

# Breaking Down Grit: Persistency and Flexibility in the Career Plans of Military Medical Students

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## ABSTRACT

### Introduction:

The field of medicine is experiencing a crisis as high levels of physician and trainee burnout threaten the pipeline of future physicians. Grit, or passion and perseverance for long-term goals, has been studied in high-performing and elite military units and found to be predictive of successful completion of training in adverse conditions. The Uniformed Services University of the Health Sciences (USU) graduates military medical leaders who make up a significant portion of the Military Health System physician workforce. Taken together, an improved understanding of the relationships between burnout, well-being, grit, and retention among USU graduates is critical to the success of the Military Health System.

### Materials and Methods:

The current study was approved by the Institutional Review Board at USU and explored these relations among 519 medical students across three graduating classes. These students participated in two surveys approximately one year apart from October 2018 until November 2019. Participants completed measures on grit, burnout, and likelihood of leaving the military. These data were then merged with demographic and academic data (e.g., Medical College Admission Test scores) from the USU Long Term Career Outcome Study. These variables were then analyzed simultaneously using structural equation modeling to examine the relationships among variables in a single model.

### Results:

Results reaffirmed the 2-factor model of grit as both passion and perseverance (or interest consistency). No significant relationships emerged between burnout and other study variables. Sustained and focused interest was predictive of less likelihood of staying in the military.

### Conclusion:

This study offers important insights into the relationship among well-being factors, grit, and long-term career planning in the military. The limitations of using a single-item measure of burnout and measuring behavioral intentions in a short time frame during undergraduate medical education highlight the importance of future longitudinal studies that can examine actual behaviors across a career lifespan. However, this study offers some key insights into potential impacts on the retention of military physicians. The findings suggest that military physicians who are most likely to stay in the military tend to embrace a more fluid and flexible medical specialty path. This is critical in expectation setting for the military to train and retain military physicians across a wide range of critical wartime specialties.

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All medical students graduating from the Uniformed Services University (USU), an accredited allopathic medical school, are future employees of the Department of Defense. The training costs associated with a USU medical graduate as both a physician and military officer are substantial.<sup>1</sup> Understanding student experiences, occurring at the foundation of military medical officers' careers, that may bolster or dampen the likelihood of burnout and intentions to remain in the service, is thus critical to this substantive investment by the Department of Defense. As USU graduates make up approximately 25% of the annual physician pipeline<sup>1</sup> and an

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even larger percentage of its military medical leadership,<sup>2</sup> factors that influence their retention also have a significant impact on the availability of physicians to the Military Health System and thus the National Defense Strategy.

In military medicine, there is growing recognition that burnout among healthcare providers, including physicians, is a serious concern.<sup>3</sup> The literature on burnout has suggested that while it is a system-level issue, there are systemic and individual factors that increase risk for burnout.<sup>4-7</sup> A potential indicator of burnout risk is “grit,” a psychosocial construct that consists of passion and perseverance.<sup>8</sup> Grit has been associated with beneficial military training outcomes, including on-time graduation and initial training completion at a military service academy.<sup>9</sup> Attempting to measure “grit” itself has been a challenge. The reliability and validity of its measurement have been found to vary based on the population surveyed and measurement context,<sup>10,11</sup> and the degree to which grit is independent from other constructs, such as conscientiousness, has been questioned.<sup>10</sup> For example, studies in military populations (e.g., special operations) indicate that while grit was significantly associated with retention, other factors, such as cognitive factors (e.g., mathematical reasoning, lexical knowledge, and passage comprehension) and physical fitness, maybe more strongly related to retention.<sup>12</sup> In addition, educational outcomes in the military population have not yet examined long-term military service, for example, after the initial service obligation incurred by training. Taken together, research is needed to further examine the measurement of grit, as well as its association with indicators of well-being, in a sample of military medical students, as these factors likely contribute to retention within the Military Health System. What is more, the degree to which grit may be associated with lower or delayed risk of burnout in military medical students is also unclear. Understanding the interplay of factors impacting burnout within military medical education and training is essential to develop specific strategies to prevent or attenuate burnout and promote well-being and retention. Therefore, the goal of the present study is to understand the multidimensional latent structure of student characteristics, academic factors, and grit and their relationships with burnout and reported intention to remain in the military.

