmore, & Buro, 2013; Wells & Evans, 2003). Nature therapy is an innovative experiential approach that has been integrated into many therapeutic practices, helping people immerse themselves in a natural environment to enhance their well-being (Berger & McLeod, 2006; Burns, 1998, 2009; Raanaas, Patil, & Hartig, 2012).

**Running and Well-Being**

Running provides an outlet to help improve and maintain physical and emotional health. Researchers have found that running improves mood (Boudreau & Giorgi, 2010; Chapman & De Castro, 1990), increases cognitive ability (Hillman, Belopolsky, Snook, Kramer, & McAuley, 2004), decreases stress and fatigue (Hanson & Neddle, 1974), increases work productivity (Coulson, McKenna, & Field, 2008), enhances self-image (Noakes, 2003), and contributes to overall well-being (Hillman et al., 2004).

Ultramarathons, races extending beyond the 26.2 mile marathon, have grown in popularity over the past decade. Although 26,842 people participated in ultramarathons in 2000, participation increased to 46,280 in 2012 (Medinger, 2011). Ultrarunners run longer distances and spend extensive periods of time in nature compared to short-distance runners.

Runners often develop a sense of achievement and purpose by overcoming the obstacle of distance. Researchers found that first-time female marathon runners experience self-discovery and personal change (Boudreau & Giorgi, 2010). For many, completing an ultramarathon is considered a mastery of the mind and body (Runs, 2013). In a phenomenological study of 26 ultrarunners, preparation, management, discovery, personal achievement, and a sense of community were the primary factors that characterized the ultrarunning experience (Simpson, Post, Young, & Jensen, 2014).

In his book, *Ultramarathon Man: Confessions of an All-Night Runner*, veteran ultrarunner Dean Karnazes (2006) described the role of ultrarunning in his life: “Some seek the comfort of their therapist’s office, others head to the corner pub and dive into a pint, but I chose running as my therapy” (p. 86). Although there are numerous nonfiction books and memoirs written by ultrarunners, few studies have examined the impact of ultrarunning on well-being. Although the science behind the physical benefits of running has been established, research exploring the psychological benefits of ultramarathon running is in the beginning stages of development. The present study examined the impact of distance and nature on runners’ flow and well-being.

**Flow**

Flow is complete absorption in the present moment, an optimal psychological state that often occurs during an enjoyable activity (Csíkszentmihályi, 1990, 1998). Flow is described as “the state in which people are so intensely involved in an activity that nothing else seems to matter, and such an experience is so enjoyable that people will carry it out even at a great cost, just for the sheer sake of doing it” (Csíkszentmihályi, 1990, p. 4). Csíkszentmihályi (1990) found that key components of flow are the balance between challenge and skills, an autotelic personality (i.e., those who...
actively seek challenges and are driven to do things for the experience in itself), distortion of time, and a loss of self-awareness. Flow is an important vehicle for promoting a positive outlook on life, which contributes to increased health and longevity (Xu & Roberts, 2010).

Flow has been examined extensively with athletes (Jackson, 1988, 1992, 1995, 1996, 1999; Jackson & Roberts, 1992; Jackson, Kimiecik, Ford, & Marsh, 1998). Positive emotions facilitate flow and performance in athletes (Stavrou, Jackson, Zervas, & Karteroliotis, 2007). Chavez (2008) found that athletes must engage in positive thinking, mental preparation, and task orientation to get into flow. Exploring the characteristics of elite athletes can help illuminate ways of promoting optimal flow experiences among athletes (Jackson, 1996).

Long-distance runners may tap into this process to achieve a runner’s high, a term often used to describe the flow experience (Wise, 2011). Weinberg (1999) investigated runners’ flow during the Western States 100-Mile Endurance Race in 1997. Ultrarunners were highly motivated by one component of flow, the balance between perceived challenge and skill. When the challenge and mastery were in balance, flow was more likely to occur. This may explain why many runners desire to run longer distances: As they become acclimated to certain distances over time, their motivation to push the balance between challenge and skill leads to a gradual increase in mileage.

Runners’ Personality

Personality profiles differ between athletes and nonathletes, and vary among athletes depending on the sport (Colley, Roberts, & Chipps, 1985; Dowd & Innes, 1981; Egloff & Gruhn, 1996; Nieman & George, 1987). In general, athletes tend to be more extraverted (Colley et al., 1985; Egloff & Gruhn, 1996) and more goal oriented (Acevedo, Dzewaltoski, Gill, & Noble, 1992) than nonathletes. Ultramarathon runners are more extraverted, open, and experience seekers compared to the general population (Hughes, Case, Stuemple, & Evans, 2003). Hughes et al. (2003) argued that runners who were able to complete ultramarathons did so because of their personality. Ultramarathon runners thrive on energy, optimism, and curiosity, which enhance their desire and competitive drive to take on the challenge of an ultramarathon.

