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The Relationships Among Sleep Quality, Self-Efficacy And Performance In A Military Setting

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The Relationships Among Sleep Quality, Self-Efficacy and Performance in a Military Setting

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This thesis, submitted by Andrew David Lautner in partial fulfillment of the requirements for the degree of master of Science from the University of North Dakota has been read by the faculty advisory committee under whom the work has been done and is hereby approved.

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Abstract

This study examined sleep, self-efficacy, and confidence and their effect on performance. Cadets from an Army Reserve officer training corps (ROTC) program were surveyed about their sleep quality using the Pittsburgh Sleep Quality Index (PSQI), their fatigue using the Epworth Sleepiness Scale (ESS), their sleep quantity using the Rosenkind formula, their confidence using the competitive trait anxiety index (CTAI-2), their self-efficacy using a task specific questionnaire, and performance was measured via the Army physical fitness test (APFT). The data from each variable was analyzed through correlations and regressions. The results support the hypothesis of cadets who have poorer sleep quality are less efficacious in their abilities subsequently score lower on their Army Physical Fitness Test (APFT). Further research is suggested to explore the mediation effect of sleep quantity and quality on self-efficacy and performance.

Chapter I

Introduction and Literature Review

Every day the armed forces are in search of ways to get the upper hand on the enemy, to keep our borders safer, and to develop new ways to increase force readiness. Sleep problems and fatigue are common among those in the armed forces (Troxel et al., 2015). Sleep has been directly linked with fatigue (Lavidor, Weller, & Babkoff, 2003) and sleep is considered an effective counter measure against fatigue (Aaronson, Teel, Cassmeyer, Neuberger, Pallikkathayil, et al., 1999; Aaronson, Pallikkathayil, Crighton, 2003). While fatigue has been included as a physiological source of self-efficacy (Feltz, Short, & Sullivan, 2008), less attention has been devoted to the relationship between sleep and self-efficacy beliefs. Self-efficacy is defined as "beliefs in one's abilities to organize and execute the courses of action required to product given attainments" (Bandura, 1997, p. 3). The purpose of this study was to examine sleep as a physiological source of self-efficacy and its relationship with performance in the armed forces. It was hypothesized that cadets who have poorer sleep quality would be less efficacious in their abilities and would score lower on their Army Physical Fitness Test (APFT). With lower quality of sleep, higher rates of fatigue will be present effecting the overall levels of self-efficacy which will reduce participant's performance outcomes.

Higher levels of self-efficacy are associated with better performance and other positive outcomes (Bandura, 1997; Moritz, Feltz, Fahrbach, & Mack, 2000). Bandura's self-efficacy theory states that physiological states are a source of self-efficacy, together with performance accomplishments, vicarious experiences, verbal persuasion, emotional states and imaginal experiences (Bandura, 1977; Feltz et al. 2008). Compared to other sources of self-efficacy,

physiological states has not received much research attention. People cognitively appraise their physiological state (i.e., levels of strength, fitness, fatigue, pain, etc.) when forming efficacy judgments (Feltz et al., 2008). According to Bandura (1997), the impact of physiological states on efficacy beliefs will depend on things such as situational factors and the meaning given to them. For example, speakers who ascribe their sweating to temperature in a room will likely perform better than those who ascribe their sweating to nervousness and anxiety.

One of the most popular examples of physiological states used in sport and exercise settings is fatigue. Fatigue has been defined as feelings of tiredness, weakness, or exhaustion (Campbell, et al., 2017; Gibson, Baden, Lambert, 2003). A prevalence of 15-20 percent of people suffer from fatigue symptoms in the United States (Aliyu, 2007; Aritake, S., Kaneita, Y., Ohtsu, T., Uchiyama, M., 2014; Buchwald, 1995; Sharpe & Wilks, 2002). There are many performance outcomes associated with fatigue. For example, people who are fatigued will reach exhaustion faster when compared to those who are not fatigued (Marcora, Staiano, & Manning, 2009). Reaction time is slowed when an individual becomes fatigued (Sant'Ana, Franchini, & Diefenthaeler, 2016; Williamson & Feyer 2000) and decision making is inhibited (Harrison & Horne, 2000; Williamson & Feyer 2000). In sport situations, soccer in particular, people are less accurate with shot placement and make more ball control errors (Duncan, Fowler, George, Joyce, & Hankey, 2015). Running velocity has been shown to be slower (Smith, Marcora, & Coutts, 2015), and the distance covered is 15 percent less when fatigued (Marcora, 2014). For cyclists, fatigue results in slower finish times (Pires, Silva-Júnior, Brietzke, Franco-Alvarenga, 2018).