## METHOD

### *Participants and Procedures*

The Grit survey study (IRB MED-83-9085) and the well-being and burnout survey study (IRB MED-83-9823) were approved by USU’s Institutional Review Board. There were three classes of students—in their second year,  $n = 174$ ; third year,  $n = 175$ ; and fourth year,  $n = 170$ —of medical school, who were invited to both survey studies. The first survey used the Grit scale,<sup>13</sup> and data from the second survey included questions regarding burnout and likelihood of leaving the military. The demographic and academic measures were extracted from the Long Term Career Outcome Study

(LTCOS) database. These students were asked to complete the Grit survey online in October and November 2018 and the well-being and burnout survey approximately one year later. The LTCOS team was able to leverage their extensive archival database to connect these two data collections for the purpose of this research study.

## Measures

### **Demographics and academic factors**

Demographic factors included assigned sex (male or female) and prior service (yes or no). Academic factors included class year (2-4) and Medical College Admission Test (MCAT) score.

### **Grit scale**

The Grit scale consists of 12 items, with a 2-factor structure<sup>8,9</sup> of Interest Consistency (6 items) and Perseverance of Effort (6 items), and was measured at time 1. Interest Consistency might be considered the “passion” part of grit and measures the degree to which participants have an area they are particularly interested in and that interest is sustained over time. Perseverance of effort refers to the “persistence” element of grit and measures the degree to which participants will sustain effort in a task when it is difficult, challenging, or requires sustained energy.<sup>8,9</sup> Participants responded to each item using a 5-point Likert-type response scale (1 = very much like me; 2 = mostly like me; 3 = somewhat like me; 4 = not much like me; 5 = not at all like me), with higher scores indicating less consistency in interest over time and greater persistence of effort. Statements with reverse coding are included to control for response bias. Previous literature has demonstrated adequate internal consistency reliability (Cronbach’s  $\alpha > 0.70$ ).<sup>13</sup>

### **Burnout**

Burnout was assessed with a single item that has validity evidence in related contexts<sup>14</sup> and convergent validity with the Maslach Burnout Inventory.<sup>15</sup> The item asked students to rate their overall burnout level, based on their own definition of burnout. Participants responded to the item using a 5-point response scale ranging from “I enjoy my work. I have no symptoms of burnout” to “I feel completely burned out and often wonder if I can go on. I am at the point where I may need some changes and may need to seek some sort of help.”

### **Likelihood of leaving the military**

A single question was asked to students to rate their likelihood of leaving military service following the completion of their current service obligation and was measured at time 2. Participants responded to the item using a 5-point response scale ranging from “not at all likely” to “definitely.” Responses were transformed into a binary variable (not at all/somewhat likely versus moderately, quite, and definitely likely) due to the non-normal distribution of participant response.

