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Deconstructing Resilience: Running, Personality, and Psychopathology

Laila Drury

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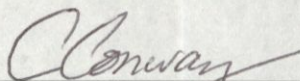
Deconstructing Resilience: Running, Personality, and Psychopathology

A thesis submitted in partial fulfillment of the requirement
for the degree of Bachelor of Science in Psychological Sciences from
The College of William and Mary

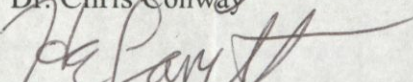
by

Laila Elizabeth Drury

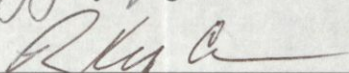
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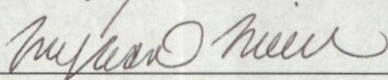
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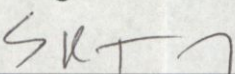
Dr. Harvey Langholtz



Dr. Kelly Crace



Dr. Meghan Miller



Dr. Sylvia Tandeciarz

Williamsburg, VA
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Deconstructing Resilience: Running, Personality, and Psychopathology

Laila E. Drury

Department of Psychological Sciences

College of William & Mary

Abstract

Personality plays a major role in resilience to anxiety and depression. This study explored how runners' personalities differ from non-runners, and whether specific personality traits—conscientiousness, grit, and mindfulness—protect against emotional problems. In the present study, participants ($N = 222$) completed self-report questionnaires to measure depression, anxiety, and stress, all Big 5 personality traits, grit, mindfulness, and resilience. Participants were also asked if they run as a form of exercise; if yes, they were presented with subsequent questions discerning internal and external motivations for running. There were weak associations, including some in unexpected directions, between runner status and personality. Conscientiousness, grit, and mindfulness strongly predicted resilience. Resilience was, in turn, related with significantly lower depression and anxiety. These findings suggest that, although running has little effect on personality, personality is a key component of resilience to mental health problems.

Keywords: running, conscientiousness, grit, mindfulness, resilience, depression, anxiety, stress

Deconstructing Resilience: Running, Personality, and Psychopathology

Long Distance Running

The human mind and body are both incredibly adaptable. Long distance runners are living proof of the plasticity of both. In previous studies, distance runners have reported higher levels of resilient traits—such as tenacity, determination, and tolerance of negative affect—as compared to non-runners (Bebetsos & Goulimaris, 2015, p. 500). This is possibly due to the fact that they purposefully slog through grueling training rituals on a daily basis, choosing physical pain and mental anguish over comfort.

Perhaps because of the neurochemical effects of running, including the release of endorphins, endocannabinoids, and serotonin, the sport has been shown to reduce depression and anxiety (Rethorst, Wipfli, & Landers, 2009, p. 502). Due to all of the positive effects of running on the mind and body, it also can be addictive, resulting in compulsive behaviors that undermine its adaptive effects (Leedy, 2000, p. 256). Compulsive runners show startlingly similar psychological, social, and physiological profiles to those suffering from anorexia nervosa (Coen & Ogles, 1993, p. 349).

Endurance competition, especially long distance running, cultivates a unique psychosocial atmosphere within oneself that values endurance above all else (Gucciardi, Hanton, & Fleming, 2017, p. 307). “The stress and discomfort of athletic competition is rarely as intense as during competitive endurance events,” (Raglin & Wilson, 2009, p. 275). Research on endurance sports with similar training programs, such as swimming and cycling, has proved that endurance athletes display similar personalities.

Additionally, similar personalities have been observed in “aesthetic” sports, in which

thinness is desired, such as long distance running, gymnastics, and rowing (Rice et al., 2016, p. 1341).

Endurance athletes have unique personalities that have either led them to the sport, or fostered their success as a runner. Some runners are drawn to the sport because they excel in it due to their preexisting characteristics, yet some runners are driven by other motivations and shifts in personality occur along the way (Gucciardi et al., 2017, p. 308).

Runners tend to show healthier mood profiles than non-runners, with lower levels of depression, anger, fatigue, and confusion, as well as higher levels of vigor than the population norm (Raglin & Wilson, 2009, p. 277). Running is also correlated with elevated levels of trait conscientiousness (Lane & Wilson, 2011, p. 360). Long distance running is physically demanding to an extreme level, and is notorious for cultivating a “never give up” attitude, akin to grit, more than nearly all other athletic endeavors (Moran, 2012, p. 58).

