

Grit and Academic Success in Graduate Masters-Level Athletic Training Programs



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ABSTRACT: A construct termed *grit*, a non-cognitive personality trait, defined as the perseverance and passion for achieving long-term goals, was introduced by Duckworth et al. Grit entails working tirelessly to reach goals while maintaining determination and interest despite obstacles that hinder progress. Although grit-scale surveys are included as part of the application process in other healthcare professional education programs, no published literature cites grit-scale surveys as part of the applications process in Masters-level athletic training (MSAT) programs. The problem addressed is the current lack of grit-scale utilization during the admission process to MSAT programs as a non-cognitive tool to contribute to identifying applicants who will be academically successful. The National Athletic Trainers' Association Research Survey Service was utilized to send a web-based survey to over 1000 email addresses. Data was analyzed using the most current version of SPSS (26.0) and was analyzed over four stages. All variables in the study were examined using descriptive statistics. Examples of descriptive statistical analysis used were mean and standard deviation, nominal/ordinal level frequency and percentage of categorical variables, and interval and ratio levels of values for continuous variables. Results of the study uncovered that Grit-S scores were higher in participants who attempted to complete the BOC exam more than once. Grit-S scores were lower in participants who had experienced severe human suffering. No demographic variable (age, racial and ethnic identity, gender) was found to correlate with the Grit-S score. Although the first-time pass rate of the BOC exam was not positively correlated with a higher grit score, Grit continues to reveal itself as a positive indicator of academic success. To maintain and increase alignment with other healthcare professional education programs, the use of Grit-S assessments during the admissions process as an identifier of applicants who will maintain determination and interest, despite failures, setbacks, and plateaus is recommended.

KEYWORDS: Interprofessional education, online learning, synchronous learning, distance learning, immersive experiences.

I. INTRODUCTION

The Commission on Accreditation of Athletic Training Education (CAATE), the governing body which endorses professional athletic training programs (ATPs) that meet minimum requirements, dictates that entry-level professionals demonstrate competency and proficiency of essential theoretical and clinical skills.^{1,2} This requirement is met by the completion of both didactic and clinical education, and students must earn a minimum score of 500 on the nationally recognized Board of Certification Examination (Board of Certification).³ Beginning in the Fall of 2022, all ATPs will be required to transition from bachelor-level degrees to master's-level degrees.¹ Information obtained in the 2020 reporting period shows 139 CAATE-accredited master's-level AT (MSAT) degree programs in the United States.¹ With the transition to a graduate-level degree, athletic training education will strengthen its alignment with its peer healthcare professional degrees, such as physician assistants, occupational therapy, physical therapy, and nursing.² MSAT programs require two years of intense, dedicated coursework and intentional clinical study in the field of athletic training.¹ Curricula requiring such length and intensity demand its students to fully immerse themselves in the educational materials and practices, petitioning that they be intentional in their preparation for their future profession.

To ensure that ATPs are preparing students for success in the profession, CAATE published standards designed to oversee and safeguard the quality of the education provided. Until 2022, ATPs were required to meet or exceed a three-year cumulative first-time BOC pass rate of 70% or higher.^{1,3} Now ATPs must make a 10-year history of program graduation rate, program retention rate, BOC pass rates, and graduate employment rates available. The intentional preparation needed to meet this first-time pass rate can be straining on athletic training students. While attrition is necessary to ensure that only competent students become practicing athletic trainers,² attrition in excess can damage a program or practice's reputation. Limiting attrition from ATPs while producing strong professional athletic trainers is essential to maintaining the status and quality of professional ATPs.^{2,4}

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The National Athletic Trainers' Association (NATA) published a document delineating the foundational behaviors for professional athletic training practice,⁵ while Prentice⁶ acknowledged that it takes a particular set of personality traits and characteristics to become a successful athletic trainer. A construct termed *grit*, a non-cognitive personality trait, defined as the perseverance and passion for achieving long-term goals, was introduced by Duckworth et al.⁷ Grit entails working tirelessly to reach goals while maintaining determination and interest despite obstacles that hinder progress. Although grit-scale surveys are included as part of the application process in other healthcare professional education programs,⁸ no published literature cites grit-scale surveys as part of the applications process in MSAT programs. This lack of publication indicates a void in the literature that this study resolved to satisfy. The inclusion of grit-scale surveys in the MSAT application process has the potential to aid in the identification of applicants who will achieve academic success within these programs. For the purpose of this study, academic success is defined as successful completion of the BOC exam on the first attempt.