**TABLE I.** Grit Construct Measurement Invariance Model Parameters

Model	Factor loadings	Item intercepts	Residual variances	Residual covariances	Factor variances	Factor means
1. Original	Free	Free	Free	Free	Free	Free
2. Modified	Free	Free	Free	Free	Free	Free
3. Config. invariance	Free	Free	Free	Free	Fixed to 1	Fixed to 0
4. Metric invariance	Constrain	Free	Free	Free	Free	Fixed to 0
5. Partial metric invariance	Constrain (-) Grit 1	Free	Free	Free	Free	Fixed to 0
6. Scalar invariance	Constrain (-) Grit 1	Constrain	Free	Free	Free	Free
7. Partial scalar invariance	Constrain (-) Grit 1	Constrain (-) Grit 4 & Grit 5	Free	Free	Free	Free
8. Residual variance invariance	Constrain (-) Grit 1	Constrain (-) Grit 4 & Grit 5	Constrain	Free	Free	Free
9. Residual covariance invariance	Constrain (-) Grit 1	Constrain (-) Grit 4 & Grit 5	Constrain (-) Grit 4 & Grit 5	Constrain	Free	Free
10. Factor invariance	Constrain (-) Grit 1	Constrain (-) Grit 4 & Grit 5	Constrain (-) Grit 4 & Grit 5	Constrain	Fixed to 1	Free
11. Factor mean invariance	Constrain (-) Grit 1	Constrain (-) Grit 4 & Grit 5	Constrain (-) Grit 4 & Grit 5	Constrain	Fixed to 1	Fixed to 0

Abbreviations: Config. = configural, (-) = except.

**Analytic Approach**

**Sample description**

We used univariate and bivariate statistics to describe the sample. Study data on class year, assigned sex, age, prior service, and MCAT scores were available for all medical students. To examine potential response bias, we compared the sample of students who responded to all relevant questions in the first survey versus those who did not respond. Then, we used bivariate analyses to compare students who completed only the first time point versus both time points. Bivariate comparisons were analyzed using the “compareGroups” R package.<sup>16</sup>

**Measurement invariance**

A successive series of confirmatory factor models with robust maximum likelihood estimation examined grit (two latent factors) invariance (configural, metric, scalar, residual variance, residual covariance, and factor invariances) between assigned sex male (reference group) and assigned sex female students. Step-wise constraints applied to factor loadings, item intercepts, residual variances, residual covariances, factor variances, and factor means isolated the source of any non-invariance (Table I). Likelihood ratio tests compared fit differences across models. To be used in a subsequent structural equation model (SEM), each latent factor needed to demonstrate at least partial metric and partial scalar invariance to have adequate measurement properties for further analysis.

**Structural equation modeling**

An SEM with weighted least squares mean and variance adjusted estimation examined direct pathways as follows:

(1) demographics factor predicted burnout, (2) demographic factors and burnout predicted grit factors, and (3) demographic factors, burnout, and grit factors predicted military leave likelihood. SEM is a tool to explore relationships between variables by testing the degree to which a single statistical model “fits” or explains the variability observed within the data. Mediation analyses examined whether burnout mediated the relationship between grit and likelihood of leaving the military. If model fit was not adequate per selected indicators, then regression pathways were added per modification indices or removed if not significant (e.g.,  $P > .10$ ). Model fit was first evaluated using the significance of the  $\chi^2$  test of model fit. In SEM, the null hypothesis is that the proposed relationships in the model are no different than the actual model relationships. Thus, a  $P$  value  $>.05$  corresponding to the  $\chi^2$  test of model fit indicates that the null hypothesis is retained and that the proposed model is consistent with the actual data structure. Whereas a  $P$  value  $<.05$  indicates that the proposed model was significantly different than the actual data structure. In the event, the  $\chi^2$  test of model fit  $P$  value was  $<.05$ , and then, the additional fit statistic criteria were used to determine the adequacy of model fit, including the comparative fit index (CFI  $>0.95$ ), Tucker-Lewis Index (TLI  $>0.95$ ), and root mean square error approximation (RMSEA  $<0.06$ ).<sup>17</sup> All analyses were completed in R Statistics and MPlus version 8. The significance level was  $P < .05$ .