Research in personality has also examined *why* an individual chooses to partake in running. Intrinsic motivation refers to the feeling of liking what you are doing. It is different from achievement, or extrinsic, motivation, which is the act of striving toward a standard of excellence (Locke & Schattke, 2018, p. 8). Extrinsic motivation is defined as any reliance on external affirmations for effort or intensity, and is marked by a dependence on objective evaluations (Senecal & Whitehead, 2018, p. 1). It refers to doing something as a means to an end, such as performance awards or physical beauty (Locke & Schattke, 2018, p. 13). The absence of immediate extrinsic gratification, as is the case in endurance athletics, often encourages individuals to shift to an intrinsically

motivated perspective. When this occurs in long distance running, athletes report more relaxation and greater enjoyment of a workout (Senecal & Whitehead, 2018, p. 7). On the other hand, some athletes choose to run as a way to lose weight, or as an all-encompassing stress coping mechanism. The prevalence of eating problems in female athletes over female non-athletes is striking, yet not directly related to sport itself. Rather, there are personality traits that co-occur with eating problems and high-level athletics (Smolak, Murnen, & Ruble, 2000, p. 377).

Personality

Endurance athletics require elevated levels of self-control, defined as one's "capacity to regulate attention, emotion, and behavior in the presence of temptation" (Duckworth & Seligman, 2017, p. 715). Long distance running necessitates attuned abilities of emotion regulation due to the sport's physiologically stressful nature. Emotion regulation is defined as one's ability to initiate and maintain control of one's own emotion state. Rather than ruminating on unpleasant sensations, most runners use mental skills, such as goal setting, to shape their own feelings and thoughts (Stanley, Lane, Beedie, Friesen, & Devonport, 2012, p. 163). Emotion regulation is a key component of both conscientiousness and mindfulness. Dispositional mindfulness is linked to high self-regulatory processes, leading to protection against intrusive thought patterns typical to anxiety and depression (Masicampo & Baumeister, 2007, p. 255).

Furthermore, running in and of itself is a difficult endeavor requiring significant effort. The consistent exercise of running requires consistent effort, or grit. Trait levels of grit have been found to predict completion of athletic endeavors more than most other variables (Reed, Pritschet, & Cutton, 2012, p. 614). Every individual has a unique

personality, and those of runners are more likely to be strong in conscientiousness, grit, and mindfulness.

Conscientiousness, Grit, and Mindfulness

For the past five decades, the most prominent model used to conduct research in the field of personality psychology has been the Big 5 model, a representation of the main dimensions of human individual differences: agreeableness, neuroticism, openness, extraversion, and conscientiousness. Conscientiousness refers to impulse control, orderliness, dedication to achievement, and dutifulness. This trait can be divided into two subdimensions: industriousness and orderliness (DeYoung, Quilty, & Peterson, 2007, p. 855).

There is also a significant relationship between conscientiousness and self-control, defined as the “capacity to regulate attention, emotion, and behavior in the presence of temptation” (Duckworth & Seligman, 2017, p. 715). Furthermore, prior research has identified a strong connection between grit and trait levels of conscientiousness (Credé, Tynan, & Harms, 2017, p. 495).

Industriousness and orderliness are characterized by regulation of focus, feelings, and actions. Conscientiousness and mindfulness are therefore linked on a fundamental level. Mindfulness is defined as paying attention, on purpose, to the present moment (Bajaj & Pande, 2016, p. 63). Conscientiousness is the single strongest personality predictor of mindfulness (Giluk, 2009, p. 805). To be conscientious, one must be mindful. Before a sense of self-regulation enters the picture, it is crucial that an individual is *aware* of their own attention, emotion, and behavior. Furthermore, to embrace one’s full conscientiousness in the face of extremely challenging situations, and individual must

have “enduring goals of superordinate personal significance.” In a word, such an individual has grit (Duckworth & Seligman, 2017, p. 715).

Grit is defined as passion and perseverance in the pursuit of long-term goals (Duckworth et al., 2007, p. 1087). In her book *Grit: The power of passion and perseverance*, Angela Duckworth narrates the development of the positive psychological concept. Duckworth concludes that “gritty” individuals possess a “never give up” attitude, who are achievement-driven and not dismayed by failure. On average, these individuals are no more talented or intelligent than others. Grit is unique not only because it bolsters passion, mental fortitude, and resilience, but also because it is plastic. It can grow, transform, and develop. Researchers have even suggested that “grit should be considered a facet of conscientiousness” due to both traits’ focus on “short-term gain for long-term goals” (Credé et al., 2017, p. 495). Grit is a multidimensional concept, parsed into “passion” and “perseverance.” Both facets are strongly related to subjective well-being. Researchers have investigated grit cross-culturally as well, and have found similar results regarding the importance of grit (Disabato, Goodman, & Kashdan, 2018, p. 12).

Mindfulness originates from ancient Buddhist tradition, in which it is defined as “an act of paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally,” (Raphiphattana, Jose, & Chobthamkit, 2019, p. 146). While this tradition derives from collectivistic Eastern cultures, it has been transcribed as a key pillar of psychological well-being in individualistic Western cultures as well. There is an extensive space in the literature describing the positive effect of mindfulness practice on anxiety and depression (Bajaj & Pande, 2016, p. 63). Mindfulness has been conceptualized as a sense of awareness and nonreactivity toward external and internal

observations and experiences, which are pivotal components of resilience to anxiety and depression (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006).