By identifying individuals high in grit during the application process, MSAT programs may increase student retention, thus increasing the overall quality and volume of available athletic trainers in the profession while remaining in good standing with CAATE. Further research on grit as a predictor of academic success is essential as it can influence future admissions into healthcare professional education programs, increase perceived quality of life,⁸ decrease burnout rates, and be developed⁹ to increase the opportunities for success in students at-risk of attrition.

The problem is there is a current lack of grit-scale utilization during the admission process to MSAT programs as a non-cognitive tool to contribute to identifying applicants who will be academically successful. A shared objective of healthcare professional education programs is to enroll students with the most potential for academic success and a long-term career in a healthcare profession.¹⁰ The selection and admissions process can be difficult, particularly when the quantity of seemingly qualified applicants surpass program limitations. The ability to predict academic success in any healthcare professional education program has the potential to change the admission processes.¹¹

II. RESEARCH PURPOSE

The purpose of this non-experimental quantitative correlational study was to examine the current lack of grit-scale utilization during the admission process to MSAT programs as a non-cognitive tool to contribute to identifying applicants who would be academically successful. This study also intended to address whether the number of adverse life events and demographic variables modulated grit score. This was accomplished by collecting primary data from an online survey of recent graduates from CAATE-accredited MSAT programs across the United States. Participant inclusion criteria were recent graduates from a CAATE-accredited MSAT program (five years or less) and at least one BOC exam attempt within the past five years. The exclusion criteria for participants are current MSAT students, have never attempted the BOC exam, or attempted the BOC exam six or more years ago.

The non-experimental quantitative correlational study aimed to answer the following research questions:

RQ1: What is the relationship, if any, between post-graduation Grit-S survey scores and the number of attempts to successful completion of the BOC exam in recent graduates of masters-level athletic training programs?

RQ2: What is the relationship, if any, between age and Grit-S survey scores in recent graduates of masters-level athletic training programs?

RQ3: What is the relationship, if any, between racial and ethnic identity and Grit-S survey scores in recent graduates of masters-level athletic training programs?

RQ4: What is the relationship, if any, between gender and Grit-S survey scores in recent graduates of masters-level athletic training programs?

RQ5: What is the relationship, if any, between the number of adverse life events and Grit-S survey scores in recent graduates of masters-level athletic training programs?

RQ6: What impact, if any, does adverse life events have on the relationship between gender and Grit-S survey scores in recent graduates of masters-level athletic training programs?

A. Hypotheses

The following alternative hypotheses were tested:

H₁: There is a relationship between higher Grit-S survey scores and the number of attempts to successfully complete the BOC exam in recent graduates of masters-level athletic training programs.

H₂: There will be a relationship between age and Grit-S scores at a statistically significant level in recent graduates of masters-level athletic training programs.

H₃: Grit-S scores will vary by racial/ethnic identity at a statistically significant level in recent graduates of masters-level athletic training programs.

H₄: Grit-S scores will vary by gender at a statistically significant level in recent graduates of masters-level athletic training programs.

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H₅: There is a relationship between the number of adverse life events and higher Grit-S survey scores in recent graduates of masters-level athletic training programs.

H₆: Adverse life events will moderate the relationship between gender and higher Grit-S survey scores in recent graduates of masters-level athletic training programs.