**RESULTS**

**Sample Description**

Overall, 315 of the 519 eligible students (response rate = 61%) completed all questions in the first survey that were

**TABLE II.** Summary Descriptives Table by Merged Data Sets

	[ALL] N = 315	Both time points N = 230	Single time point N = 85	P
Class				<.01
2020	100 (31.7%)	39 (17.0%)	61 (71.8%)	
2021	115 (36.5%)	96 (41.7%)	19 (22.4%)	
2022	100 (31.7%)	95 (41.3%)	5 (5.88%)	
Assigned sex				<.01
Male	168 (56.4%)	119 (51.7%)	49 (72.1%)	
Female	130 (43.6%)	111 (48.3%)	19 (27.9%)	
Age	23.0 [22.0;26.0]	23.0 [22.0;25.8]	24.0 [22.0;27.0]	.09
Prior service	118 (39.6%)	97 (42.2%)	21 (30.9%)	.13
Grade point average	3.67 [3.51;3.81]	3.67 [3.50;3.83]	3.67 [3.51;3.78]	.98
MCAT	509 [505;513]	509 [505;513]	507 [410;512]	.46
Grit total <sup>a</sup>	3.92 [3.58;4.17]	3.92 [3.67;4.17]	3.83 [3.48;4.19]	.10

<sup>a</sup>Individual items summed and divided by 12; range 0-5.

part of the present analysis. Bivariate analyses indicated a lack of significant differences between those who completed these questions versus those who did not (all  $P > .05$ ). Given the longitudinal nature of this study, students who completed both the first and second survey ( $n = 230$ ; response rate = 44%) were included in the subsequent SEM analysis. Bivariate analyses indicated that students graduating in 2022 (95%) and 2021 (83%) were more likely to complete both time points, relative to students graduating in 2020 [39%;  $\chi^2(2) = 89.65, P < .001$ ]. In regards to assigned sex, female students (85%) were more likely to complete both time points, relative to male students [71%;  $\chi^2(1) = 8.81, P = .002$ ]. Means, standard deviations, and percentages of key demographic data, including Grit scores, are presented in Table II. Age was not found to differ significantly across class years, Kruskal–Wallis  $\chi^2(17) = 23.81, P = .12$ .

**Measurement Invariance**

Grit invariance model results and comparisons are presented in Table III. This refers to the degree to which the relationship between variables is the same across measurements. Analysis can explore increasingly strict forms of variance such that the patterns of relationship between variables, strength of those associations, and initial starting values (or intercepts) are consistent across various groups of participants. These forms of variance are referred to as configural, metric, and scalar invariance, respectively.<sup>18</sup> Using data from 315 students who completed the Grit scale, the 2-factor (perseverance and interest consistency) model of grit that included eight inter-item covariances fits the data well, demonstrating configural invariance. Because 17 students did not report their assigned sex, metric and scalar invariance were modeled using data from 298 students. The grit factors demonstrated partial metric and partial scalar invariance, such that 1-factor loading (Grit 1) and 2-item intercepts (Grit 4 and Grit 5) varied between assigned sex male and female students. The grit latent factors demonstrated residual variance, factor, and factor mean invariances and therefore were included in subsequent models.

**Structural Equation Model**

Full model fit was not acceptable per previously described fit statistic criteria [ $\chi^2(107) = 147.04, P = .01, CFI = 0.94, TLI = 0.91, RMSEA = 0.04$  (95% CI 0.02, 0.06)]. Therefore, the model was modified to improve fit. Pathways in which prior service and assigned sex predicted burnout and grit factors were removed since they did not contribute to the model and were not statistically significant. The revised model had adequate fit per previously described fit statistic criteria [ $\chi^2(113) = 135.01, P = .08, CFI = 0.97, TLI = 0.96, RMSEA = 0.03$  (95% CI <0.01, 0.05)] and was retained. SEM pathway results are detailed in Table III and Figure 1. Perseverance and interest standardized factor loadings ranged from 0.36 to 0.72, and all significantly loaded onto their respective latent variables. Prior service was associated with assigned sex, such that male students were more likely to report prior service than female students. Class year was positively associated with perseverance, such that students who matriculated earlier reported higher perseverance. MCAT scores were positively associated with interest consistency. Students with prior service were less likely to report plans to leave the military after completion of obligatory years of service than were students without prior military service. Lastly, greater interest consistency was associated with greater likelihood of leaving the military. There was no association between perseverance and likelihood of leaving the military. There was also a lack of significant pathways associated with the single-item burnout variable.