Sources of fatigue include poor sleep quality – as poor sleep quality persists a higher rate of fatigue is present (Scott, Arslanian-Engoren, & Engoren, 2014). In a literature review of sleep loss and fatigue, researchers concluded that sleep loss, in any degree, can increase the feeling of

fatigue and negatively affect cognitive ability and performance (Veasey, Rosen, Barzansky, Rosen, & Owens, 2002). When an individual is fatigued due to lack of sleep, performance variables decline (Duncan, et. Al, 2015; Marcora, 2014; Marcora, Staiano, & Manning, 2009; Pires et al., 2018; Smith, Marcora, & Coutts, 2015). With respect to sleep, some researchers have shown that just thinking you received poor sleep makes people feel worse and perceive heightened levels of fatigue (Buboltz, Brown, & Sopcr, 2001; Buboltz, Jenkins, Soper, Woller, Johnson, & Faes, 2009) showing that sleep likely effects perceptions of physiological states.

Sleep is an important factor to our daily functioning. A short sleep duration (or sleep deprivation) has been defined as less than 7 hours of sleep per night (Center for Disease Control (CDC), 2017). In the United States, depending on geographical location, it is estimated that between 28.5 to 44.1 percent of people sleep short durations per 24-hour period. College aged adults fall right into the national average of short sleep duration at about 32 percent.(CDC, 2017) A high percentage of students reported irregular sleep patterns or short sleep duration (>8 hrs) or poor sleep quality (Shahid, Shen, & Shapiro, 2009; Vargas, Flores, & Robles, 2014). Twenty-five percent of adults also report having insufficient sleep 15 out of every 30 days (Office of Disease Prevention and Health Promotion (ODPHP), 2018). Overall, there is a high percentage of people who are sleep deprived or receive an improper amount of sleep according to recommendations, which may put them at a higher risk for health problems.

Improper amounts of sleep and poor sleep can lead to many physical and mental health problems when compared to good quality sleep (Lund, Reider, Whiting, & Prichard, 2010; ODPHP, 2018). In terms of physical health, chronic health conditions have many factors that play into the total risk percentage with sleep being one of them. For example, the risks for heart attacks, coronary heart disease, strokes, asthma, COPD, cancer, arthritis, chronic kidney disease,

and diabetes are all higher in individuals that reported a shorter sleep duration (CDC, 2017). Sleep is also necessary to fight off infection and support metabolism (ODPHP, 2018). Too much sleep or not enough sleep also raises the risk for all-cause mortality (Cappuccio, Delia, Strazzullo, & Miller, 2010). Short duration sleepers (less than 5 hours of per 24-hour period) are at a 12 percent higher risk of all-cause mortality and longer duration sleepers (greater than 9 hours per 24-hour period) are 30 percent more likely to die from all-cause mortality

Sleep has also been linked to cognitive function and mental health. Sleep deprivation has been linked to daytime sleepiness and decreased mental sharpness; negatively affecting cognitive ability and performance (Irwin, 2015; Leonard, Fanning, Attwood & Buckley, 1988; Shahid, Shen, & Shapiro, 2009), which includes performing well in school and at work. When sleep deprivation occurs, the risk for developing new-onset depressive symptoms are higher (Lee, Park, Nam, & Park, 2016). Mood (anger, confusion, depression and tension), memory, and stress levels are also directly affected by sleep (Irwin, 2015; Lund, Reider, Whiting, & Prichard, 2010). As the amount of sleep declines, the amount of time it takes to make decisions also declines (Ratcliff & Dongen, 2009). The ability to stay on task and not let the mind wander is also adversely affected when the body is sleep deprived (Poh, Chong, & Chee, 2016). Poor sleep practices lead to decline in mental health and cognitive function although when sleep quality is improved defects associated with sleep quality are diminished (Selby, 2013).

