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Big Five personality dimensions in ultramarathon runners: findings of the Ultrarunners Longitudinal TRacking (ULTRA) Study

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Abstract:

The psychological aspect of ultrarunning is of interest in sports medicine. Ultrarunners are described as mentally tough, and have been shown in studies to be goal oriented, and intrinsically motivated. It is unknown how the personality traits of this group compare to the general population. 734 ultramarathon runners participated in this large longitudinal study. Ultramarathon runners scored significantly lower in extroversion (3.74 vs 4.44, $p < .0001$), and agreeableness (5.10 vs 5.23, $p = .0099$) compared to a control population. They scored higher in conscientiousness (5.93 vs 5.4, $p < .0001$), and emotional stability (5.28 vs 4.83, $p < .0001$), while statistically similar in openness to experiences (5.33 vs 5.38, $p = 0.4174$). The current study dimensions of relatively low agreeableness (competitive), and extroversion (able to stay within oneself), combined with relatively high conscientiousness (organized, goal-directed), and emotional stability (stable in stressful circumstance), quantify the differences between a large ultramarathon runner population and a control group.

Keywords: ultrarunners, ultramarathon, personality, runners

Introduction:

Ultramarathon runners are individuals who participate in long-distance running events, covering distances of 50 kilometers (31 miles) or more. Long distance running is thought to bring numerous health benefits.(Ruta et al., 2024) Understanding the personality traits of these athletes is important for a variety of reasons, including insight for researchers studying the psychological aspects of endurance sports, for coaches looking to support and motivate

their athletes, and for ultramarathon runners themselves who may benefit from self-reflection and self-awareness.

While ultramarathon runners have been described as mentally tough and self-efficacious, it is unclear if these conceptualizations manifest as personality traits, which are thought to be relatively stable across time.(Harris et al., 2016) It is also uncertain if ultramarathon runners share certain personality traits that are conducive to the pursuit of this physically and mentally demanding activity.(Roebuck et al., 2018) For example, ultramarathon runners may be described as highly determined, disciplined, and driven, with a strong ability to withstand physical and mental challenges. However, it's worth noting that there is significant individual variation in personality, so not all ultramarathon runners may share these traits. Anghel et al. found that personality traits of athletes are indicative of the discipline of the sport that they train, indicating that there is a general personality profile of athletes, thus creating the argument that the strength of personality traits is determined by the disciplines of the sport.(Anghel et al., 2009)

The Big 5 personality traits are a widely-used model in psychology that describes personality in terms of five broad dimensions: openness, conscientiousness, extraversion, agreeableness, and emotional stability.(Digman, 1990) These traits are thought to be relatively stable over time and across different situations, and they can be used to describe an individual's personality.(Harris et al., 2016) Openness refers to a person's willingness to experience new things and their level of intellectual curiosity. Conscientiousness refers to a person's level of organization, dependability, and self-discipline, it is also defined to an extent to which a human is persistent, dependable, and achievement oriented. Extraversion refers to a person's level of sociability, assertiveness, and energy toward the social world. Agreeableness refers to three main traits, altruism, trust, and compliance. Emotional stability refers to a person's level of emotional vulnerability and the manner in which a person is calm, self-confident, enthusiastic, and responsive to negative emotions. These traits are not mutually exclusive and people can vary in the degree to which they exhibit each trait.

Understanding the personality traits of athletes is of interest to researchers.(Piepiora et al., 2020b, Piepiora et al., 2020a) This information can be useful in certain contexts, such as when studying the psychological factors that contribute to their behavior or when developing interventions to support their well-being.(Bucher et al., 2019, Piepiora et al., 2020a) The purpose of the current study was to determine the extent to which ultramarathon runners differ

in personality on the Big 5 personality traits relative to a control population, and to assess their motivation for running and self-perception of health.

Methods:

Study participants were enrolled in the Ultrarunners Longitudinal TRacking (ULTRA) Study. Recruitment for participation in the study began in 2011 and required prior completion of at least one ultramarathon of 50 km or longer. Enrollment via online survey included self-report on a wide range of personal characteristics and exercise history. Findings from the enrollment,(Hoffman et al., 2014, Hoffman and Krishnan, 2013, Hoffman and Krishnan, 2014) and the subsequent follow-up surveys(Hoffman and Krouse, 2018, Hoffman, 2019, Hoffman and White, 2020, Jastifer et al., 2024, Jastifer and Hoffman, 2023) have been published elsewhere. The present data are largely from the third follow-up questionnaire that was completed during 2022 by prior ULTRA Study enrollees. The study is currently approved by the Institutional Review Board of xxxx.