**DISCUSSION**

The current study replicated previous findings for the psychometric properties of the 2-factor Grit scale.<sup>11</sup> This finding suggests that grit, as a measure of interest consistency and perseverance, appears to operate similarly across assigned sex categories. In the SEM, greater interest consistency (not perseverance) and lack of prior service (relative to those with prior service) were associated with a greater likelihood of leaving the military following their current service obligation. This may seem counter-intuitive, especially given that the interest consistency has been previously associated with positive outcomes in other military samples.<sup>9</sup> However, lack of interest consistency (or interest inconsistency) may be an adaptable strategy for military physicians given the unique nature of their dual profession.

Military physicians, similar to other service members, are often expected to have and implement a diverse set of skills, fulfill a variety of positions and roles, adapt quickly to changing missions and circumstances, and take on leadership positions as their military career advances. A sustained career as a military physician may add to the need for a broad, generalist approach with less interest consistency, to account for occupational variation. Therefore, flexibility in interests may be adaptive in a military context and may actually reflect more “grit” to adapt and change to new environments and missions. Whereas a medical student who has more interest consistency,



**TABLE III.** Grit Construct Measurement Invariance Model Values

Model	LL	LL CF	Parameters	$\chi^2$	DF	$\chi^2$ CF	Model fit <i>P</i> value	RMSEA	CFI/TLI	LL ratio test $-\Delta 2LL$ (df), <i>P</i> [comparison]
1. Original	-4029.51	1.21	37	151.95	53	1.14	<.001	0.08 (0.06, 0.09), <i>P</i> = .01	0.88/0.85	n/a
2. Modified	-3969.89	1.20	45	47.83	45	1.14	.36	0.01 (<.001, 0.04), <i>P</i> = .99	0.99/0.99	n/a
3. Config. invariance	-3694.26	1.19	90	121.29	90	1.07	.02	0.05 (0.02, 0.07), <i>P</i> = .53	0.96/0.95	n/a
4. Metric invariance	-3704.75	1.18	80	137.93	100	1.09	.01	0.05 (0.03, 0.07), <i>P</i> = .47	0.96/0.94	16.13 (10), <i>P</i> = .10 [3 vs. 4]
5. Partial metric invariance	-3701.91	1.18	81	132.18	99	1.10	.01	0.05 (0.02, 0.07), <i>P</i> = .56	0.96/0.95	9.07 (1), <i>P</i> = .002 [4 vs. 5] 11.14 (9), <i>P</i> = .10 [3 vs. 5]
6. Scalar invariance	-3715.17	1.21	71	158.03	109	1.09	.001	0.06 (0.04, 0.07), <i>P</i> = .32	0.94/0.93	27.40 (10), <i>P</i> = .002 [5 vs. 6]
7. Partial scalar invariance	-3707.62	1.20	73	143.68	107	1.09	.01	0.05 (0.02, 0.07), <i>P</i> = .55	0.96/0.95	16.79(2), <i>P</i> < .001 [6 vs. 7] 11.59 (8), <i>P</i> = .17 [5 vs. 7]
8. Residual variance invariance	-3713.70	1.16	63	150.99	117	1.12	.02	0.04 (0.02, 0.06), <i>P</i> = .67	0.96/0.96	8.59 (10), <i>P</i> = .57 [7 vs. 8]
9. Residual covariance invariance	-3718.37	1.18	55	160.13	125	1.11	.02	0.04 (0.02, 0.06), <i>P</i> = .70	0.96/0.96	9.04 (8), <i>P</i> = .34 [8 vs. 9]
10. Factor invariance	-3718.42	1.18	53	159.82	127	1.12	.03	0.04 (0.02, 0.06), <i>P</i> = .75	0.96/0.96	0.08 (2), <i>P</i> = .96 [9 vs. 10]
11. Factor mean invariance	-3720.05	1.18	51	162.96	129	1.11	.02	0.04 (0.02, 0.06), <i>P</i> = .74	0.96/0.96	9.13 (2), <i>P</i> = .20 [10 vs. 11]

Abbreviations: Config. = configural, CF = correction factor, LL = loglikelihood.

knowing exactly what they want to do, may not be as willing to be “flexible” to meet the long-term requirements of a military career.