Military Applications

In recent times, the military has looked to use applied sports psychology to help improve their soldiers. Improvements in confidence is one of the focuses the military has in its Army Center for Enhanced Performance (Hite, 2011; Meyer, 2018). The United States military thrives on their soldiers being apt and ready for battle. Officers and enlisted personal are asked to make

decisions daily that hang lives in the balance (Headquarters, Department of the Army, 2006; Useem, 2010).

A solider needs quality sleep, exercise, and sustenance to be at peak performance (Headquarters, Department of the Army, 2006). Sleep has been noted as vital part of the Army Performance triad (Army Public Health Center, 2015). Researchers have shown that military personal are at a higher risk for sleep disorders and sleep disorder prevalence has doubled and tripled in some cases (Caldwell, Knapik, & Lieberman, 2017). In one study, only 37 percent of U.S. military members slept the recommended 7-8 hours of sleep and over half reported poor sleep quality (Troxel et al., 2015). There are many reasons sleep is poor in the military; for example, physical and emotional stressors, poor sleep practices and environments (Caldwell, Knapik, & Lieberman, 2017). Poor sleep quality effects combat readiness/physical performance (Lentino, Purvis, Murphy, & Deuster, 2013), and over 50 percent of service members report being fatigued at least 1-2 times per week (Troxel et al., 2015).

The purpose of this study was to understand and observe the effect of sleep quality on self-efficacy and performance. The Army Physical Fitness Test (APFT) was used to assess muscular fitness and cardiovascular fitness. Standards are set for each test by age and gender and military members are assessed through the amount of repetitions and time on each individual test combined at the end to yield a total score. Failure of the APFT is associated with lower fitness level, premature discharge, and significant career disruption (U.S. Department of the Army, 2016). Failure of the APFT also have a cost to the individual soldier and the U.S Military. The military tests their member in order to gauge their physical readiness for battle.

Chapter II

Method

Participants

Participants were 84 cadets from an upper Midwest Army ROTC Program. They were full time college students balancing a school schedule along with early morning physical training and duties in the military science program. There were 30 females and 54 males. Ages ranged from 18 to 25 years with an average of 19.90 years (*SD* = 1.62). Military science cadet levels were 31 MS1s Freshman, 32 MS2 Sophomore, 16 MS3 Junior, and 5 MS4 Senior.

Measures

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI: Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; see Appendix A) was used to asses sleep quality. The index consists of 19 items that yielded scores on 7 subscales (sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction). Each item was rated from 0 to 3. The subscale scores were used to compute a total score that ranges from 0 to 21; higher scores were indicative of poor sleep quality. Cronbach Alpha was reported between 0.69 and 0.83 depending on the population (De la Vega et al., 2015). The Alpha for this study was .75.

Epworth Sleepiness Scale

The severity of daytime sleepiness was evaluated using the Epworth Sleepiness Scale (Johns, 1991; see Appendix B). Cadets were asked to indicate if they would never doze (0), had a

slight chance of dozing (1), had a moderate chance of dozing (2), or had a high chance of dozing (3) in 8 common situations (e.g., studying, sitting in lecture, driving, etc.). Total scores on the scale can range from 0 to 24 where scores greater than 10 indicate abnormal daytime sleepiness and scores greater than 16 suggest pathological sleepiness. Cronbach's Alpha for this sample was .76.

Sleep Quantity Assessment

A sleep quantity assessment evaluated sleep debt using the Rosenkind formula (M. R. Rosenkind, personal communication, May 26, 2019; see Appendix C). Cadets were asked to report the amount of sleep obtained each night for 5 consecutive nights, starting from six days prior to the physical fitness test. The 5 consecutive nights included weekdays and weekends. The amount was totaled to determine the overall amount of sleep obtained within a 5-day period. In addition, cadets were asked to think about the number of hours of sleep obtained when they felt the most alert and performed their best in class and training. If this amount was unknown, they were instructed to report 8 hours. This amount was multiplied by 5 to determine the amount of sleep required in a 5-day period for optimal performance. The total amount of sleep obtained was then divided by the hours of sleep participants reported to be to be when they felt the most alert and performed to their best. The closer the percent to one reflected an optimal sleep quantity for the participant. Scores ranged .45 (45%) to 1.67 (167%). The acceptable threshold for this study was .90, meaning cadets with > .90 were only missing 10 percent of their sleep in the last five days; for a recommended 40 hours per 5-day period means they were lacking 4 hours of sleep.