III. METHODOLOGY

A. Research Design

This study used a non-experimental correlational online survey design to examine whether positive relationships between grit and academic success can be predicted in master's-level athletic training students. The study also assessed if relationships between grit levels and demographic variables, as well as grit levels and adverse life events can be discovered. A non-experimental design was chosen as there were no control groups or interventions. An online survey design was chosen with the intent of reaching a large sample population to strengthen the generalizability of the results. This is a commonly used tool to expeditiously obtain a geographically and culturally diverse sample.¹²

Participants completed an online survey that consisted of the validated Grit-S survey (Duckworth & Quinn, 2009), the Life Events Checklist-5,¹³ and demographic questions. The validated Grit-S survey contained eight statements to measure a respondents' level of Consistency of Interest and Perseverance of Effort. The Life Events Checklist-5 contained sixteen statements that described stressful or traumatic events for participants to indicate whether they had experienced, witnessed, heard about, were in regular contact with as part of their career, or were not applicable to their life.

The adaptation of both the Grit-S survey and the Life Events Checklist-5 into one survey was indicated through previous research. While many studies have considered grit as an accurate predictor of academic success and retention¹³ and studies regarding adverse life events have found that limited exposure to hardship can have a positive effect on the development of grit, the two have two concepts have not been studied together, particularly in the athletic training population. The incorporation of both sets of statements will potentially shed further insight on the development of grit and provide new insight on grit and academic success in the athletic training population.

Cross-sectional data collection was accomplished through a survey. The time frame and instrument to be used are similar to the design of this study; however, cross-sectional designs are unable to determine relationships (Eddy, 2016), which was the intent of this study and, therefore, an unfavorable choice. A longitudinal cohort study design is another option. This design would assess first-year MSAT students' level of grit and adverse life events. It would then follow them through attrition or completion of their MSAT program. The benefit of this would be the ability to prove or refute hypotheses made upon entry to the MSAT program. While this would potentially provide the most robust data, the time frame needed to complete a longitudinal cohort study design is beyond the scope and ability of this research study, and thus, not a satisfactory choice. This solidifies the need for a non-experimental correlational study design to add to the body of knowledge on grit and provide insight on grit and academic success in athletic training, which represents a current gap in the available literature.

B. Population and Sample

Recent graduates (five years or less from January 2022) from CAATE-accredited MSAT programs nationwide, who met the requirements to practice in their respective states, were the desired audience for participation. The BOC released the most recently updated Standards for Professional Practice in October 2017.³ By recruiting participants who graduated from an MSAT program within the last five years or less, it was assumed that participants had been exposed to and tested against these standards, which helps ensure standardization for the BOC Exam (e.g., students attempting the BOC in 2011 will have seen a different version of the exam than those attempting the BOC exam in 2019).

Though the population is very focused (recent MSAT graduates from CAATE-accredited programs), this study utilized a convenience sampling strategy. Convenience sampling uses a non-probability method.¹² In this technique, all within the population have equal opportunity for participation. The size of the sampling pool, and which pool is generally more comprehensive compared to other sampling strategies, is a benefit to convenience sampling. This increases the prospect of a larger number of participants, which increases the statistical power and generalizability of the results.

This study collected primary data from an online survey tool delivered to the email addresses retrieved from the National Athletic Trainers' Association Research Survey Service, the Athletic Training Association of Florida email registry, the Florida Department of Health Athletic Training email registry, and the Southeast Athletic Trainers Association email registry.

When determining sample size, the significance criterion (alpha), effect size (small, medium, large), and confidence interval or power must be considered.¹⁴ The hypothesized relationship for this study was moderate to strong, thus requiring the effect size (r) of either .30 or .50. The alpha value remained at 0.05, according to recommendations based on empirical data,¹² and power ($1-\beta$) as set to .80, indicating that there is a 20% chance of a false-negative conclusion that the outcome was incorrectly classified.¹⁴ Using this equation, the sample size needed to find statistical significance in this study was 85 participants. However, to ensure a sufficient amount of data is available, this project sought a minimum of 100 participants.

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C. Data Collection

The instruments used to collect data in this study were the Grit-S survey⁷ and the Life Events Checklist-5.¹³ The first five questions prior to the Grit-S survey items were related to participant demographics and the number of attempts to earn a passing score on the BOC Exam. As discussed in Chapter 2, the Original Grit-Scale was developed by Duckworth et al.⁷ and subsequently improved upon by Duckworth and Quinn.¹⁵ The improved survey was named Short Grit Scale, also known as Grit-S.

