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Demographic Characteristics of 161-km Ultramarathon Runners

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Demographic Characteristics of 161-km Ultramarathon Runners

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Despite considerable recent growth in ultramarathon running, little is known about the characteristics of the participants. This work documents demographic characteristics of 161-km ultramarathoners. Surveys were completed by 489 of 674 runners entered in two of the largest 161-km ultramarathons in North America in 2009. Respondents had a mean (\pm SD) age of 44.5 ± 9.8 years (range 20–72 years) and were generally men (80.2%), married (70.1%), had bachelor's (43.6%) or graduate (37.2%) degrees, and used vitamins and/or supplements (75.3%). They reported 2.8 ± 20.2 days of work or school loss in the previous year from injury or illness. Body mass index (23.4 ± 2.2 and 20.8 ± 1.8 kg/m² for men and women, respectively) was not associated with age. The findings indicate that 161-km ultramarathon participants are largely well-educated, middle-aged, married men who rarely miss work due to illness or injury, generally use vitamins and/or supplements, and maintain appropriate body mass with aging.

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Recent years have seen an exponential growth in the number of participants in 100-mile (161-km) ultramarathon runs in North America, as well as the number of such events in which one can participate (Hoffman, Ong, & Wang, 2010). Little is known, however, about the individuals who voluntarily choose to undertake an endeavor as challenging as running 161 km. Given the extent of training and commitment required to successfully complete a run of this distance, an examination of the characteristics of individuals participating in such events is of interest.

Previous work has demonstrated that around 80% of the participants in 161-km ultramarathons are men and that the average age is in the mid-forties (Hoffman, 2008a, 2008b, 2010; Hoffman, Lebus, Ganong, Casazza, & Van Loan, 2010; Hoffman Ong, et al., 2010; Hoffman & Wegelin, 2009). Examination of small samples of ultramarathon runners also has suggested that they tend to be well educated (Rauch, Tharion, Strowman, & Shukitt, 1988; Thompson & Nequin, 1983). The literature, however, is lacking a large-scale study describing basic characteristics of this population.

In this work, we present demographic characteristics of entrants in two of the largest 161-km trail ultramarathon runs in North America. The primary intent of this study was to define, from a large sample, some of the general characteristics of individuals participating in these events (including age, sex, education level, marital status, running history, and previous year injury and illness history), perform a cross-sectional analysis to determine if this population maintains appropriate body weight with aging, and examine the use of vitamins and supplements and whether such use is affected by age.

METHODS

The study was approved by our institutional review board. After contact with race directors of four of the largest 161-km ultramarathons in North America, agreement was secured to perform the study in association with the Western States Endurance Run (WSER) and the Vermont 100 Endurance Race (VT100). Loss of privacy to race participants was cited as the reason the other events chose to not participate.

The WSER is the premier 161-km trail ultramarathon having its origins as an official running race in 1977. The race is held annually on the last weekend of June. The course traverses trails in the Sierra Nevada Mountains in northern California. Finishes of this race account for around 20% of all 161-km ultramarathon finishes in North America and around 35% of those who have finished a 161-km ultramarathon in North America have completed the WSER (Hoffman, 2010; Hoffman, Ong, et al., 2010; Hoffman &

Wegelin, 2009). The event has been restricted to a 5-year running average of 369 participants since the establishment of a national wilderness area on part of the course. It is normal for around 400 entries to be accepted each year with the recognition that approximately 10% will not start the race, but because the race had been canceled in 2008 due to nearby forest fires, a larger than typical field had been allowed for the 2009 event.

The VT100 dates back to 1989 and is held annually in July near West Windsor, Vermont. The race normally has around 250–300 entries each year. Both races have 30-hour time limits.

Details of the procedures are provided elsewhere (Hoffman & Fogard, 2011). Briefly, information about the study was sent to all entries by race directors in prerace correspondence. Within 5 days of the event, all entries were sent an email with link to the surveys. Separate links were provided to questionnaires for entries who did not start (nonstarters), those who dropped out (nonfinishers), and those who finished (finishers). Nonresponders received multiple emails. Survey closure occurred at 30 and 18 days after the race for the WSER and VT100, respectively.