Along with the relationship between mindfulness and conscientiousness, there is a strong connection between all three personality traits (Raphiphattana et al., 2019, p. 148). For example, the relationship between grit and well-being is mediated by mindfulness in some prior research (Li, Lin, Zhao, Chen, & Wang, 2018, p. 236). Furthermore, prior research has identified a strong connection between grit and trait levels of conscientiousness (Credé et al., 2017, p. 495). Thus, conscientiousness, mindfulness, and grit are three overlapping, yet conceptually distinct, concepts.

Personality Traits and Mental Health

Prior research has established clear connections between emotional well-being and conscientiousness, grit, and mindfulness. The present study will examine the connections between these three traits and psychopathology symptoms.

The current literature poses a strong positive relationship between conscientiousness and well-being. Smith, Ryan, and Röcke (2013, p. 15) found that trait conscientiousness is positively associated with mean daily life satisfaction and positive affect, as well as greater fluctuation in perceived control. Conscientiousness mediated the relationship between affect and perceived self-control. Subjective psychological well-being, conceptually comprised of daily life satisfaction, positive affect, and a perceived sense of control, was assumed to predict the global concept of trait conscientiousness (Smith et al., 2013, p. 17). In a later study, conscientiousness was divided into six distinct facets: competence, orderliness, dutifulness, achievement motivation, self-discipline, and cautiousness. While particularly conscientious individuals do tend to report higher levels

of well-being, there is no significant connection between the individual facets of conscientiousness and well-being. Furthermore, those who exhibit extreme levels of trait conscientiousness are prone to obsessive-compulsive tendencies, higher negative affect, and maladaptive reactions to negative feedback and adverse life events (Carter, Guan, Maples, Williamson, & Miller, 2016, p. 514).

Another facet of grit that helps individuals triumph over adversity is “learned industriousness,” the opposite of Seligman’s “learned helplessness.” When individuals believe that they have the power within them to become more industrious, they become more perseverant. In other words, they become more gritty (Duckworth, 2016, p. 8).

A wide array of studies have connected mindfulness and increased subjective well-being. For example, mindfulness has been linked with higher life satisfaction and more positive affect as indices of subjective well-being. In fact, the relationship between mindfulness and well-being is mediated by resilience in prior research, indicating that aspects of mindfulness help facilitate the development of resilience in the face of adversity (Bajaj & Pande, 2016, p. 63). Mindfulness is a trait, and also a skill that can be developed. Individuals who undergo mindfulness training have shown to improve their core self-evaluations, essentially how they feel about their most authentic, honest selves. Mindful individuals can “accept their thoughts, feelings, and situations, which may lead to higher positive self-evaluations,” (Kong, Wang, & Zhao, 2013, p. 165-166). As mentioned above, emotional regulatory thought patterns mediate the relationship between mindfulness and subjective well-being (Schutte & Malouff, 2010, p. 1116). Mindfulness directly impacts mental health. It has shown to be effective from a psychopathological intervention standpoint in reducing symptomology (Baer, 2003, p. 125) as well as from a

general healthy mood perspective (Brown & Ryan, 2003, p. 822). Grit, conscientiousness, and mindfulness are very overlapping concepts, but are still distinct in their manifestations and effects on an individual's emotional state.

Research has established a firm theory that mindfulness is one antecedent to resilience. Those with heightened senses of mindfulness display greater resilience, subsequently increasing their own emotional well-being (Bajaj & Pande, 2016, p. 63). Those that are characterized by a high level of grit tend to be particularly resilient. They “resolve to make tomorrow better,” utilizing a pattern of positive emotion regulation to manage their motivation levels (Duckworth, 2016, p.169). Duckworth describes what she terms a “growth mindset,” in which an individual focuses on challenges as opportunities for growth rather than failure. With this growth mindset as a base combined with other psychological factors, the result is usually perseverance over adversity. This cycle represents “resilience training,” as it has been coined in the literature (Duckworth, 2016, p. 192).

The Dark Side

Long distance running is a double-edged sword: there can be a dark side to personality traits associated with committed runners. These athletes are more prone to perfectionism and trait anxiety (Coen & Ogles, 1993, p. 348), highly sensitive to internal sensations of anxiety (Saborin, Stewart, Watt, & Krigolson, 2015, p. 264), and generally lack self-awareness in order to “push through” the pain of daily training rituals (Jaeschke, Sachs, & Dieffenbach, 2016, p. 244). The very traits that make an individual a successful long distance runner may also corrode mental health.

Traditionally, the resilient traits that runners tend to display have been assumed to promote psychological health, just as they contribute to athletic success (Morgan, O'Connor, Ellickson, & Bradley, 1988, p. 250). It is also possible that resilience, like grit, reaches a point of diminishing returns in the face of depression and anxiety, conferring vulnerability to psychiatric problems. More generally, runners may be vulnerable to rigidity, perfectionism, and excessive worry (Coen, & Ogles, 1993, p. 348-349). Extreme levels of grit have been linked with emotional dysfunction (Credé et al., 2017, p. 495). Exploring the dynamic network of traits associated with running, and all that attract individuals to the sport, will help reveal more about resilience as a concept. Currently, there is little to no research examining the connections between grit, personality profiles, and psychological resilience.