The Grit-S is an 8-item survey used to quantify a respondent's level of total grit, and Consistency of Interest and Perseverance of Effort.^{11,15} The Grit-S was validated by re-sampling four groups used in the validation of the Original Grit Scale. The results verified the Grit-S scale to have increased sensitivity to detect and measure trait-level grit – the Consistency of Interest and Perseverance of Effort, was found to sustain test-retest reliability and predictive validity, and maintain internal consistency.¹⁵ Scoring for the Grit-S survey is illustrated in Table 1. After all questions have been appropriately assigned points, the sum of all points will be derived, and divided by eight. According to Duckworth and Quinn,¹⁵ the maximum score achievable on the Grit-S survey is five (considered extremely high in grit); the lowest score achievable on the survey is one (considered extremely low in grit).

Table 1. Grit-S Survey Scoring

| Question Numbers | Point Assignment |
|------------------|--|
| 2, 4, 7, and 8 | "Very much like me" = 5 points "Mostly like me" = 4 points "Somewhat like me" = 3 points "Not much like me" = 2 points "Not much like me at all" = 1 point |
| 1, 3, 5, and 6 | "Very much like me" = 1 point "Mostly like me" = 2 points "Somewhat like me" = 3 points "Not much like me" = 4 points "Not much like me at all" = 5 points |

The Life Events Checklist-5 is a sixteen-item self-reported instrument designed to gather information and assess for occurrences of potentially distressing events in the respondent's lifetime. This validated instrument evaluates exposure to events linked to resulting in Post-Traumatic Stress Disorder (PTSD) symptoms and includes one open-response for respondents to describe any distressing events not captured in the previous sixteen statements.¹³ The Life Events Checklist-5 has been validated and found to reliably measure psychometric properties resulting from traumatic exposure.¹³ The checklist is frequently used in combination with another instrument. There is no formal scoring protocol for the Life Events Checklist-5 and it does not produce a composite score. The intention is simply to detect if an individual has identified experiencing one or more potentially traumatic events. A copy of the Life Events Checklist-5 is included in Appendix A. Although developed by Weathers et al.,¹³ the instrument is housed and published by the United States Department of Veteran Affairs National Center for PTSD.

VI. DATA ANALYSIS AND RESULTS

A. Analysis

Following data collection, the data were prepared and then analyzed to determine the common themes in Pearson's r correlations were used to examine if any explanatory variables (*number of attempts to complete the BOC exam, age, racial/ethnic identity, gender, adverse life events*) were significantly related to the dependent variable, *Grit-S Scores*. Finally, Bivariate and MLR analysis indicated whether hypothesis testing could accept or reject the null hypothesis. These analyses were conducted in relation to each research question.

Table 2 presents a Pearson's r correlation examining the relationship between Grit-S scores and the summed experiences by exposure type. As shown, there are six exposure-type responses study participants could choose from. Therefore, this analysis was run to examine if any of the six adverse life event exposure types were significantly associated with the Grit-S score.

Table 2. Pearson's r Correlation Between Grit-S Scores and Types of Summed Exposures (n=20)

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|----|-----|------|-------|-------|------|------|
| 1. Grit-S Scores | -- | .12 | .06 | .18 | -.08 | -.31 | .34 |
| 2. Exposure: Happened to Me | | -- | .53* | .54* | .59** | -.10 | -.22 |
| 3. Exposure: Witnessed it Happening to Someone Else | | | -- | .60** | .50* | .30 | -.39 |

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| | | | | |
|---|-----|-----|--------|-------|
| 4. Exposure: Learned About it Happening to a CFM ¹ or Friend-- | .00 | .12 | -.59** | |
| 5. Exposure: Exposed to it as Part of my Daily Job Role | | -- | .23 | -.14 |
| 6. Exposure: Not Sure | | | -- | -.47* |
| 7. Exposure: Does Not Apply to me | | | | -- |

¹CFM = Close Family Member, * $p < .05$. ** $p < .01$.