The study included questions on general health status, running behavior and performance. The Big Five personality dimensions were obtained using the validated Ten-Item Personality Inventory (TIPI).(Gosling et al., 2003) The TIPI is a short, self-report questionnaire that is used to measure the Big Five personality traits of openness, conscientiousness, extraversion, agreeableness, and emotional stability. The TIPI consists of 10 questions, with each question measuring one of the five personality traits. The TIPI is a quick and easy way to assess an individual's personality, has been used in a variety of research settings, and has been cited over 9,400 times by other authors as of May 2023, according to Google Scholar (<https://scholar.google.com>). The control group for the present study involves a previously published normative data set of 1,813 adults (1,173 Female and 633 males)(Gosling et al., 2003)

Data are presented as percentages or median, standard deviation (SD) and 25th and 75th interquartile (IQR) range because the nominal data were generally skewed on the D'Agostino-Pearson normality test. Group comparisons of continuous data were made with the Mann-Whitney test. Statistical significance was set at $p < .05$. Pearson's correlation coefficient was used for correlations among variables. R version 4.2.2 (2022-10-31) was used for statistical analysis.

Results:

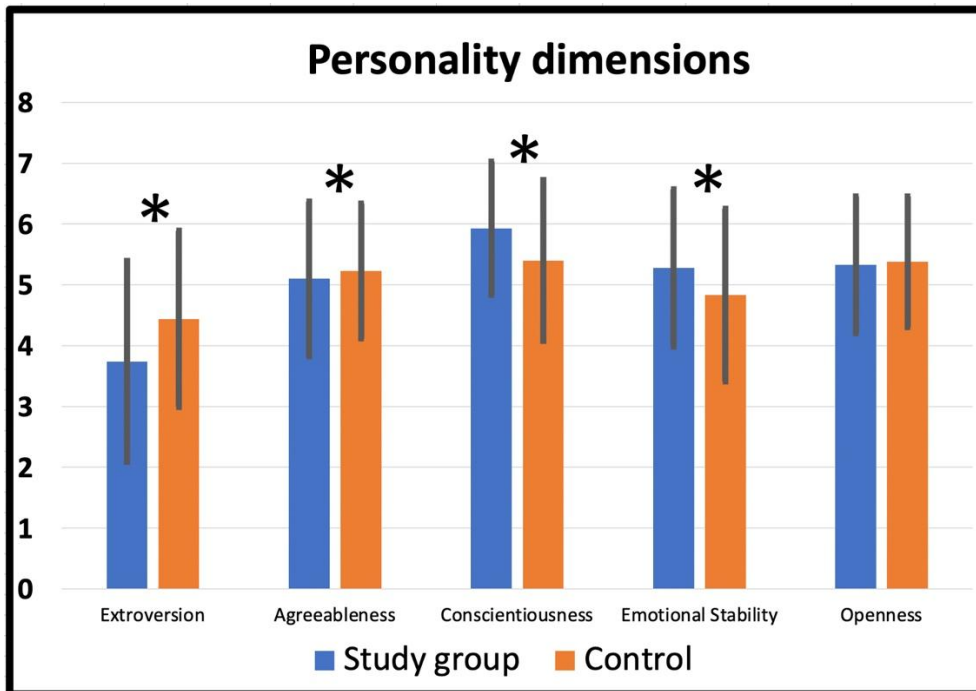
Demographics and Running behavior:

The survey collected data from 734 ultramarathon runners, whose ages ranged around a median (IQR) of 53.9 (45.1 to 61.9) years and a median body mass index of 23.3. The participants had been running a median (IQR) of 40.2 (19.3 to 59.5) kilometers per week for the prior 12 months and spent a median of 8 hours per week exercising. The exercise routine included a median (IQR) of 5 (3 to 6) days per week running, 3 (2 to 4) days per week cross training, 2 (1 to 3) days per week on strength work, and 2 (1 to 3) days per week on focused stretching. Most of the runners (80.9%) reported being employed full-time, working a median of 40.0 hours per week.