The surveys included questions directed at obtaining information about body height and weight, education level, marital status, running history, injuries and illnesses in the past year, and use of vitamins and supplements. The surveys received by finishers and nonfinishers also included questions about issues affecting race performance, and the survey for nonstarters explored why the runner did not start the race. Results of the questions related to race performance and reasons for not starting are presented separately (Hoffman & Fogard, 2011). Most questions required an answer to allow the respondent to advance to the next question.

Runners with values for anthropometric and running history variables at the high and low extremes were contacted to verify that our data were accurate, and values were corrected when appropriate. Ages for men and women were compared among all entries and survey responders with unpaired *t* tests. Body mass index (BMI) was calculated from the reported body mass and height. Pearson correlation analyses were used to examine the associations between age and BMI for both men and women, and between age and the number of days of work or school lost in the previous year to any illness or injury and to running-related injury or illness. Ages for those using and not using select vitamins and supplements were compared with *t* tests. The level of statistical significance was set at $p < 0.05$.

RESULTS

Survey Completion

Overall survey completion was 71.3% (500 of 701). Of the 701 combined entries between both races, there were 27 runners who were entered in

both races. Among those, 11 completed the survey for both races, so the sample represents 489 of 674 (72.6%) different runners.

The frequency distribution of finish times was similar for those finishers who completed the survey and all finishers (Figure 1).

Age and Sex

The mean (\pm SD) age of all entries was 44.1 ± 9.7 years (range 20–72 years, interquartile range 37–51 years). Women were younger ($p = 0.03$) than men (42.8 ± 7.9 vs. 44.8 ± 10.1 years). Considering only the survey respondents, mean (\pm SD) age was 44.5 ± 9.8 years (range 20–72 years). A mean age difference of 1.6 years between men and women among those completing the survey did not reach statistical significance ($p = 0.07$). Women accounted

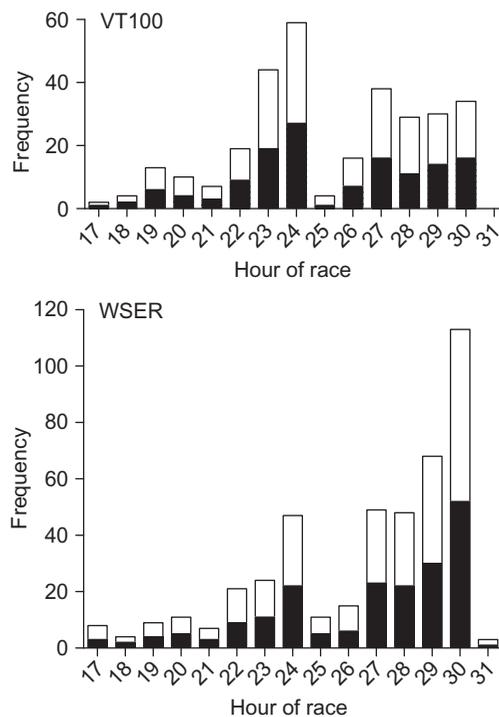


FIGURE 1 Frequency distribution of finish times among all finishers (open bars) and survey respondents (solid bars) for the two races. Each bar is displayed for the hour of the race, so, for instance, hour 24 includes finishers with times from 23 to 24 hours. While the official time limit was 30 hours for both events, two individuals (one of whom completed the survey) who reached the WSER finish during the thirty-first hour are displayed since they were listed in the official finish results. The pattern of increasing number of finishers up to 24 hours followed by a decrease the next hour and then a gradual increase again is typical (Hoffman, 2010; Hoffman & Wegelin, 2009) and relates to the emphasis on finishing under the 24-hour mark and the time limit of the event.

for 20.4% of all entries and 97 of the 489 (19.8%) runners who completed surveys.