Bivariate analysis indicated that Grit-S scores were not significantly associated with exposure: *Happened to Me*, $r(18) = .12$, $p = .62$; exposure: *Witnessed it Happening to Someone Else*, $r(18) = .06$, $p = .81$; exposure: *Learned About it Happening to a Close Family Member or Friend*, $r(18) = .18$, $p = .46$; exposure: *Exposed to it as Part of my Daily Job Role*, $r(18) = -.08$, $p = .73$; exposure: *Not Sure*, $r(18) = -.31$, $p = .19$; or exposure: *Does Not Apply to me*, $r(18) = .34$, $p = .14$.

1) Research Question 1/Null Hypothesis 1

RQ1: What is the relationship, if any, between post-graduation Grit-S survey scores and the number of attempts to successful completion of the BOC exam in recent graduates of masters-level athletic training programs?

H1₀: There is no relationship between higher Grit-S survey scores and the number of attempts to complete the BOC exam in recent graduates of masters-level athletic training programs.

Rejected: Table 3 presents data indicating a greater number of attempts to successfully completing the Board of Certification (BOC) Exam was significantly related to higher Grit-S Scores, $B = .89$, $SE = .28$, $\beta = .53$, $p < .01$. Table 3 also presents an MLR model examining Grit-S Scores by the study of independent variables. Multivariate analysis indicated that the overall model was statistically significant, $F(4, 15) = 7.19$, $p < .01$, and explained 66% ($R^2 = .66$, Adjusted $R^2 = .57$) of the variance in the dependent variable. Therefore, null hypothesis 1 is rejected.

Table 3. Multiple Linear Regression Examining Grit-S Scores by Independent Variables (n=20)

| Variable | B (SE) | β | p |
|--|------------|---------|------|
| Sudden accidental death | .08 (.26) | .06 | .78 |
| Serious injury, harm, or death you caused to someone else | -.44 (.28) | -.26 | .14 |
| Severe human suffering | -.76 (.25) | -.63 | .009 |
| # Of attempts to successfully complete the Board of Certification (BOC) Exam | .89 (.28) | .53 | .006 |

Note. Model: $F(4, 15) = 7.19$, $p < .01$, $R^2 = .66$, Adjusted $R^2 = .57$.

1) Research Question 2/Null Hypothesis 2

RQ2: What is the relationship, if any, between age and Grit-S survey scores in recent graduates of masters-level athletic training programs

H2₀: There will be no relationship between age and Grit-S scores at a statistically significant level in recent graduates of masters-level athletic training programs.

Accepted: Table 4 presents an independent-samples t-test analysis of Grit-S Scores by categorical study variables. This table presents data indicating Grit-S Scores were not significantly related to age, $t(11) = .19$, $p = .85$. Therefore, null hypothesis 2 is accepted.

Table 4. Independent Samples T-Test Analysis of Grit Scores by Categorical Study Variables (n=20)

| Variable | n | M (SD) | t(df) | p |
|--|----|------------|-------------------|------------|
| Age | | | .19 (11) | .85 |
| 22-23 | 7 | 3.26 (.66) | | |
| 24 or older | 6 | 3.19 (.61) | | |
| Racial/Ethnic Identity | | | .80 (18) | .44 |
| White | 14 | 3.29 (.70) | | |
| Other | 6 | 3.53 (.37) | | |
| Gender | | | -.09 (18) | .93 |
| Male | 3 | 3.39 (.79) | | |
| Female | 17 | 3.35 (.61) | | |
| Number of attempts to successfully complete | | | -2.13 (18) | .05 |

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the Board of Certification (BOC) Exam

| | | |
|------------------|----|------------|
| 1 Time | 17 | 3.25 (.59) |
| More than 1 Time | 3 | 4.00 (.33) |

2) Research Question 3/Null Hypothesis 3

RQ3: What is the relationship, if any, between racial and ethnic identity and Grit-S survey scores in recent graduates of masters-level athletic training programs?

H3₀: Grit-S scores will not vary by racial/ethnic identity at a statistically significant level in recent graduates of masters-level athletic training programs.

Accepted: Table 5 presents an independent-samples t-test analysis of *Grit-S Scores* by categorical study variables. This table presents data indicating *Grit-S Scores* were not significantly related to racial/ethnic identity, $t(18)=.80, p=.44$. Therefore, null hypothesis 3 is accepted.