Gray (1987) argued that certain personality characteristics help people create life events that have an effect on their well-being. Gray found a connection between extraversion, positive affect, and approach behavior, in which people seek out positive events/situations. On the other hand, those who are neurotic are more likely to avoid negative affect and events. Extraverts are more likely to seek out fulfilling social interactions that promote higher levels of happiness and well-being (Argyle & Lu, 1990; Hills, Argyle, & Reeves, 2000; Pavot, Diener, & Fujita, 1990; Watson, Clark, McInthyre, & Hamaker, 1992; Vik & Russell, 2001). Agreeableness and conscientiousness are also related to happiness (McCrae & Costa, 1991). Because personality is an important characteristic that distinguishes athletes, the present study explored whether there were differences in personality between short-distance and ultrarunners, and the extent to which personality predicted runners’ well-being.

The Present Study

The present study aimed to close the gap in the literature, examining the extent to which nature and distance have an impact on runners’ flow and well-being. Although many runners enjoy running around their neighborhoods or on a treadmill, others choose a natural environment such as trails, mountains, and beaches. The amount of time spent immersed in a natural environment varies between runners.

Running 4 hr in a natural environment compared to 30 to 45 min on a treadmill inside a gym may have very different effect on a person’s well-being. Researchers found that long-distance running promotes an enhanced sense of self and well-being (Boudreau & Giorgi, 2010). Simpson et al. (2014) found that ultrarunners reported feeling spiritual, connected with a higher power, and a sense of unity with nature. McDonald, Wearing, and Pointing (2009) found that immersion in nature had positive effect on flow. Nature had a positive effect on mood, which can enhance both flow and performance for athletes (Stavrou et al., 2007).

For the present study, we predicted that being an ultrarunner, running in nature, and personality characteristics of extraversion, conscientiousness, and openness would contribute to greater flow. We also hypothesized that being an ultrarunner, running in nature, personality characteristics (i.e., extraversion, conscientiousness, and openness), and flow would predict greater well-being.

Method

Participants

One hundred eighty-nine runners (132 women, 57
Runners, \( M_{age} = 35.93 \) years, \( SD = 9.66 \) were recruited from a small private liberal arts school on the West Coast, as well as through postings in local running shops, social media, and e-mails to local running groups. Of the 189 participants, 52% were married, 27.9% were single, and 13% were cohabitating. Seventy-nine percent of participants were from the United States. The rest were from countries including the United Kingdom, Canada, and Australia. Forty-two percent reported that their highest education was a bachelor’s degree; 35.4% had a graduate degree; 21.6% attended some college; and 1% obtained a high school diploma. Approximately 90% of participants self-identified as European American, and the rest identified as Hispanic/Latino/a (6%), Asian/Pacific Islander (2%), American Indian/Native American (1%), and other (1%).

Participants reported having between 1 and 45 years of running experience (\( M = 10.44, SD = 8.73 \)). Of the 189 participants, 36% identified as ultramarathon runners (50 km+), 33% as long-distance runners (5 km to half marathon), 20% as marathon runners, 9% as short-distance runners (less than 5 km), and 1% did not identify as a runner (1% was missing).

Measures

Runner identity. Runner identity was assessed by a self-report measure created for the purposes of the present study. Some of the questions included “How many days per week do you run; “In an average week, what is your total distance run; “Enter the number of hours per week you run; “To date, what is the longest distance you have run; “Are you currently active as an ultrarunner; “Do you consider yourself an ultrarunner; “And “How many ultramarathons have you completed in the past year?” Participants were also asked, “As a runner, how would you identify yourself?” For this question, they were provided the following choices, as well as an open-ended response option: (a) nonrunner, (b) short-distance runner (less than 5K), (c) long-distance runner (5K to half marathon), (d) marathon runner (26.2 mi), (e) ultramarathon runner (50K+), and (f) other ______.

Personality traits. The Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003) is a valid and reliable personality measure. Gosling et al. (2003) found that the TIPI has test-retest reliability and alternate forms reliability, converging with widely used Big-Five measures of self, observer, and peer reports. Short scales of personality traits have been found to be just as valid as long scales (Burisch, 1997). The Big Five personality characteristics (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism) were individually assessed by summing the items of each subscale, and obtaining the means. Cronbach’s alphas for the following subscales indicated good reliability and internal consistency, extraversion (\( \alpha = .74 \)), conscientiousness (\( \alpha = .62 \)), and neuroticism (\( \alpha = .69 \)). Cronbach’s alphas for openness (\( \alpha = .45 \)) and agreeableness (\( \alpha = .34 \)) were low. However because they were two-item scales, they were incorporated for exploratory analyses.

Flow. Jackson and Marsh’s (1996) Flow State Scale is a 36-item measure used to assess runners’ overall flow experience defined as being completely immersed and absorbed in an activity in the present moment. Examples of items included “I knew clearly what I wanted to do,” “My attention was focused entirely on what I was doing,” and “Things just seem to happen automatically.” Each item was rated on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree). An overall composite score of flow was calculated by summing the responses and obtaining the mean. Cronbach’s alpha indicated that the measure had good reliability and internal consistency for this sample (\( \alpha = .89 \)).

Running environment. Prior to the present study, no measure of running environment existed. For the purpose of the present study, a measure was created assessing how often participants run in a natural environment where the surface is nonnatural. First, participants identified whether they ran in the following natural environments: (a) at the beach, (b) on a trail in the mountains, (c) on a natural path, (d) on grass, and (e) in other natural environments. Next, participants were asked to describe whether they ran on nonnatural surfaces such as (a) around their neighborhood, (b) in the city, (c) on an inside track, or (d) on a treadmill at the gym. Participants were asked to rate how often they ran in each environment ranging from 1 (never) to 5 (every day). Items were summed, and the mean was obtained to provide a score indicating the frequency of running in natural and nonnatural environments.