Body Mass Index

Mean (\pm SD) BMI values were 23.4 ± 2.2 and 20.8 ± 1.8 kg/m² for men and women, respectively. The distribution of BMI values is demonstrated in Figure 2. As shown in Figure 3, the relationship of BMI with age was not significant for men or women.

Education

The highest educational level attained by the 483 runners completing the survey who were at least 25 years of age is shown in Table 1. The group had a mean (\pm SD) number of years of education beyond high school of 5.3 ± 2.9 years.

Marital Status

Of those completing the survey, 70.1% were married or in a committed relationship, 19.2% were single, 9.8% were divorced or separated, and 0.8% were widowed.

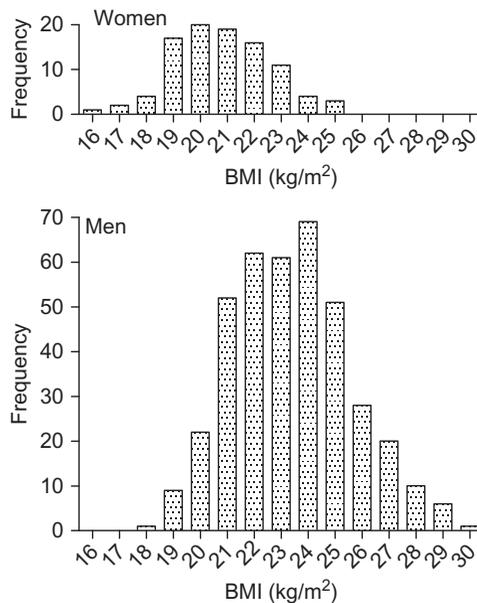


FIGURE 2 Histograms of BMI for women and men. Bars are plotted with a bin width of 1 centered at each whole numbered BMI value. All women and 77.6% of the men had BMI values under 25.

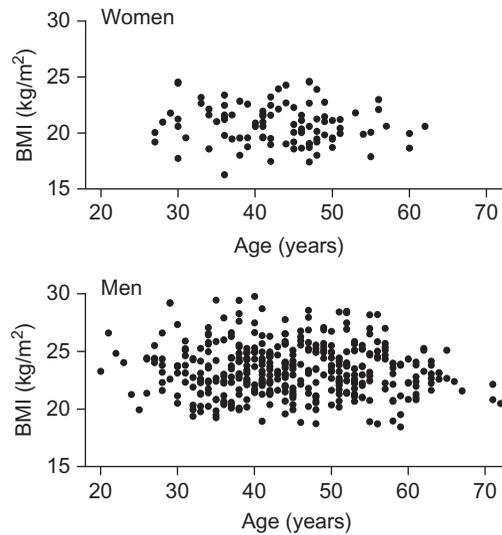


FIGURE 3 Relationship of BMI with age for women ($r = -0.12$, $p = 0.26$) and men ($r = -0.06$, $p = 0.22$).

TABLE 1 Highest Level of Education Attained by the Survey Respondents Who Were at Least 25 Years of Age ($n = 483$)

| Education level | Percentage |
|--------------------------------|------------|
| Less than high school graduate | 1.2 |
| High school graduate | 11.0 |
| Associate's degree | 6.8 |
| Bachelor's degree | 43.1 |
| Master's degree | 23.6 |
| Doctoral degree | 14.3 |

Running History

Running experience of the survey respondents is shown in Table 2. Only 47 had not completed a 161-km ultramarathon, inclusive of the event associated with the survey.

TABLE 2 Running Experience of the Survey Respondents. The Numbers of Races Finished and Not Finished Are Inclusive of the Event Associated With the Survey

| | Mean \pm SD | Minimum | Maximum |
|--|---------------|---------|---------|
| Years running ultramarathons | 7.6 \pm 6.3 | < 1 | 34 |
| 161-km races finished | 4.7 \pm 6.9 | 0 | 55 |
| 161-km races started but not finished | 1.6 \pm 5.4 | 0 | 111 |
| Highest running distance in one week during the 3 months before event (km) | 131 \pm 43 | 0 | 340 |

Illnesses and Injuries

Among all survey respondents, the mean (\pm SD) number of days of work or school lost in the previous year due to any injury or illness was 2.8 ± 20.2 . The number of days of work or school lost in the previous year due to injury or illness related to running was 0.7 ± 8.3 . Neither variable was correlated with age.