Table 5. Independent Samples T-Test Analysis of Grit Scores by Categorical Study Variables (n=20)

| Variable | n | M (SD) | t(df) | p |
|--|----|------------|-------------------|------------|
| Age | | | .19 (11) | .85 |
| 22-23 | 7 | 3.26 (.66) | | |
| 24 or older | 6 | 3.19 (.61) | | |
| Racial/Ethnic Identity | | | .80 (18) | .44 |
| White | 14 | 3.29 (.70) | | |
| Other | 6 | 3.53 (.37) | | |
| Gender | | | -.09 (18) | .93 |
| Male | 3 | 3.39 (.79) | | |
| Female | 17 | 3.35 (.61) | | |
| Number of attempts to successfully complete the Board of Certification (BOC) Exam | | | -2.13 (18) | .05 |
| 1 Time | 17 | 3.25 (.59) | | |
| More than 1 Time | 3 | 4.00 (.33) | | |

3) Research Question 4/Null Hypothesis 4

RQ4: What is the relationship, if any, between gender and Grit-S survey scores in recent graduates of masters-level athletic training programs?

H4₀: Grit-S scores will not vary by gender at a statistically significant level in recent graduates of masters-level athletic training programs.

Accepted: Table 6 presents an independent-samples t-test analysis of *Grit-S Scores* by categorical study variables. This table presents data indicating *Grit-S Scores* were not significantly related to gender, $t(18)= -.09, p=.93$. Therefore, null hypothesis 4 is accepted.

Table 6. Multiple Linear Regression Examining the Moderating Effect of Adverse Life Events (ALE) on the Relationship between Gender and Grit-S Scores (n=20)

| Variable | B (SE) | β | p |
|---------------------------------------|-----------|---------|-----|
| ALE: Does Not Apply vs. Some Exposure | .04 (.03) | .29 | .27 |
| ALE: DNASE X Gender | .05 (.09) | .35 | .55 |

Note. Model: $F(4, 15) = .86, p=.48, R^2=.14, \text{Adjusted } R^2 = -.02$.

Multivariate analysis of the data displayed in Table 6 indicates that *adverse life events* did not moderate the relationship between gender and *Grit-S Scores* at a statistically significant level, $B=.05, SE=.09, \beta=.35, p=.55$. Therefore, null hypothesis 6 is accepted.

4) Research Question 5/Null Hypothesis 5

RQ5: What is the relationship, if any, between the number of adverse life events and Grit-S survey scores in recent graduates of masters-level athletic training programs?

H5₀: There is no relationship between the number of adverse life events and higher Grit-S survey scores in recent graduates of masters-level athletic training programs.

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Rejected: Table 3 presents data indicating that exposure to *Severe human suffering* was significantly associated with lower *Grit-S Scores*, $B=-.76$, $SE=.25$, $\beta=-.63$, $p<.01$, while reporting a greater number of attempts to complete the *Board of Certification (BOC) Exam* was significantly related to higher dependent variable scores, $B=.89$, $SE=.28$, $\beta=.53$, $p<.01$. Table 2 also presents data indicating *Grit-S Scores* were not significantly associated with cumulative exposures, including the exposure: *Happened to Me*, $r(18)=.12$, $p=.62$; exposure: *Witnessed it Happening to Someone Else*, $r(18)=.06$, $p=.81$; exposure: *Learned About it Happening to a Close Family Member or Friend*, $r(18)=.18$, $p=.46$; exposure: *Exposed to it as Part of my Daily Job Role*, $r(18)=-.08$, $p=.73$; exposure: *Not Sure*, $r(18)=-.31$, $p=.19$; exposure: *Does Not Apply to me*, $r(18)=.34$, $p=.14$. Therefore, null hypothesis 5 is rejected.

5) Research Question 6/Null Hypothesis 6

RQ6: What impact, if any, do adverse life events have on the relationship between gender and *Grit-S* survey scores in recent graduates of masters-level athletic training programs?

H60: Adverse life events will not moderate the relationship between gender and higher *Grit-S* survey scores in recent graduates of masters-level athletic training programs.