Resilience

As the classic saying goes, “fall down seven times, stand up eight.” This adage encapsulates what it means to be resilient. Resilience is defined as the ability to respond to adverse events in adaptive, creative ways, and to do so with optimism and curiosity. As a construct, resilience is not a directly observable behavior, but rather one’s pattern of reaction to difficulties (Tugade, Fredrickson, & Barrett, 2004, p. 8). Resilient people use their hardships in order to emotionally fortify themselves. Furthermore, they reflect on their past failures in order to learn for the future (Southwick, Vythilingam, & Charney, 2005, p. 255).

Resilience is bolstered by industriousness in the face of life stress, a “never give up” attitude, and meditation; essentially, conscientiousness, grit, and mindfulness (Rogers, 2013, p. 545).

Resilience is a particularly advantageous trait in the face of the stress of life. The effects of stress are negatively associated with resilience, and positively associated with symptoms of anxiety and depression (Anyan & Hjemdal, 2016, p. 213). In the face of psychological adversity, high levels of resilience attenuate the additional vulnerability created by environmental challenges (Luthar, Cicchetti, & Becker, 2000, p. 543). Additionally, there is a direct psychobiological relationship between the autonomic activation of stress hormones, psychopathology, and resilience. There are “eleven possible neurochemical, neuropeptide, and hormonal mediators of the psychobiological response to extreme stress and resilience.” Developing the skills that contribute to individual level of resilience rewires the brain (Charney, 2004, p. 204). A greater understanding of why some individuals are able to cope with extreme stress with minimal psychopathological consequences is necessary to fully understand, and therefore improve upon, resilience research (Charney, 2004, p. 209-210).

Extreme stress and other environmental factors, in combination with genetic propensity, can predispose to mental illness. While it is not the only relevant factor to consider, resilience can mitigate the pathogenic effects of life stress. “Resilience may be viewed as a measure of stress coping ability and, as such, could be an important target of treatment in anxiety, depression, and stress reactions” (Connor & Davidson, 2003, p. 76). Clinical psychology is marked by different opinions, schools of thought, and theories regarding effective treatment for mental illness. Resilience is a common factor amongst them all (Connor & Davidson, 2003, p. 81). Specifically, psychological resilience is defined as “the ability to bounce back from negative events by using positive emotions to

cope.” From a psychopathological perspective, resilience is the skill that brings adverse events into focus and provides a more productive perspective (Tugade et al., 2004, p. 12).

Resilience is inherently valuable, and additionally so due to its plasticity. Any individual, regardless of biological or environmental predisposition, has the ability to cultivate a deeper sense of resilience (Southwick et al., 2005, p. 255).

Resilience and Emotional Disorder Symptoms

Resilience to psychopathology is an urgent topic. More than 17 million people in the United States today struggle with major depressive disorder, with an annual cost of more than \$43 billion. There are equally concerning comorbidity rates of depression with anxiety disorders, which also have debilitating, life-altering consequences (NIMH, 2018). It is now, more than ever before, crucial to examine exactly what constitutes resilience in order to further cultivate the positive trait on a global scale. The present study will examine how resilience is connected to symptoms of anxiety and depression.

Anxiety and depression are the two most common forms of emotional psychopathology in the world. Clinical anxiety is defined as uncontrollable fear and crippling worry that has detrimental effects on an individual’s day-to-day life (Nutt & Ballenger, 2003, p. 51). These worries are “...more pervasive, pronounced, and distressing; have longer duration; and frequently occur without precipitants.” Additionally, depressive disorders are marked by the presence of a sad, empty, or irritable mood, accompanied by somatic and cognitive changes that significantly affect an individual’s capacity to function (DSM-5, 2013, p. 222). As previously mentioned, the two have incredibly high comorbidity rates with one another.

The Present Study

Personality could explain why runners experience less anxiety and depression. Research shows runners are more protected from emotional problems, but the specific traits producing this effect remain unknown. Figure 1 presents a conceptual diagram of the possible links between running, personality, resilience, and emotional disorder symptoms.

We predict that runner status will predict higher trait levels of conscientiousness, grit, and mindfulness. Furthermore, we hypothesize that higher levels of conscientiousness, grit, and mindfulness will predict higher levels of resilience. Finally, we expect that resilience will predict lower levels of anxiety, depression, and stress.

Figure 1.