Well-being. The Measure of Well-Being Scale (Côté, Gyrak, & Levenson, 2010) was used to assess subjective well-being. This measure was validated and verified by administering it along with the Satisfaction With Life Scale (Diener, Emmons,
Larsen, & Griffin, 1985), indicating that these two measures were strongly correlated. Participants were asked to describe their overall well-being, rating five statements on a 5-point Likert-type scale, ranging from 1 (not at all true of me) to 5 (extremely true of me). Some examples of the statements are “My daily life is full of things that keep me interested,” “Most of the time I feel happy,” and “It often seems that my life has no meaning.” Three of the statements were reverse scored. The mean was calculated to obtain a composite score of subjective well-being. Cronbach’s alpha indicated that the measure had good reliability and internal consistency for this sample (α = .81).

Procedures
The study was approved by the institutional review board in accordance with ethical standards and protection of human subjects (protocol #2012083). Participants were recruited through social media, local runners groups, postings at local gyms, and through flyers at a local university campus. The survey was administered via a web-based survey tool, Qualtrics®. An online survey method was used to allow a wider range of runners from around the world to participate. Participation in the survey was completely voluntary. No incentives were given to participants. The survey took approximately 20 min to complete. Eighty percent of participants who began the survey finished it.

Results
Runners ran between 5 and 80 miles per week (M = 33.74, SD = 20.36). Of the 189 participants, 36% ran in a natural environment weekly to every day. Descriptive statistics and correlations of all key variables are shown in Table 1. Thirty-six percent identified as ultrarunners, 33% as long-distance runners, 20% as marathon runners, 9% as short-distance runners, and 1% did not identify as a runner, although they ran regularly. Because a large percentage identified as ultrarunners, comparative analyses were conducted to examine differences between ultrarunners and nonultrarunners.

Pearson’s correlational analyses were conducted to examine the relationships between key variables (see Table 1). There was a moderate positive correlation between running distance and flow, r(174) = .26, p = .001. Running in a natural environment was positively associated with flow, r(174) = .26, p = .001, but not significantly related to well-being, r(187) = -.04, p = .63. Those who were more open ran more often in nature, r(182) = .26, p = .001. They also reported greater flow, r(182) = .30, p = .001, and well-being, r(182) = .29, p = .001. Conscientiousness was also associated with greater flow, r(183) = .31, p = .001, and well-being, r(183) = .24, p = .001. There were low correlations between extraversion and flow, r(183) = .16, p = .03, and well-being, r(183) = .15, p = .04. Flow was related to greater well-being, r(183) = .20, p = .008.

Independent-samples t tests were conducted to examine differences in distance ran per week, time spent running in nature, personality traits, flow, and well-being for ultrarunners and nonultrarunners. Those who identified themselves as ultrarunners ran more miles per week (M = 42.67, SD = 19.84) than nonultrarunners (M = 27.04, SD = 18.19), t(110) = -4.33, p = .001. Ultrarunners ran more often in natural environments (e.g., on trails and in mountains; M = 2.57, SD = 0.62) than nonultrarunners (M = 2.08, SD = 0.71), t(174) = -4.77, p = .001. Ultrarunners (M = 4.40, SD = 0.78) scored higher on neuroticism than nonultrarunners (M = 4.16, SD = 0.79), t(184) = -2.10, p = .04. Although ultrarunners experienced greater flow (M = 4.23, SD = 0.50) than nonultrarunners (M = 3.92, SD = 0.58, t(184) = -3.70, p = .001, there was no difference in subjective well-being, t(184) = -0.91, p = .37.

Multiple regression analyses were conducted to examine the extent to which being an ultrarunner, running in nature, and personality traits (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism) contributed to flow. Ultrarunners were coded as 1, and all other runners were coded as 0. The final model was trimmed excluding the nonsignificant variables. As shown in Table 2, being an ultrarunner (β = .23), running in nature (β = .13), conscientiousness

| Variable          | M     | SD    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    |
|-------------------|-------|-------|------|------|------|------|------|------|------|------|
| 1. Ultrarunner    | 0.39  | 0.49  | —    | —    | —    | —    | —    | —    | —    | —    |
| 2. Nature         | 2.28  | 0.71  | .34**| —    | —    | —    | —    | —    | —    | —    |
| 3. Openness       | 5.67  | 1.06  | .07  | .26**| —    | —    | —    | —    | —    | —    |
| 4. Conscientiousness | 5.66  | 1.19  | .003 | .02  | .11  | —    | —    | —    | —    | —    |
| 5. Extraversion   | 4.46  | 0.84  | .07  | .08  | .06  | .05  | —    | —    | —    | —    |
| 6. Agreeableness  | 4.40  | 0.93  | .07  | .02  | .05  | .22**| .22**| —    | —    | —    |
| 7. Neuroticism    | 4.30  | 0.79  | .15  | .14  | .11  | .01  | .03  | .11  | —    | —    |
| 8. Total flow     | 4.04  | 0.57  | .26**| .26**| .30**| .31**| .16  | .13  | .01  | —    |
| 9. Well-being     | 4.20  | 0.73  | .07  | .04  | .29**| .24**| .15  | .08  | .07  | .20**|

Note: *p < .05, **p < .01, ***p < .001.
and a face-paced lifestyle, enabling them to focus in the present moment to experience flow. Researchers have found that immersion in nature has a positive impact on the experience of flow (MacAlloon & Csikszentmihalyi, 1974; McDonald et al., 2009; Mitchell, 1985). Nature plays a role in enhancing peak experiences (Maslow, 1964; Stavrou et al., 2007) and has a positive impact on mood (Davis et al., 1991; Passmore, 2011).