Personality inventory:

Study participants scored significantly lower in extroversion (3.74 (SD 1.65) vs 4.44 (SD 1.45), $p < .0001$), and agreeableness (5.10 (SD 1.27) vs 5.23 (SD 1.11), $p = .00179$) compared with a control population, **FIGURE 1**. They scored higher in conscientiousness (5.93 (SD 1.10) vs 5.4 (SD 1.32), $p < .0001$), and emotional stability (5.28 (SD 1.29) vs 4.83 (SD 1.42), $p < .0001$), while statistically similar in openness to experiences (5.33 (SD 1.12) vs 5.38 (SD 1.07), $p = 0.3989$).

Figure 1: Median scores and standard deviation for personality dimensions compared to a large control group. (Gosling et al., 2003) *denotes a significant group difference.



The participants were asked about their physical and mental health status as well as their motivation to run, **FIGURES 2 and 3**. Correlations among perceived physical and mental health status and motivation for running are shown in **TABLE 1**. A total of 92.6% of respondents report that they “agree” or “strongly agree” that they are in good physical health and 84.1% report that they “agree” or “strongly agree” that they are in good mental health. Similarly, 88.1% “agree” or “strongly agree” that they run to improve their physical health, and 87.1% “agree” or “strongly agree” that they run to improve their mental health. Only 51.0% “agree” or “strongly agree” that they use running as a coping mechanism.

Table 1: Correlations (p value) among self-perception of health and motivation for running.

	<i>I am in good physical health</i>	<i>I am in good mental health</i>	<i>I run to improve my physical health</i>	<i>I run to improve my mental health</i>
<i>I am in good mental health</i>	0.42 (p<.001)	-		
<i>I run to improve my physical health</i>	0.21	0.20	-	

health	(p<.001)	(p<.001)		
I run to improve my mental health	0.16 (p<.001)	0.02 (p=.655)	0.52 (p<.001)	-
I use running as a coping method	-0.01 (p=.893)	-0.18 (p<.001)	0.17 (p<.001)	0.44 (p<.001)

Figure 2: Motivations for running (SD, strongly disagree; D, disagree; N, neutral; A, agree; SA, strongly agree)

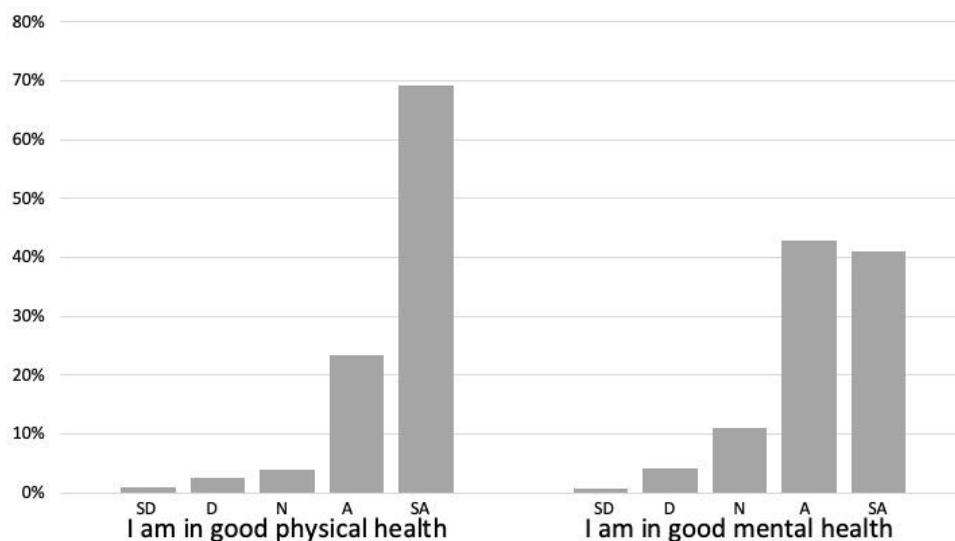
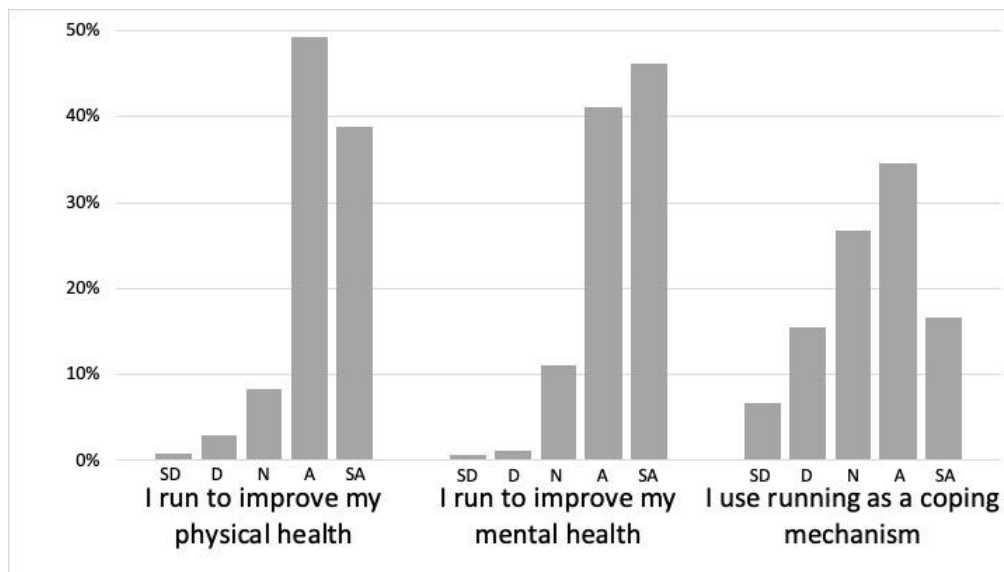