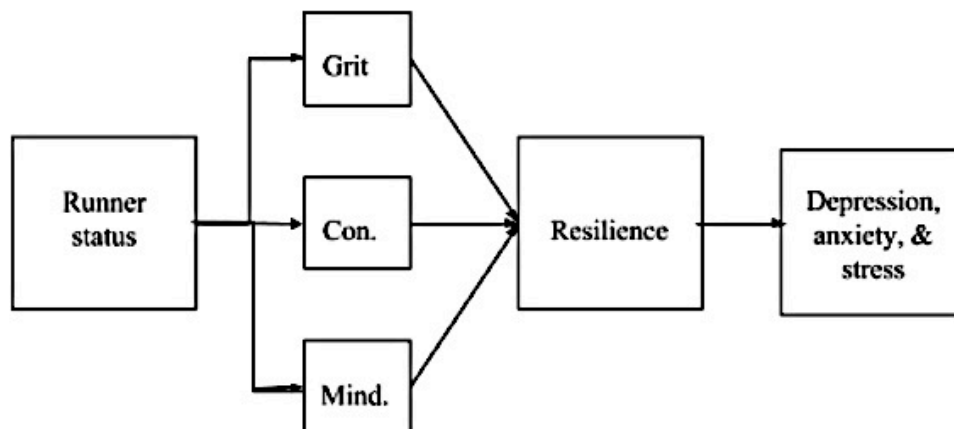


Figure 1: General conceptual diagram

Method

Participants

Participants were 222 William & Mary students recruited via the Psychology research participant pool. 112 (50.5%) were considered runners and 110 (49.5%) were

considered non-runners, as defined below. “Runners” were students who reported running 1-40 miles/week. “Non-runners” reported running 0 miles/week and no motivation to participate in long distance running.

Participants completed all questionnaires via the Qualtrics online survey administration platform. 106 participants, 47.7% of our sample, were male, and 166 participants, 52.3% of our sample, were female. See Table 1 for the sample’s race/ethnicity composition.

Table 1.

Race/Ethnicity	N	%
Asian	38	17.1%
Black	21	9.5%
Hispanic	21	9.5%
Middle Eastern	9	4.1%
Native American	2	0.9%
Pacific Islander	1	0.5%
Self-Identify	4	1.8%
White	162	73.0%

Measures

Depression and Anxiety Stress Scale (DASS)

Participants took the DASS (Lovibond & Lovibond, 1995, p. 355) to determine a global index of depression and anxiety symptomatology, as well as life stress. The DASS is a 42-item self-report measure of depression, anxiety, and stress (Parkitny, & McAuley, 2010, p. 204). Total scores were calculated by summing the items on each subscale.

Answers were scored on a four-point Likert scale from 1, “did not apply to me at all” to 4, “applied to me very much, or most of the time.” Prior research has found that aerobic exercise significantly reduces depression, anxiety, and stress as measured by the DASS (Carneiro et al., 2015, p. 48). The current literature shows that the DASS demonstrates

good discriminant validity as well as convergent validity (Akin & Çetin, 2007).

Additionally, the test-retest and split-half reliability coefficient scores were .99 and .96, respectively (Akin & Cetin, 2007). The DASS also shows high reliability and internal consistency. In this study, the Cronbach's alpha for the overall DASS was found to be $\alpha = 0.97$ $\alpha = 0.95$ for depression, $\alpha = 0.90$ for anxiety, $\alpha = 0.94$ for stress. See Table 2 for descriptive statistics.

Table 2.

DASS Component	Mean	SD
Depression	22.09	8.52
Anxiety	18.72	6.18
Stress	23.35	8.86
Total	64.17	20.74

Big-Five Aspect Scale (BFAS)

Participants took the BFAS (DeYoung, Quilty, & Peterson, 2007, p. 877-878) to assess their personality profiles according to the Big-Five model. The BFAS is a 100-item self-report questionnaire in which participants answer based on a 5-point Likert scale ranging from 1, "strongly disagree," to 5, "strongly agree." Total scores were calculated based on the sum of the five personality domains: agreeableness, conscientiousness, extraversion, neuroticism, and openness. Each domain was represented by two factors underlying the shared variance within each domain, represented by a subscale. While we administered the entire BFAS, the variable of note in this study is conscientiousness.

Conscientiousness is defined as an individual's responsibility, competence, dependability, and self-discipline (Giluk, 2009, p. 805). Based on factor analyses, the two

primary subdomains of conscientiousness are “industriousness” and “order.” In prior studies, it has been found that extreme forms of conscientiousness can be maladaptive (DeYoung, Quilty, & Peterson, 2007, p. 892). When compared to other measures of personality, such as the Big Five Inventory, BFI, and the Revised NEO Personality Inventory, NEO-PI-R, the BFAS displayed high reliability. The Cronbach’s alpha was $\alpha = 0.85$ for the BFAS Conscientiousness scale.

Grit Scale

Participants took the 12-Item Grit Scale (Duckworth, 2016). Grit is defined as “passion and perseverance toward long-term goals,” (Duckworth et al., 2007, p. 1087). Answers were scored on a five-point Likert scale from 1, “not like me at all,” to 5, “very much like me.” The alpha coefficient was $\alpha = 0.82$. Total scores were calculated based on the sum of all 12 items.