Although there was only a small correlation between extraversion and flow, consistent with previous research, conscientiousness and openness contributed to greater flow (Costa & McCrae, 1992; Hughes et al., 2003). Conscientiousness has been related to goal orientation and dedication (Costa & McCrae, 1992). Those who are goal oriented and hardworking are more likely to focus on a task at hand, a fundamental aspect of flow. In addition, those who are open to new experiences are more likely to experience flow (Csikszentmihalyi, 1993). The influence of personality on flow appears to be multidimensional, affecting the choice of activity, a person’s environment, and their overall perception of the experience.

Personality was also a primary factor associated with runners’ well-being. Specifically, extraversion, conscientiousness, and openness contributed to greater well-being. This was consistent with previous research indicating that ultrarunners tend to be more extraverted and open (Hughes et al., 2003). Those who are more extraverted are more likely to seek out life events and fulfill social interactions that promote happiness and well-being (Argyle & Lu, 1990; Gray, 1987; Hills et al., 2000; Pavot et al., 1990; Watson et al., 1992; Yik & Russell, 2001). McCrae and Costa (1991) found that conscientiousness was related to greater happiness, which was consistent with findings from the present study.

Contrary to expectations, being an ultrarunner, distance, and nature did not have an impact on runners’ well-being. These findings were

**Discussion**

Ultrarunners ran more miles per week and spent more extensive periods of time in a natural environment than nonultrarunners, which is consistent with Medinger’s (2011) findings. Contrary to expectations, rather than being more extraverted, open, and conscientious, ultrarunners reported higher neuroticism than nonultrarunners. Gray (1987) found that neuroticism is linked to avoidance of negative events and affect. Perhaps ultrarunners utilize running as an outlet to relieve stress and cope with negative life events. Ultrarunners may have certain personality characteristics that contribute to why they choose to run such long distances (Hughes et al., 2003). As a veteran ultrarunner, Karnazes (2006) argued that rather than seeking the comfort in a therapist’s office, some ultrarunners choose running as therapy.

Being an ultrarunner, running in nature, and personality characteristics of conscientiousness and openness contributed to runners’ flow, complete immersion in the activity of running. Csikszentmihalyi (1990) argued that flow occurs during times of great exertion: “The best moments usually occur when a person’s body or mind is stretched to its limits in a voluntary effort to accomplish something difficult or worthwhile” (p. 3). This encapsulates an ultrarunner’s experience.

Findings confirmed that running in a natural environment contributes to runners’ experience of flow. Ultrarunners’ sense of connectedness with nature may help them disconnect from technology and a face-paced lifestyle, enabling them to focus in the present moment to experience flow. Researchers have found that immersion in nature has a positive impact on the experience of flow (MacAlloon & Csikszentmihalyi, 1974; McDonald et al., 2009; Mitchell, 1985). Nature plays a role in enhancing peak experiences (Maslow, 1964; Stavrou et al., 2007) and has a positive impact on mood (Davis et al., 1991; Passmore, 2011).

Although there was only a small correlation between extraversion and flow, consistent with previous research, conscientiousness and openness contributed to greater flow (Costa & McCrae, 1992; Hughes et al., 2003). Conscientiousness has been related to goal orientation and dedication (Costa & McCrae, 1992). Those who are goal oriented and hardworking are more likely to focus on a task at hand, a fundamental aspect of flow. In addition, those who are open to new experiences are more likely to experience flow (Csikszentmihalyi, 1993). The influence of personality on flow appears to be multidimensional, affecting the choice of activity, a person’s environment, and their overall perception of the experience.

Personality was also a primary factor associated with runners’ well-being. Specifically, extraversion, conscientiousness, and openness contributed to greater well-being. This was consistent with previous research indicating that ultrarunners tend to be more extraverted and open (Hughes et al., 2003). Those who are more extraverted are more likely to seek out life events and fulfill social interactions that promote happiness and well-being (Argyle & Lu, 1990; Gray, 1987; Hills et al., 2000; Pavot et al., 1990; Watson et al., 1992; Yik & Russell, 2001). McCrae and Costa (1991) found that conscientiousness was related to greater happiness, which was consistent with findings from the present study.