Accepted: Table 7 introduces data indicating that *adverse life events* did not moderate the relationship between gender and *Grit-S Scores* at a statistically significant level, $B=.05$, $SE=.09$, $\beta=.35$, $p=.55$. In addition, Table 7 presents a multiple linear regression model examining the moderating effect of *Adverse Life Events* (Summed Items: Does Not Apply to Me versus Some Exposure) on the relationship between gender and *Grit-S Scores*.

Table 7. Multiple Linear Regression Examining the Moderating Effect of Adverse Life Events (ALE) on the Relationship between Gender and Grit-S Scores (n=20)

| Variable | B (SE) | β | p |
|---------------------------------------|-----------|---------|-----|
| ALE: Does Not Apply vs. Some Exposure | .04 (.03) | .29 | .27 |
| ALE: DNASE X Gender | .05 (.09) | .35 | .55 |

Note. Model: $F(4, 15) = .86$, $p=.48$, $R^2=.14$, Adjusted $R^2 = -.02$.

Multivariate analysis of the data displayed in Table 7 indicates that *adverse life events* did not moderate the relationship between gender and *Grit-S Scores* at a statistically significant level, $B=.05$, $SE=.09$, $\beta=.35$, $p=.55$. Therefore, null hypothesis 6 is accepted.

VII. EVALUATION OF THE FINDINGS

The above research sought to determine if *Grit-S* survey scores could be correlated to academic success, defined as successful first-attempt completion of the BOC exam, in recent graduates of CAATE-accredited MSAT programs. Furthermore, it sought to evaluate if relationships existed between *Grit-S* survey score and demographic variables, such as age, race, and sex. Lastly, the research assessed if exposure to adverse life events produced a higher grit score as compared to those claiming a lesser degree to no exposure of adverse life events. Previous literature has indicated varying relationships between *Grit-S* scores and academic success.^{11,16,17} In addition, Credé et al.¹⁸ and Morell et al.¹⁹ have found a correlation between age, gender, race, and grit. Currently, available research is inconclusive regarding a correlation between *Grit-S* and exposure to adverse life events.⁹

This research found a negative relationship between *Grit-S* survey scores and the number of attempts to complete the BOC exam. The three study participants who attempted the BOC exam three or more times before successful completion also indicated higher grit scores compared to those who successfully completed the BOC exam on their first attempt. No significant relationships were revealed between demographic variables (age, sex, and gender) and *Grit-S* survey scores. Lastly, a negative relationship between *Grit-S* scores and exposure to severe human suffering amidst adverse life events was reported. Participants indicating that they had been exposed to severe human suffering reported lower *Grit-S* survey scores as compared to those who had limited or no exposure to such adverse life events. These findings are consistent with the Constructivism framework. Each participant's experiences are unique to themselves, developed from a variety of experiences in life that have difficulty being standardized and boxed into producing norms.¹²

VIII. DISCUSSION

The problem addressed by this study is the current lack of grit scale utilization during the admission process to MSAT programs as a non-cognitive tool to aid in identifying applicants who would be academically successful. This non-experimental quantitative correlational study aimed to examine if *Grit-S* scores could be correlated with first-time pass rates of the BOC exam in recent graduates of CAATE-accredited MSAT programs. This study also assessed if a relationship between demographic variables and the *Grit-S* score existed and addressed if the degree of exposure to adverse life events modulated the *Grit-S* score.

Presently, the most used metrics to predict an applicant's academic success in a healthcare professional education program are high school GPA, overall science GPA, and standardized testing scores.^{20,21} Many have recently begun to believe that these metrics can no longer predict an applicant's true capabilities.^{3,8,15} An association between grit score and academic achievements,

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over and above aptitude testing scores, has been seen in multiple studies.^{7,8,10} However, the MSAT population has limited research yet in this regard.

The current study sought to examine if the Grit-S score could positively affect first-time pass rates on the BOC exam. The study also assessed if relationships between Grit-S levels and demographic variables and Grit-S levels and adverse life events would be discovered. A quantitative methodology structured the non-experimental correlational online survey study design. The non-experimental correlational online survey design was chosen because the study had no control groups or interventions. Using an online survey allowed for the easy and efficient gathering of data across a large geographic area. Lastly, the online survey provided the opportunity for individuals from diverse cultural backgrounds within the targeted population to be represented.