Five-Factor Mindfulness Questionnaire (FFMQ)

Participants took the 39-item FFMQ (Baer et al., 2006, p. 125) to measure their level of mindfulness. Mindfulness is defined as a sense of awareness and non-reactivity toward external and internal observations and experiences (Giluk, 2009, p. 805). Answers were scored on a five-point Likert scale from 1, “never or very rarely true,” to 5, “very often or always true.” Total scores were calculated based on the sum of all 39 items. The Cronbach’s alpha was calculated as $\alpha = 0.93$.

Connor-Davidson Resilience Scale (CD-RISC)

Participants took the 25-item CD-RISC (Connor & Davidson, 2003) to measure individual levels of resilience. Resilience is defined as the temperament, traits, and abilities that allow an individual to cope with stress and “bounce back” from adversity.

Answers were scored on a five-point Likert scale from 0, “not true at all,” to 4, “true nearly all the time.” Total scores were calculated based on the sum of all 25 items. The CD-RISC shows high internal consistency, with a Cronbach’s coefficient of $\alpha = 0.933$. Additionally, the scale demonstrates test-retest reliability, and convergent and discriminant validity as compared to other measures of resilience (Connor & Davidson, 2003, p. 80). Resilience intervention methods for clinical samples are strongly rooted in conscientiousness, grit, and mindfulness. For example, dialectical behavioral therapy (DBT) is a common treatment modality used in cases of eating disorders, bipolar disorder, major depressive disorder, generalized anxiety disorder, obsessive-compulsive disorder, and other mental illnesses. DBT is centered on the practice of self-awareness, distress tolerance, and meditation: essentially conscientiousness, grit, and mindfulness respectively (Robins, 2002, p. 50). Furthermore, the current literature shows that resilience improves outcomes of anxiety and depression (deVibe et al., 2018, p. 78).

Results

Correlational Analyses

Table 3 presents the correlations among the main study variables. Runner status was weakly, albeit statistically significantly, correlated with grit ($r = -.15, p < .05$) and conscientiousness ($r = -.17, p < .05$). There was a small and non-significant relationship between runner status and mindfulness ($r = -.12, p = .07$). Resilience was robustly correlated with grit ($r = .55, p < .01$), conscientiousness ($r = .41, p < .01$), and mindfulness ($r = .55, p < .01$) (Table 3).

Table 3.

Measure	Conscientiousness	Grit	Mindfulness	Runner Status
Conscientiousness	1			
Grit	.63**	1		
Mindfulness	.46**	.47**	1	
Runner Status	-.17*	-.18*	-.12	1

** . Correlation is significant at the .01 level (2-tailed).

* . Correlation is significant at the .05 level (1-tailed).

One-Way Analysis of Variance

We hypothesized that the highest rates of psychopathology symptoms will be associated with non-runner status and that there would be lower rates of symptomology in runners. A one-way ANOVA was conducted to compare the effect of runner status on anxiety, depression, and stress.

The analysis of variance showed that the effect of runner status on depression was significant ($\eta^2 = .04$, $F(1, 220) = 8.27$, $p < .05$], as well as significant for overall symptomology ($\eta^2 = .03$, $F(1, 220) = 5.69$, $p < .05$). The analysis of variance did not show a significant effect of runner status on anxiety ($\eta^2 = .01$, $F(1, 220) = 1.86$, $p = .17$) or stress ($\eta^2 = .02$, $F(1, 220) = 3.62$, $p = .06$). For all symptom dimensions, runner status explained less than 5% of outcome variance. In the present study, runners reported more problems with depression, anxiety, and stress.

Hypothesis I- Runner Status and Personality

Simple linear regressions were calculated to predict levels of conscientiousness, grit, and mindfulness based on runner status. The regressions of conscientiousness ($R^2 = .03$, $F(1, 220) = 6.75$, $p < .05$) and grit ($R^2 = .02$, $F(1, 220) = 4.95$, $p < .05$) on runner status were both statistically significant. There was not a significant relationship between

runner status and mindfulness ($R^2 = .012$, $F(1, 220) = 3.26$, $p = .07$). See Table 4 for standardized effect sizes.

Table 4.

Source	B	SE B	β	<i>t</i>	<i>p</i>
Conscientiousness	-3.62	1.39	-.17	-2.60	.01
Grit	-2.09	.94	-.15	-2.23	.03
Mindfulness	-6.62	3.66	-.12	-1.81	.07

Hypothesis II- Personality and Resilience

A multiple linear regression was calculated to predict resilience based on conscientiousness, grit, and mindfulness. Overall, these three predictors explained a significant portion of the variance in resilience ($R^2 = .41$, $F(3, 218) = 50.66$, $p < .05$).

Examining the unique effects of the individual predictors in the multiple regression, we found that grit significantly predicted resilience ($t(221) = 5.25$, $p < .05$) while controlling for conscientiousness and mindfulness, as did mindfulness ($t(221) = 6.83$, $p < .05$) while controlling for conscientiousness and grit. Conscientiousness did not predict resilience while controlling for grit and mindfulness ($t(221) = .08$, $p = .94$). See Table 5 for effect sizes.