Figure 3: Self-perception of physical and mental health (SD, strongly disagree; D, disagree; N, neutral; A, agree; SA, strongly agree)



Discussion:

This study represents a large study of the personality traits of ultramarathon runners. The results of this study can be used to inform sports medicine personnel to better treat and train these athletes. The current study demonstrates that ultramarathon runners show relatively low agreeableness (more competitive), and extroversion (able to stay within oneself). They show relatively high conscientiousness (more organized, goal-directed), and emotional stability (stable in stressful circumstance), and similar scores on openness to new experiences. This study quantifies the differences between a large ultramarathon runner population and a previously published control group. This study also shows that a majority of the study participants (greater than 87%) agree or strongly agree that they use running to improve both their physical and mental health.

The interest in ultramarathon runner psychology has been of interest dating back to the 1970's and 1980's when the activity became an organized sport.(Roebuck et al., 2018) Many traits have been ascribed to ultramarathon runners such as: mentally tough, resilient, determined, self-motivated, goal oriented, organized, prepared, adaptable, confident, self-efficacious, able to overcome challenges, pain tolerant, among others. Yet, little is known about how these descriptions translate to objectively measured personality traits.

Personality research on ultramarathon runners is not new in the psychological literature. There have been several studies investigating various aspects of ultramarathon runner personality.

(Folkins and Wieselberg-Bell, 1981, Freund et al., 2013, Hashimoto et al., 2006, Acevedo, 1992, Hughes et al., 2003, McCutcheon and Yoakum, 1983, Krouse et al., 2011, Martinez and Scott, 2016, Rauch et al., 1988, Krokosz et al., 2018) These studies have several problems including a small sample size (ranging from 20-344 participants), and utilize inhomogeneous instruments. The instruments used in these studies include the Adjective Checklist, Eysenck Personality Questionnaire EPQ-R, Multiple Affect Adjective Checklist, Self-Motivation Inventory, State-Trait Anxiety Inventory, Commitment to Running Scale, Philosophies of Human Nature Scale, Sport Orientation Questionnaire, Trait Sport-Confidence Inventory, NEO-Five Factor Inventory, Sensation Seeking Scale, Myers-Briggs Type Indicator, Perception of Success Questionnaire, Temperament and Character Inventory, General Self-Efficacy Scale and finally the Ten Item Personality Inventory used in the current study. (Folkins and Wieselberg-Bell, 1981, Freund et al., 2013, Hashimoto et al., 2006, Acevedo, 1992, Hughes et al., 2003, McCutcheon and Yoakum, 1983, Krouse et al., 2011, Martinez and Scott, 2016, Rauch et al., 1988, Krokosz et al., 2018)

Despite the limitations in drawing general conclusions for these studies as a group, individually, these studies have demonstrated several important and at times contradictory findings associating ultramarathon runners with particular personality traits. Rauch et al. in a study of 44 ultrarunners demonstrated that, compared to the general population, ultramarathon runners are more self-motivated. (Rauch et al., 1988) Hughes et al. in a study of 66 ultramarathon runners demonstrated that participants were more extraverted and open to new experiences than the normative group. (Hughes et al., 2003) They were also more experience-seeking but less disinhibited than the normative group. Hashimoto et al. found that their study of 52 ultramarathon runners were more likely to be introverted. (Hashimoto et al., 2006) Freund et al. studied 11 ultramarathon runners and found them to have a higher pain tolerance, be more spiritually transcendent, and less cooperative and reward-dependent. (Freund et al., 2013)