Within the SEM, there were only a few factors associated with the grit latent factors. Perseverance tended to be higher in students who were closer to graduation. This finding is consistent with previous research indicating that grit itself can increase with age.<sup>8</sup> In the present study, length of participation in the degree program may be a better proxy than age specifically for the idea that grit may increase with experience and acclimation within a challenging environment. This was consistent with the finding that age did not differ by class year in the current sample, reinforcing the notion that it may be seniority and acclimation driving the increase in grit over the length of time in the program. The model also indicated a lack of significant associations between burnout and other factors in the SEM. It is possible that, given the service commitments inherent with military training, burnout at one time point does not have a strong relationship with long-term planning, particularly when there is little control about the interceding years relevant to a service commitment. It may be that students recognize that burnout in medical school may not be consistent with how they may feel at the end of their service commitment, which is typically several years post-residency. For this reason, other factors such as interest and “fit” may be more

relevant. In addition, other military-specific benefits that are salient to them while in their student status, such as pay as an active duty officer, lack of tuition for medical school, and access to medical care, may also offset other environmental contributors to burnout, although these factors were not measured in the present study.

This study had several limitations, including the use of a single-item measure of burnout, which may impact the relationship between burnout and other factors in the model. Although the single-item burnout score has been validated against the emotional exhaustion subscale of the Maslach Burnout Inventory, it has not been validated against the depersonalization (cynicism) and personal accomplishment subscales.<sup>14,15</sup> That said, both emotional exhaustion and cynicism have been linked to burnout.<sup>19</sup> By not measuring cynicism, we may be missing an important aspect of the relationship between grit and burnout given that grit has been reported to be protective against burnout.<sup>20</sup> A more complete measure of burnout that includes psychometrically validated measures of cynicism and personal accomplishment, in addition to emotional exhaustion, may provide further insight. In addition, the participation rate among students (61% response rate), while consistent with large survey-based studies, may indicate some sampling bias, although no significant differences were found between respondents and nonrespondents