Use of Vitamins and Supplements

Of the survey respondents, 75.6% reported using vitamins and/or supplements. The primary vitamins and supplements are listed in Table 3. Among the most commonly reported vitamins and supplements, users were determined to be older than nonusers for glucosamine/chondroitin sulfate (mean \pm SD age 47.0 ± 9.6 vs. 43.2 ± 9.5 years, $p < 0.0001$) and antioxidants (mean \pm SD age 47.0 ± 9.1 vs. 43.7 ± 9.7 years, $p = 0.002$). Age was not different among those using and not using multiple vitamins or fish oil.

DISCUSSION

The present analysis is based on survey data from 489 different ultramarathon runners of which 442 (90.4%) had finished at least one 161-km ultramarathon prior to taking the survey. In previous work, it was identified that 9,815 individuals had completed 161-km ultramarathons in North America through 2008, and 2010 unique individuals finished such races in 2008 (Hoffman, 2010; Hoffman, Ong, et al., 2010). As such, this survey accounts for nearly 5% of the individuals who had ever completed a 161-km ultramarathon in North America and around 20% of the individuals who had

TABLE 3 Reported Vitamin and Supplement Use by the Survey Respondents

| Vitamin or supplement | Percentage |
|----------------------------------|------------|
| Multiple vitamin | 58.5 |
| Glucosamine/chondroitin sulfate | 34.8 |
| Fish oil (omega-3 fatty acid) | 31.3 |
| Antioxidants including Vitamin C | 24.9 |
| Calcium | 9.2 |
| Coenzyme Q10 | 4.9 |
| B vitamins | 4.7 |
| Vitamin D | 4.3 |
| Quercetin | 3.5 |
| Vitamin E | 2.9 |
| Magnesium | 2.9 |
| Iron | 1.8 |

finished such events during the year. Furthermore, the overall response rate to the survey of 72.6% was quite robust.

As a group, the survey participants were experienced ultramarathon runners, having been running such events an average of 7.6 years and having finished an average of 4.7 161-km ultramarathon races prior to taking the survey. This appears to be slightly higher than the 3.3 average number of 161-km finishes by each person who had ever finished a 161-km ultramarathon between 1977 and 2008, but it is consistent with the trend that runners are finishing more of these events each year (Hoffman, Ong, et al., 2010).

Participants in 161-km ultramarathons have been found to have an average age in the mid-forties, but they span a wide range of ages (Hoffman, Ong, et al., 2010; Hoffman & Wegelin, 2009). The present sample had an average age of 44.5 years (range 20 to 72 years) and is representative of those who historically have participated in events of this distance. Women finishing 161-km ultramarathons have been slightly younger than men (Hoffman, Ong, et al., 2010; Hoffman & Wegelin, 2009) as was the case for the survey participants. Furthermore, women typically have accounted for about 20% of participants in recent years (Hoffman, Ong, et al., 2010; Hoffman & Wegelin, 2009) as was the case in this analysis.

The present work demonstrates that 161-km ultramarathon participants are well-educated compared with the general population. Only 18.8% had less than a bachelor's degree, 43.5% had a bachelor's degree, and 37.7% had a graduate degree. U.S. Census Bureau data from 2008 (2008a) demonstrate that, among those 25 years of age and older, 71% of the general population had not received at least a bachelor's degree and that the highest level of education attained was a bachelor's degree for 19% and graduate degree for approximately 10%. Limited previous work also has suggested that ultramarathoners are a well-educated group, as 84% of participants in an 80-km trail race were found to hold white-collar or professional job positions (Rauch et al., 1988). Findings from another 80-km race showed that occupations were heavily weighted toward professional and business areas and that the highest degree attained was high school for 14%, college for 53%, and doctoral for 33% (Thompson & Nequin, 1983).