Table 5.

Source	B	SE B	β	<i>t</i>	<i>p</i>
Conscientiousness	.01	.10	.01	.08	.94
Grit	.76	.14	.36	5.25	.00
Mindfulness	.21	.03	.38	6.29	.00

Hypothesis III- Resilience and Psychopathology

Simple linear regressions were calculated to predict depression, anxiety, and stress levels based on resilience. Significant regressions were found regarding all three outcome variables. Specifically, a significant regression was found ($R^2 = .19$, $F(1, 220) =$

52.27, $p < .05$) regarding depression, anxiety ($R^2 = .08$, $F(1, 220) = 19.39$), and stress ($R^2 = .07$, $F(1,220) = 15.23$). The overall composite on the DASS was also significantly linked with resilience levels ($R^2 = .14$, $F(1,220) = 35.19$). See Table 6 for effect sizes.

Table 6.

Source	B	SE B	β	<i>t</i>	<i>p</i>
Depression	-.25	.04	-.44	-7.23	.00
Anxiety	-.12	.03	-.285	-4.40	.00
Stress	-.15	.04	-.25	-3.90	.00
Total	-.52	.09	-.37	-5.93	.00

Discussion

Overview of Aims and Findings

Depression and anxiety are the most prevalent forms of mental disorder in the United States (NIMH, 2018). They are associated with significant distress, impairment, morbidity, and mortality (Seligman, Schulman, & Tryon, 2006, p. 1111). They also co-occur often.

Depression and anxiety clearly represent a major public health problem. Therefore, it is important to understand the factors that confer resilience to these conditions. Research shows that certain personality traits protect against internalizing problems (Watson, Wiese, Vaidya, & Tellegen, 1999, p. 820). Resilience is defined as the ability to respond to adverse events in adaptive, creative ways, and to do so with optimism and curiosity (Tugade et al., 2004, p. 12). Specifically, resilience is bolstered by traits such as conscientiousness, grit, and mindfulness (Rogers, 2013, p. 545).

The present study explored how resilience might fit in the causal chain involving running, personality, and emotional problems. Prior research has established clear connections between personality characteristics and emotional well-being (Baer, 2006, p.

125; Bajaj & Pande, 2016, p. 63; Brown & Ryan, 2003, p. 822; Credé et al., 2017, p. 495; Duckworth, 2016; Kong, Wang, & Zhao, 2013; Li et al., 2018, p. 232; Schutte & Malouff, 2010, p. 1116; Smith, Ryan, & Röcke, 2013, p. 15). We extended this line of research to examine how running fits into the equation.

The first main aim of the present study was to analyze the effect of runner status on conscientiousness, grit, and mindfulness. We found that runner status predicts lower levels of conscientiousness and grit, contrary to our hypothesis. There was not a significant relationship predicting mindfulness from one's runner status, but the effect was in the same (negative) direction. While the effect sizes were small ($\beta = -.17$ for conscientiousness, $\beta = -.15$ for grit, and $\beta = -.12$ for mindfulness), runners in our study tended to be *less* conscientious, gritty, and mindful. This finding is inconsistent with much of the prior research that suggests that runners display higher levels of these traits (Bebetsos & Goulmaris, 2015, p. 500; Gucciardi, Hanton, & Fleming, 2017, p. 307; Raglin & Wilson, 2009, p. 275). Runner status accounted for 3.6% of the variance in depression symptomology, 8% of anxiety symptomology, and 2.5% of overall symptomology (i.e., the combination of depression, anxiety, and stress scales on the DASS) in this sample. Runner status did not have a statistically significant effect on depression, anxiety, or stress.

Our next hypothesis was that personality would predict an individual's resilience. Together, the three personality traits accounted for 41% of the variance in resilience, a large collective effect. Specifically, as we predicted, there was a strong positive relationship of both grit and mindfulness with resilience. Additionally, there was a positive, albeit non-significant, relationship between conscientiousness and resilience

(Figure 2). Furthermore, in our correlational analyses, we found that each of the three traits were strongly associated with one another. For example, conscientious individuals tended to be more gritty and mindful. These findings are in accordance with prior research (Baer et al., 2006; Credé et al., 2017, p. 495; Duckworth & Seligman, 2017, p. 715; Giluk, 2009, p. 805; Li et al., 2008, p. 236; Raphiphattana et al., 2019, p. 148).

Figure 2.



Figure 2. Personality and resilience. Bold arrows indicate a statistically significant relationship.

Finally, we considered the relationship between resilience and depression, anxiety, and stress. As predicted, resilience was significantly inversely associated with levels of all three facets of symptomology: depression, anxiety, and stress. Resilience predicted 14% of the variance of the DASS total score (i.e., combination of depression, anxiety, and stress scales) (Figure 3).