The research results suggested that participants with a higher number of attempts to complete the BOC exam reported higher Grit-S scores. This outcome is aligned with Duckworth et al.⁷ and Kelly et al.,²² who found that more intelligent students may display less Grit compared to their less academically successful peers. In addition, bivariate analysis using the Independent Sample t-Test found no association between Grit-S scores and age, racial or ethnic identity, or gender. Lastly, MLR analysis reported no statistically significant relationship between Grit-S score, gender, and adverse life events. Interestingly, a statistically significant negative relationship was uncovered between increased reports of exposure to *severe human suffering* and lower Grit-S scores.

A. Limitations

While this study contributed statistically significant findings to the growing awareness and understanding regarding Grit, it was not without its limitations. Limitations of this study are sample size, use of a Likert scale, convenience sampling, and the online survey study design. An inherent challenge to research is the inability to reach a sample population large enough to provide statistical significance and the ability to generalize the findings across the intended population. While the survey was sent to over 1000 participants, only 20 fully completed and useable surveys were returned. A Likert scale was used within the survey to collect data. These scales are reliant on the participants' interpretation of the scale, which is subjective and may be influenced by cultural bias. A convenience sample was used for data collection. A limitation of convenience sampling is the commonality shared by participants that led them to the study. The largest professional athletic training organization was utilized for the survey data collection to reach the highest population of athletic trainers across the United States. However, membership in this organization is not a requirement for the practice of the profession, and response rates to survey research are notoriously low. This makes generalizing the results across all athletic trainers a limitation.

VIII. CONCLUSIONS

As the fall of 2022 approaches and MSAT programs are no longer required to maintain a three-year aggregate 70% first-time BOC exam pass rate to maintain *In Good Standing* with CAATE, it is recommended that this study be repeated with a new focus on MSAT program GPA as the marker for academic success. Additionally, a longitudinal study utilizing the Grit-S survey upon admission, the program mid-point, and graduation is recommended. Following one or more cohorts with this design will allow insight into Grit's potential to be nurtured and evolve within the study participants as they move through the program. Reviewing the endpoint (graduation) grit score, comparing these scores to the beginning-point (admission) grit score, and correlating them to program GPA could provide invaluable insight into Grit's ability to predict academic success in MSAT programs.

A recommendation would be to add a qualitative component to increase future research validity further. This addition may provide further insight into the evolution of Grit (if any is noted). The profession of athletic training often exposes its associates to numerous encounters with human suffering: physically, mentally, and emotionally. The current study found that exposure to severe human suffering was correlated with a lower grit score. This result indicates that a point in time may exist when a participant would have ranked higher in Grit and subsequently encountered an experience that impacted their grit score. Adding a qualitative component to the current study would allow future studies to monitor for a change in Grit. This may clarify why this relationship between severe human suffering and a lower grit score exists.

While many studies support grit score as a strong predictor of academic and personal success,^{11,16,17,18} others have found a weak or non-significant correlation.^{16,17} These varying conclusions continue to push research forward in search of the influential factor that might predict success. The research study sought to add to the growing body of research regarding Grit's ability to predict academic success and promote its use as a non-cognitive assessment to aid in identifying those that would be successful in MSAT programs.

The study adapted the Grit-S survey, the Life Events Checklist-5, and demographic questions to evaluate a relationship between Grit-S scores, the influence of adverse life events on Grit, and participant's first-time pass rate on the BOC exam. The results of the study uncovered that Grit-S scores were higher in participants who attempted to complete the BOC exam more than once. Grit-S scores were lower in participants who had experienced severe human suffering. No demographic variable (age, racial and ethnic identity, gender) was found to correlate with the Grit-S score. While the first-time pass rate of the BOC exam was not positively correlated with a higher grit score, Grit continues to reveal itself as a positive indicator of academic success. Further

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research is recommended into the relationship between grit score and academic success in MSAT students with a different marker for academic success suggested.

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