Contrary to expectations, being an ultrarunner, distance, and nature did not have an impact on runners’ well-being. These findings were

**Table 2**

| Variable          | B    | SE (B) | β     | t   | F    | R²   | p   |
|-------------------|------|--------|-------|-----|-----|------|-----|
| Ultrarunner       | .26  | .08    | .23   | 3.20*|     |      | .02 |
| Natural Environment | .10  | .06    | .13   | 1.78|     |      |     |
| Personality:      |      |        |       |     |     |      |     |
| Conscientiousness | .14  | .03    | .30   | 4.39**|    |      |     |
| Openness          | .12  | .04    | .22   | 3.09**|   |      |     |

Note: *p < .05; **p < .01; ***p < .001. R = .52, R² = .27, F(7, 163) = 8.48, p < .001.
inconsistent with previous studies that indicated that running distance is associated with greater well-being (Boudreau & Giorgi, 2010; Chapman & De Castro, 1990; Hanson & Neddle, 1974; Hill et al., 2004; Noakes, 2003). Boudreau and Giorgi (2010) found that marathon runners reported a stronger sense of self and well-being. Further research should involve neurological testing of cortisol levels for trail and ultrarunners. It is possible that runners may be unaware of the extent to which running long distances and running in natural environments influences well-being. Assessing cortisol levels before and after long-distance runs, or pre- and posttraining season, may help shed light on the neurobiological and psychological effects. In addition, by observing the progression of short-distance runners to becoming long-distance ultramarathon runners, researchers could also examine tolerance, persistence, flow, and well-being in relation to running distance.

Although running in a natural environment significantly predicted greater levels of flow, there was no significant effect of nature on well-being. This was inconsistent with research showing that nature enhances vitality, mood, and well-being (Brinkerhoff & Jacob, 1999; Fredrickson, 2009; Howell et al., 2011; Joye, 2007; Ryan et al., 2010). Perhaps the physiological and neurological effects of running contribute to well-being over and above being immersed in a natural environment.

One limitation of the present study was the challenge of finding an adequate measure of running environment. Because there was no previously established measure, one was created for this study to assess the running surface and environment. For example, running on a trail or in the mountains was coded as natural environment, and running in the gym was coded as a nonnatural environment. Participants were asked to rate each environment on a 5-point Likert-type scale from 1 (never) to 5 (every day). Few individuals indicated that they ran in only one type of environment. Most participants ran in both natural and nonnatural environments. Researchers have found that simply viewing nature through a window can enhance well-being (Raanaas et al., 2012). This makes it difficult to discern the unique impact of running in a natural environment. A person who runs around their neighborhood surrounded by gardens and trees may receive the same benefit as someone who is running on trails in the mountains. Comparative analyses between those who run only in nonnatural environments such as at the gym and those who only run in natural settings such as on trails would provide more accurate information regarding the specific impact that environment has on flow. Future research is needed to utilize a more reliable and valid measure of running environment to better understand the impact of nature on flow and well-being.

Results revealed a low correlation between flow and well-being. However, contrary to expectations, flow was not a significant predictor of well-being among runners. There are several important factors to consider when examining the phenomenological experience of flow in retrospect. Although a connection between ultrarunning and flow has been established, further research is needed to better understand the immediate flow experience while running. Hughes et al. (2003) conducted a study having runners describe their flow experiences every 10 miles at the aid stations. This method may elicit more genuine and immediate responses.

Another limitation of the present study was selection bias. Most participants were long-distance runners and ultrarunners. To better assess the impact of running distance on flow and well-being, it would be beneficial to compare ultrarunners with short- and long-distance runners. Furthermore, although postings were placed in local gyms, on a college campus, and with several local running groups, the study could have been advertised to a more diverse sample of runners. There was a large percentage of female participants, which could be relative to the female-dominated sport, and the large percentage of women on college campuses. In addition, the sample was mainly representative of ultrarunners in southern California, which may not adequately represent the general population of runners in the United States. Nevertheless, the sample did include diverse participants from

**TABLE 3**

| Variable          | B    | SE (B) | β     | t     |
|-------------------|------|--------|-------|-------|
| Ultrarunner       | .14  | .12    | .10   | 1.18  |
| Natural Environment | -.17 | .08    | -.17  | -2.16 |
| Personality:      |      |        |       |       |
| Extraversion      | .15  | .06    | .18   | 2.37* |
| Conscientiousness | .11  | .05    | .19   | 2.41* |
| Openness          | .20  | .05    | .29   | 3.73**|

Note: *p < .05; **p < .001. R = .43, F(8, 161) = 4.57, p < .001.
Various countries including Canada, the United Kingdom, and Australia.

Cross-cultural research is needed to examine similarities and differences in flow and well-being between individualistic and interdependent cultures. Researchers have found that individuals experience flow differently when in a group compared to when alone, reporting that group settings promote higher levels of flow and well-being among Japanese adults (Hirao, Kobayashi, Okishima, & Tomokuni, 2012). Future research should also examine the relationship between flow and mindfulness, which may have a more direct impact on well-being. Kabat-Zinn (2003) defined mindfulness as awareness that arises through purposefully and nonjudgmentally paying attention to the present moment, which can reduce stress and enhance overall well-being.

In general, there has been a lack of research investigating the ultrarunning experience. Researchers can gain a better understanding of this population by examining the motivation, personality, and routines of ultrarunners. Future research should investigate personality types of ultrarunners using a more in-depth measure of personality such as the NEO-II. It would also be interesting to examine the extent to which ultrarunners are addicted to running. There is a growing body of research investigating the relationship between running and addiction (Kanarek, D'Anci, Greco, & Toner, 2010). However, running has also been found to be a coping mechanism, which may explain why some individuals desire to run ultramarathons (Basson, 2001; Karnazes, 2006; Leedy, 2000). Further investigation of the various motives for running would shed light on what compels individuals to run marathons and ultramarathons.