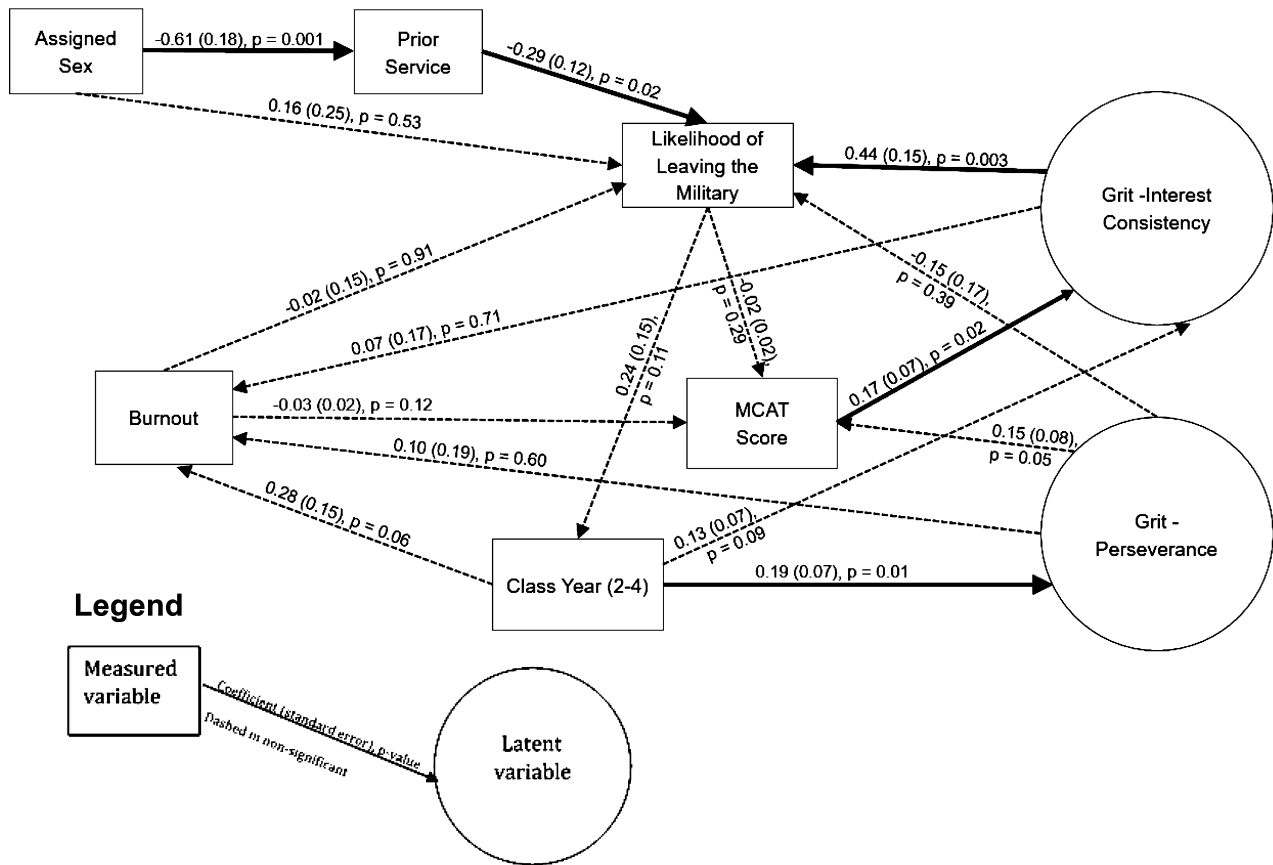


FIGURE 1. Path model of grit, intention to stay, and burnout.

on key demographic variables. Further, behavioral measures of intentions (e.g., likelihood of leaving military service) do not always align with actual behavior. As a result, follow-up longitudinal data may be particularly informative to fully understand these patterns and their relation to long-term outcomes. Lastly, the present study did not include other factors that may negatively or positively impact medical student grit, burnout, and intentions to remain in the service. For example, we did not have adequate survey data regarding well-being (e.g., social support), experiences of microaggressions and discrimination, presence of sponsors and mentors, and additional factors that systemically impact medical students. As medical schools and the U.S. military move to improve equity and justice, future studies must recognize and include overarching contextual factors (e.g., medical school climate) and personal experiences (e.g., microaggressions) to ensure any programming efforts are indeed equitable and inclusive. Not only is this an imperative for a stronger military medical force, the limited findings in the current study related to burnout specifically necessitate an expanded exploration of factors that we know to be related to burnout from civilian populations.<sup>21</sup>

Interest inconsistency, or flexibility, may be adaptive for military medical students, given the variation of their career

experiences. Our preliminary findings could be used by the U.S. military to help inform specialty selection considerations and recruitment, particularly if replicated. For example, students may benefit from career counseling that highlights the adaptive nature of military medicine and the focus on critical skills that cut across all medical specialties to ensure critical combat care. Military field practicums and courses that expose students to these common critical skills may help students develop more realistic expectations about specialty choice. Of course, these assumptions underlie important areas for future research to validate these preliminary conclusions and subsequent hypotheses. Future work is needed to better conceptualize and understand burnout, positive indicators of well-being, and systemic and experiential factors that contribute to medical student burnout and other relevant outcomes.

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## CONFLICT OF INTEREST STATEMENT

None declared.

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