Acevedo et al. in a study of 112 ultramarathon runners showed that study participants were more competitive, goal-oriented, confident, and committed to running. (Acevedo, 1992) They showed an established combination of being goal oriented yet less win oriented. In this group, goals related to finishing time were very important, but finishing place was less important. (Acevedo, 1992) This study makes an important observation. Extreme efforts as required in a 100-mile ultramarathon (the subjects in Acevedo et al.'s study) require an exorbitant amount of personal sacrifice, effort, focus, and training time. This requires a goal that can be inwardly directed and focused upon (personally finishing the race in a certain time), as opposed to a goal

dependent on others around you (finishing in a certain place). Krouse et al. in a study of 344 female ultramarathon runners found that general health orientation and psychological coping were the two strongest motivational factors of this group. They noted the runners were higher in task orientation (finishing the race or goal) than ego orientation (placing in the top 3 overall or beating an opponent). (Krouse et al., 2011)

In the study most similar to the current work, Teranishi Martinez and Scott assessed 64 ultramarathon runners (an overall total of 189 runners with most not being ultramarathon runners) with the TIPI and found that ultramarathon runners scored higher on neuroticism than shorter distance runners ($p=.04$). (Martinez and Scott, 2016) Their mean value of 4.40 (SD 0.78) on the neuroticism component in ultrarunners was higher than the mean of 4.16 (SD 0.79) in their non-ultrarunners. It is unclear how much the current results contrast these results as the current study demonstrates increased emotional stability in ultrarunners. It should be noted that the control group in Teranishi Martinez and Scott study was also runners and a true control group of nonrunners was not provided, so it is not clear if these results truly do contrast. Interestingly, they also found that ultramarathon runners spend more time in nature, and experienced greater flow state than short-distance runners (Martinez and Scott, 2016)

Two other studies (Folkins & Wieselberg-Bell, McCutcheon & Yoakum), with 46 and 50 ultramarathon participants respectively, demonstrated no personality differences between ultramarathon runners and the general population. (Folkins and Wieselberg-Bell, 1981, McCutcheon and Yoakum, 1983) Likely due to the small sample sizes (underpowered) and the variety of personality instruments used, there are conflicting results with respect to personality traits such as extraversion and self-motivation. (Hashimoto et al., 2006, Hughes et al., 2003, McCutcheon and Yoakum, 1983, Rauch et al., 1988)

The current study has several limitations. First, individual differences in personality are just one factor among many that can affect a person's performance and success as an ultramarathon runner. Second, this study is a self-selection recruitment and therefore self-selection bias is likely present to some degree. Despite this, it can be noted that the current population sample is comparable to prior reports of ultramarathon runners. (Hoffman, 2008a, Hoffman, 2008b, Hoffman, 2010, Hoffman and Fogard, 2011, Hoffman and Fogard, 2012, Hoffman et al., 2010a, Hoffman et al., 2010b, Hoffman and Wegelin, 2009) Finally, the study of personality is imperfect. The Big 5 personality model (five factor model) has been described to have near consensus among personality researchers as the best instrument to use. (Roebuck et

al., 2018, Allen et al., 2013, Laborde et al., 2020) The current tool's benefits and limitations have been published extensively.

Conclusion:

The current findings demonstrating relatively low agreeableness (more competitive), and extroversion (able to stay within oneself), combined with relatively high conscientiousness (more organized, goal-directed), and emotional stability (stable in stressful circumstance), quantify the differences between a large ultramarathon runner population and a control group. These personality characteristics may help account for the capacity of ultramarathon runners to withstand the demands of this activity. Appreciation of these personality characteristics among this population will assist clinicians in developing interventions to support their well-being.

Author Contribution:

Conceptualization, JJ, and MH; methodology, JJ, and MH; software, JJ; check, JJ, and MH; formal analysis, JJ; investigation, JJ, and MH; resources, JJ, and MH; data curation, JJ; writing - rough preparation, JJ; writing - review and editing, JJ, and MH; visualization, JJ; All authors have read and agreed with the published version of the manuscript.

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Institutional Review Board Statement:

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board at Western Michigan University Homer Stryker MD School of Medicine IRB#: WMed-2022-0935

Informed Consent Statement:

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement:

Raw data protected by IRB privacy policy.

Conflict of Interest Statement:

The authors report no conflicts of interest.

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