Short-distance runners who only run in urban environments may benefit from running in nature and pushing their limits to run longer distances. Personal challenge and feelings of achievement are cornerstones of ultrarunning. Ultrarunning is an activity that requires dedication, mental toughness, and physical stamina beyond that of the traditional marathon. Although 5 km, 10 km, and marathon races are popular, ultrarunning has roots deeper than merely being a recreational activity. Because running is a part of evolutionary history, ultramarathons are essentially the return of humans’ instinctive nature to follow in the path of their ancestors’ footsteps.

References

Acevedo, E. O., Dzewaltowski, D. A., Gill, D. L., & Noble, J. M. (1992). Cognitive orientations of ultramarathoners. The Sport Psychologist, 6, 242–252. Retrieved from http://www.humankinetics.com/acucustom/sitename/Documents/DocumentItem/8176.pdf

Argyle, M., & Lu, L. (1990). The happiness of extraverts. Personality and Individual Differences, 11, 1011–1017. doi:10.1016/0191-8869(90)90129-E

Basson, C. J. (2001). Personality and behavior associated with excessive dependence on exercise: Some reflections from research. South African Journal of Psychology, 31(2), 53–59. doi:10.1177/008124630103100207

Bauman, A. E., & Miller, Y. D. (2004). The public health potential of health enhancing physical activity (HEPA). In P. Oja & J. Borms (Eds.), Health enhancing physical activity (pp. 125–149). Oxford, United Kingdom: Oxford, Meyer, and Meyer Sport Publishers.

Berger, R., & McLeod, J. (2006). Incorporating nature into therapy: A framework for practice. Journal of Systemic Therapies, 25, 80–94. doi:10.1521/jyst.2006.25.2.80

Boudreau, A. L, & Giorgi, B. (2010). The experience of self-discovery and mental change in female novice athletes in connection to marathon running. Journal of Phenomenological Psychology, 41, 234–267. doi:10.1163/156916210X532144

Branib, D. M., & Lieberman, D. E. (2004). Endurance running and the evolution of Homo. Nature, 432, 345–352. doi:10.1038/387610

Brinkerhoff, M. B., & Jacob, J. C. (1999). Mindfulness and quasi-religious meaning systems: An empirical exploration within the context of ecological sustainability and deep ecology. Journal for the Scientific Study of Religion, 38, 524–542.

Bureau of Labor Statistics. (2008). Sports and exercise. U.S. Department of Labor Statistics. Last modified May 15, 2008. Retrieved from http://www.bls.gov/spotlight/2008/sports/

Burisch, M. (1997). Test length and validity revisited. European Journal of Personality, 11, 303–315. doi:10.1002/(SICI)1099-0984(199711)11:4<303::AID-PER292>3.0.CO;2-

Burns, G. W. (1998). Nature-guided therapy: Brief integrative strategies for health and well-being. Philadelphia, PA: Brunner/Mazel.

Burns, G. W. (2009). Can you be happy in pain? Applying positive psychology, mindfulness, and hypnosis to chronic pain management. In G. W. Burns (Ed.), Happiness, healing, enhancement: Your casebook collection for applying positive psychology in therapy (pp. 202–213). Hoboken, NJ: John Wiley & Sons.

Chapman C. L., & De Castro, J. M. (1990). Running addiction: Measurement and associated psychological characteristics. The Journal of Sports Medicine and Physical Fitness, 30, 283–290. Retrieved from http://www.researchgate.net/publication/2888832_Running_addiction_measurement_and_associated_psychological_characteristics

Chavez, E. J. (2008). Flow in sport: A study of college athletes. Imagination, Cognition, and Personality, 28, 69–91. doi:10.2190/IC.28.1f

Colley, A., Roberts, N., & Chippas, A. (1985). Sex-role identity, personality, and participation in team and individual sports by males and females. International Journal of Sport Psychology, 16, 103–112.

Costa, P. T., Jr., & McCrae, R. R. (1992). Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor-Inventory (NEO-FFI) professional manual. Odessa, FL: Psychological Assessment Resources.

Côté, S., Gyurak, A., & Levenson, R. W. (2010). The ability to regulate emotion is associated with greater well-being, income, and socioeconomic status. Emotion, 10, 923–933. doi:10.1037/a0021156

Coulson, J., McKenna, J., & Field, M. (2008). Exercising at work and self-esteem. European Journal of Sport Psychology, 16, 923–933. doi:10.1080/174613908022167806296857

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction

Spring 2016

Psi Chi Journal of Psychological Research

Copyright 2016 by Psi Chi, the International Honor Society in Psychology (Vol. 21, No. 1/ISSN 2164-8204)
Running, Flow, and Well-Being

Jackson, S. A., & Roberts, G. C. (1992). Positive performance states of athletes: Toward a conceptual understanding of peak performance. The Sport Psychologist, 6, 156–171. Retrieved from http://journals.humankinetics.com/asp-back-issues/JSPEVolume1Issue1March/

Jackson, S. A., & Roberts, G. C. (1992). Athletes in flow: A qualitative investigation of flow states in elite figure skaters. Journal of Applied Sport Psychology, 4, 223–229. doi:10.1207/s15326920jasp0402

Ernsson, Å. L., Lindström, T., Nyström, F. H., & Frisman, G. H. (2010). Young healthy individuals lack dev of energy when adopting an obesity provoking behavior for 4 weeks: A phenomenological analysis. Scandinavian Journal of Caring Sciences, 24, 565–571. doi:10.1111/j.1471-6712.2009.00750.x

Fredrickson, B. (2009). Positive. New York, NY: Random House Inc.

Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domain. Journal of Research in Personality, 37, 504–526. doi:10.1016/S0092-6566(03)00046-1

Gray, J. A. (1987). Perspectives on anxiety and impulsivity: A commentary. Psychological Bulletin, 101, 253–258. doi:10.1037/0033-2909.101.2.253

Hillman, C. H., Belopolsky, A. V., Snook, E. M., Kramer, A. F., & McAuley, E. (2004). Physical activity and executive control: Implications for increased cognitive health during older adulthood. Research Quarterly for Exercise and Sport, 75, 176–185. doi:10.1080/07061366.2004.10609149

Hills, P., Argyle, M., & Reeves, R. (2000). Individual differences in leisure satisfactions: An investigation of four theories of leisure motivation. Personality and Individual Differences, 28, 763–779. doi:10.1016/S0191-8869(00)01373-9

Hirao, K., Kobayashi, R., Oshikima, K., & Tomokuni, Y. (2012). Flow experience and health-related quality of life in community dwelling elderly Japanese. Nursing and Health Sciences, 14, 52–57. doi:10.1111/j.1442-2018.2011.00663.x

Howell, A. J., Dopko, R. L., Passmore, H., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. Personality and Individual Differences, 51, 166–171. doi:10.1016/j.paid.2011.03.037

Howell, A. J., Passmore, H., & Buro, K. (2013). Meaning in nature: Meaning in life as a mediator of the relationship between nature connectedness and well-being. Journal of Happiness Studies, 14, 1681–1696. doi:10.1007/s10902-012-9403-x

Hughes, S. L., Case, H. S., Stuempfle, K. J., & Evans, D. S. (2003). Personality profiles of half-marathon ultramarathon participants. Journal of Applied Sport Psychology, 15, 256–261. doi:10.1080/10413209300305385

Jackson, S. A. (1988). Positive performance states of athletes: Toward a conceptual understanding of peak performance (Unpublished master’s thesis). University of Illinois at Urbana-Champaign, Champaign, IL.

Jackson, S. A. (1992). Athletes in flow: A qualitative investigation of flow states in elite figure skaters. Journal of Applied Sport Psychology, 4, 223–229. doi:10.1207/s15326920jasp0402

Jackson, S. A. (1995). Factors influencing the occurrence of flow state in elite athletes. Journal of Applied Sport Psychology, 7, 138–166. doi:10.1080/10413209508406962

Jackson, S. A. (1996). Toward a conceptual understanding of the flow experience in elite athletes. Research Quarterly for Exercise and Sport, 67, 76–90. doi:10.1080/07001367.1996.10607928.

Jackson, S. A. (1999). Joy, fun, and flow state in sport. In Y. L. Hanin (Ed.), Emotions in sport (pp. 135–155). Champaign, IL: Human Kinetics.

Jackson, S. A., Kimiecik, J. C., Ford, S. K., & Marsh, H. W. (1998). Psychological correlates of flow in sport. Journal of Sport and Exercise Psychology, 20, 358–378. Retrieved from https://ess220.files.wordpress.com/2008/02/jackson-1998.pdf

Jackson, S. A., & Marah, H. W. (1996). Development and validation of a scale to measure optimal experience: The Flow State Scale. Journal of Sport and Exercise Psychology, 18, 17–35. Retrieved from http://journals.humankinetics.com/asp-back-issues/JSPEVolume1Issue1March/

Jackson, S. A., & Roberts, G. C. (1992). Positive performance states of athletes: Toward a conceptual understanding of peak performance. The Sport Psychologist, 6, 156–171. Retrieved from http://journals.humankinetics.com/asp-back-issues/JSPEVolume1Issue1March/

Kabanoff, B. (2009). Positive Flow, and Well-Being: An empirical analysis. In G. Rodriguez, S. Kesenne, & B. R. Humphreys (Eds.), The economics of sport, health and happiness: The promotion of well-being through sporting activities (pp. 213–222). Cheltenham, UK: Edward Elgar.

Kuhl, J. L. (2001). Toward an ecological humanistic psychology. Journal of Humanistic Psychology, 41, 9–24. doi:10.1177/0022164901412003

Leod, M. G. (2000). Commitment to distance running: Coping mechanism or addiction? Journal of Sport Behavior, 23, 255–270. Retrieved from https://www.questia.com/read/165-6306581/

MacAloon, J. J., & Csikszentmihalyi, M. (1974). Deep play and the flow experience in wilderness. Mountain experience: The psychology and sociology of adventure. Chicago, IL: University of Chicago Press.