Individuals participating in 161-km ultramarathons also appear to be more likely than the general population to be in a stable relationship given that 70.1% reported being married or in a committed relationship, and only 9.8% were divorced or separated. Data from the U.S. Census Bureau (2008b) indicate that, among 20 to 74 year olds in 2008, 56.4% were married and 15.2% were divorced or separated.

This work also demonstrates that 161-km ultramarathon participants lose fewer work days due to illnesses or injuries than the general population. The U.S. Department of Health and Human Services (2009) reported that the average number of work days lost from illness or injury in 2008 was

4.4 among employed individuals 18 to 74 years of age. This is 1.6 days higher than the average of 2.8 days of work or school loss due to injury or illness in the previous 12 months among our survey respondents. Also noteworthy is that an average of only 0.7 days were lost from work or school in the prior 12 months due to a running-related injury or illness. While small in absolute terms, this average of 0.7 days per year lost from work or school due to running-related injury or illness accounted for 25% of the total days lost due to any injury or illness.

Body mass index (BMI) is used to estimate if an individual has a healthy body weight. Due to its ease of measurement and calculation, BMI is the most widely used diagnostic tool to identify weight problems within a population. Values between 18.5 and 25 kg/m² for BMI have been considered to be the optimal range. The U.S. Department of Health and Human Services (2009) reports that, of adults aged 20 years and older, only 32% in the period 2003 to 2006 had BMI values below 25. The target for 2010 is that 60% of the population will have a BMI below 25. The present study demonstrates 77.6% of the men had BMI values under 25, whereas 100% of the women had BMI values under 25. Also of importance was the finding that there was no significant relationship of BMI with age for men or women. In other words, BMI did not increase with age, a finding that contrasts with the increase in prevalence of overweight and obesity with aging into the seventh decade of life among the general population (Flegal, Carroll, Kuczmarski, & Johnson, 1998). This finding that there was no increase in BMI with age confirms earlier observations from previous 161-km ultramarathons (Hoffman, 2008a).

A recent study of a random sample of the U.S. population (Kaufman, Kelly, Rosenberg, Anderson, & Mitchell, 2002) determined that 40% used vitamins and minerals. The most common vitamin/mineral supplements consumed were multiple vitamins (26%), vitamin E (10%), vitamin C (9.1%), and calcium (8.7%). Only 1.9% used glucosamine. Vitamin and supplement use among ultramarathon runners appears higher than in the general population, and there is some support for their use for enhancing muscular force recovery (Gauche et al., 2006) and attenuating the adrenal stress and anti-inflammatory responses (Peters, Anderson, Nieman, Fickl, & Jogessar, 2001) from prolonged running. Previous studies of small samples of ultramarathon runners found that 45%–70% used vitamin and mineral supplements (Peters & Goetzsche, 1997; Singh, Evans, Gallagher, & Deuster, 1993; Knechtle, Knechtle, Schulze, & Kohler, 2008), whereas the present study found that 75.3% reported vitamin and/or supplement use. Strikingly different from the general population was the use of vitamins and supplements promoted for joint health and anti-inflammatory and anti-oxidant properties. It was also interesting that there was increased use with aging of supplements promoted for improving joint health and providing anti-oxidant properties.

The present work provides insight into some of the characteristics of participants in 161-km ultramarathon races through survey of nearly 5% of the individuals who had ever completed a 161-km ultramarathon in North America and around 20% of the individuals who finished such events in the prior year. The findings indicate that participants in 161-km ultramarathons are mostly middle-aged men who are more educated, more likely to be in a stable relationship, less likely to miss work due to illness or injury, and more likely to use vitamins and supplements than the general population. This cross-sectional examination also suggests that 161-km participants generally maintain a healthy body weight with advancing age, unlike the general population where aging is associated with an increase in the proportion of individuals who are overweight and obese.

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