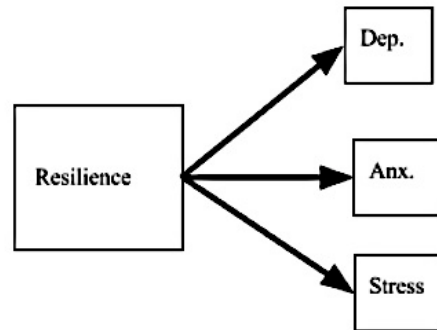
Figure 3.

Figure 3. Resilience and symptomology.

Implications and Future Research

Our research was able to fill in gaps in the literature regarding exercise, personality, and resilience. Furthermore, we were able to contribute to the extensive literature identifying resilience as a coping mechanism for depression, anxiety, and stress.

One unexpected finding of this study is that runner status was associated with lower levels of conscientiousness, grit, and mindfulness. Additionally, running was not found to be associated with anxiety or depression. These findings countered both our hypothesis and most current literature. Our participant pool consisted of mainly recreational runners, while most research is conducted on specifically competitive long-distance runners. Therefore, our sample was meaningfully different than that of prior studies. It is possible that our participants mostly turned to running as a coping strategy because they are low in conscientiousness, grit, and mindfulness.

Furthermore, the vast majority of psychological research conducted with runners is with regards to eating disorders (Coen & Ogles, 1993, p. 399, p. 338; Leedy, 2000, p. 255; Smolak, Murnen, & Ruble, 2000, p. 371). While this topic is incredibly important,

the present study did not address eating concerns other than the subset of our motivation questionnaire, which asked if individuals who chose to run do so in order to lose weight (see Appendix). Additionally, our sample consisted entirely of students at a medium-sized southern university enrolled in introductory psychology courses. This is not representative of the general US population.

Conclusion

In this study, we have shown that conscientiousness, grit, and mindfulness strongly predict resilience. Furthermore, resilience predicts lower levels of depression, anxiety, and stress. This positive association supports previous findings, which have argued that certain traits can bolster mental health. In contrast with previous research, we observed inverse, but weak, associations between running and adaptive personality traits. This set of effects merits attention in future studies across various populations of runners (e.g., younger versus older, casual versus elite).

Appendix

Supplementary Analysis- Mileage

A multiple linear regression was calculated to analyze the relationship between conscientiousness, grit, mindfulness, resilience, depression, anxiety, and stress as predictor variables for amount of weekly mileage. Non-runners had a weekly mileage of 0 miles. A non-significant regression was found ($R^2 = .24$, $F(7, 220) = 1.83$, $p = .08$) regarding mileage on personality, resilience, and psychopathology. See Table 7 for effect sizes.

Table 7.

Source	B	SE B	β	<i>t</i>	<i>p</i>
Conscientiousness	.02	.07	.03	.35	.73
Grit	-.10	.11	-.09	-.93	.36
Mindfulness	.03	.03	.11	1.17	.24
Resilience	.08	.05	.14	1.50	.14
Depression	-.10	.09	-.11	-1.10	.27
Anxiety	.13	.14	.10	.92	.36
Stress	-.03	.11	-.03	-.24	.81

Supplementary Analysis- Running Motivation

A correlation analysis was run to examine the relationship between intrinsic and extrinsic motivations for running, levels of conscientiousness, grit, mindfulness, resilience, depression, anxiety, and stress. Higher levels of intrinsic motivation were correlated significantly with mindfulness and resilience. Furthermore, extrinsic motivation was correlated with the motivation to run in order to lose weight. Prior research has shown that there are incredibly strong and dangerous connections between long distance running and eating disorders; control mechanisms focused on food consumption and body image (Smolak, Murnen, & Ruble, 2000, p. 372). 77% of our sample of runners admitted to running in order to control their body size and weight. Eating disorders could contribute to an individual's depression, anxiety, and stress. While we did not assess participants on any scales regarding eating disorders, the pressure to be thin in long distance running, and society in general, is pervasive. We would be remiss to not mention the prevalence of eating disorders within this sport, and how it could have skewed our results.

Table 8.

Measure	Intrinsic	Extrinsic	Conscientious	Grit	Mindfulness	Resilience	Depression	Anxiety	Stress	Weight
Intrinsic	1									
Extrinsic	.24	1								
Conscientious	.06	.04	1							
Grit	.16	.05	.62**	1						
Mindfulness	.22*	.13	.31**	.36**	1					
Resilience	.27**	.13	.39**	.59**	.56**	1				
Depression	-.06	.12	-.23*	-.29**	-.37**	-.47**	1			
Anxiety	-.02	-.06	-.10	-.20*	-.25**	-.22**	.55**	1		
Stress	.20	-.03	-.11	-.23*	-.34**	-.24**	.60**	.76**	1	
Weight	-.11	.38**	.14	.12	-.03	.02	.26**	.12	.14	1

** . Correlation is significant at the .01 level (2-tailed).

* . Correlation is significant at the .05 level (1-tailed).

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