MacDonald, M. G., Wearing, S., & Pointing, J. (2009). The nature of peak experience in wilderness. The Humanistic Psychologist, 37, 370–385. doi:10.1177/0093484808326071028912

Medinger, J. (2011). The year in review. UltraRunning, 30(9), 27–32.

Mitchell, R. G. (1985). Mountain experience: The psychology and sociology of adventure. Chicago, IL: University of Chicago Press.

Noakes, T. D. (2003). Lore of running (4th ed.). Champaign, IL: Human Kinetics.

Nieman, D. C., & George, D. M. (1987). Personality traits that correlate with success in distance running. Journal of Sports Medicine and Physical Fitness, 27, 345–356.

Pastore, H. (2011). Feeling blue—get green: The benefits of nature on our mental health and well-being. Earth Common Journal, 1, 80–86.

Pavot, D., Diener, E., & Fujita, F. (1990). Extraversion and happiness. Personality and Individual Differences, 11, 1299–1306. doi:10.1016/0191-8869(90)90015-9

Pilisuk, M., & Joy, M. (2001). Humanistic psychology and ecology. In K. J. Schneider, J. F. Bugental, & J. F. Pierson (Eds.), Handbook of humanistic psychology (pp. 101–114). San Francisco, CA: Jossey-Bass.

Raanaas, R. K., Patil, G. G., & Hartig, T. (2012). Health benefits of a view of nature through the window: A quasi-experimental study of patients in a rehabilitation center. Clinical Rehabilitation, 26, 21–32. doi:10.1177/0269215511412800

Reese, R. F., & Myer, J. E. (2012). EcoWellness: The missing factor in holistic wellness models. Journal of Counseling and Development, 90, 400–406. doi:10.1002/j.1556-6676.2012.00050.x

Roszak, T. (2001). The voice of the earth: An exploration of ecopsychology. Grand Rapids, MI: Phanes Press.

Roszak, T., Gomes, M. E., & Kanner, A. D. (1995). Ecopsychology: Restoring the mind, healing the earth. San Francisco, CA: Sierra Club Books.

Rush, V. (2013). The summit seeker. San Bernardino, CA: Y42k Publication Services.

Simons, D., Post, P. G., Young, G., & Jensen, P. R. (2014). It's not about the running easily: The experiences of ultramarathon runners. Sport
Teranishi Martinez and Scott | Running, Flow, and Well-Being

Singh, A., & Purohit, B. (2012). Physical activity, sedentary lifestyle, and obesity among Indian dental professionals. *Journal of Physical Activity and Health, 9*, 563–570.

Smith, D. W., Wright, C. J., & Winrow, D. (2010). Exercise dependence and social physique anxiety in competitive and noncompetitive runners. *International Journal of Sport and Exercise Psychology, 8*, 61–69. Retrieved from http://www.e-space.mmu.ac.uk/e-space/handle/2173/371923

Stavrou, N. A., Jackson, S. A., Zervas, Y., & Karteroliotis, K. (2007). Flow experience and athletes’ performance with reference to the orthogonal model of flow. *The Sport Psychologist, 21*, 438–457. Retrieved from http://www.academia.edu/371923

Teychenne, M., Ball, K., & Salmon, J. (2010). Sedentary behavior and depression among adults: A review. *International Journal of Behavioral Medicine, 17*, 246–254. doi:10.1007/s12529-010-9075-z

Totton, N. (2003). The ecological self: Introducing ecopsychology. *Counseling and Psychotherapy Journal, 14*, 14–17.

Watson, D., Clark, L. A., McIntyre, C. W., & Hamaker, S. (1992). Affect, personality, and social activity. *Journal of Personality and Social Psychology, 63*, 1011–1025. doi:10.1037/0022-3514.63.6.1011

Weinberg, G. (1999). Motivation in ultradistance runners: A reversal theory approach to optimal experience. *Dissertation Abstracts International: Section B: Sciences and Engineering, 60*(1–B), 0404.

Weiss, N. M., & Evans, G. W. (2003). Nearby nature: A buffer of life stress among rural children. *Environment and Behavior, 35*, 311–330. doi:10.1177/0013916503251445

Wise, J. (2011, March). The tough track: How—and why—an average guy became an ultramarathoner. *Psychology Today*. Retrieved from https://www.psychologytoday.com/articles/201103/the-tough-track

World Health Organization. (2005). *Preventing chronic diseases: A vital investment*. Geneva, Switzerland: World Health Organizations.

Xu, J., & Roberts, R. E. (2010). The power of positive emotions: It’s a matter of life or death—Subjective well-being and longevity over 28 years in a general population. *Journal of Health Psychology, 29*, 9–19. doi:10.1037/a0016767

Yik, M. S. M., & Russell, J. A. (2001). Predicting the Big Two of affect from the Big Five of personality. *Journal of Research in Personality, 35*, 247–277. doi:10.1006/jrpe.2001

Author Note. Christy Teranishi Martinez, Department of Psychology, California State University Channel Islands; Crista Scott, Department of Psychology, California Lutheran University.

Crista Scott is now a business owner, a consultant, and an ultrarunner.

Correspondence regarding this article should be addressed to Christy Teranishi Martinez, California State University Channel Islands, Psychology Program, 1 University Drive, Camarillo, CA 93012. E-mail: christy.teranishi-martinez@csuci.edu