Self-Confidence

The Competitive Trait Anxiety Inventory 2 (CTAI-2: Albrecht & Feltz, 1987; see Appendix D) is a 27-item assessment of self-confidence and anxiety. Only the confidence subscale was used (9 items). Cadets rated the intensity with which they usually experience each of the nine items before or during competition/performance on a 4-point Likert type scale ranging from 1 (*not at all*) to 4 (*very much so*). Sample items were the following: I feel at ease; I feel comfortable; I feel self-confident; I feel secure; I'm confident I can meet the challenge, etc. Scores can range from 9 to 36. Previous Alpha for this subscale was shown to be .83 (Neil, Mellalieu, & Hanton, 2006). Cronbach's Alpha for this sample was .93.

Self-efficacy

Self-efficacy was assessed using a task-specific measure assessing cadets' thoughts about their ability and score on an upcoming physical fitness test (see Appendix E). The self-efficacy questionnaire contained items regarding scores in each individual event (pushups, sit-ups and 2 mile run) along with a total score. Cadets were asked to indicate the strength of their belief to obtain certain scores (increasing in difficulty) using a 1 (*low degree of certainty*) to 10 (*high degree of certainty*). The self-efficacy measure was formatted in increments of 5 points, ranging from zero to 100 ("How confident are you that you will score a 50 on the Push-up portion of the APFT?" and then: "How confident are you that you will score a 55 on the Push-up portion of the APFT?"). The same 0 to 100 format (20 questions each) was used for sit-ups and the 2-mile run. The overall APFT score started at 50 points and increased by 10 points up to 300. For each measure, the total scores were computed by adding efficacy ratings together and then dividing by the number of questions in the subscale. Alphas for each measure were high, ranging from .95-.97.

Performance

The APFT is the Army's measurement of physical fitness. It measures a soldier's overall fitness through three parts of the test: sit-ups, push-ups, and the two-mile run. Raw scores were recorded on a scorecard then calculated into scaled scores. Scaled scores were calculated through the Army's standards (U.S. Department of the Army, 2010; see Appendix F); different scores are given by gender and age. The total scores range from 0 to 300, and each event from 0 to 100.

Procedure

Approval to conduct this study was provided by the Institutional Review Board (see Appendix G). Cadets were contacted via email and encouraged to participate by completing the surveys online (Qualtrics link). The survey collected the background information that was used to describe the participants (see Appendix H), and measures for PSQI, Sleep Quantity, self-confidence (CTAI subscale), and self-efficacy. The deadline to take the survey was 11:59pm the night before the cadets were scheduled to complete the Army's APFT. Three testing dates were used; so, the same person could have participated three times in this study (n = 133).

Chapter III

Results

Preliminary analysis were run for accuracy of data, missing values, and assumptions of multivariate factors. Two cases had filled out the self-efficacy for the push-up, sit-up, two-mile and overall APFT incorrectly and were subsequently deleted. SPSS Statistics 25 was used for data analysis. Descriptive statistics for each measure can be found in Table 1.

Table 1

Descriptive statistics

	Min	Max	Mean	SD
Global PSQI	0.00	17.00	8.20	3.46
ESS	0.00	18.00	7.59	3.91
Sleep Quantity	0.45	1.67	0.89	0.17
CTAI2	9.00	36.00	23.44	6.66
SE PU	1.30	10.00	8.12	1.81
SE SU	2.05	10.00	8.37	1.71
SE 2M	1.00	10.00	8.13	1.97
SE APFT	1.15	10.00	8.12	1.95
Pushup Score	41.00	100.00	87.56	14.52
Situp Score	22.00	100.00	82.17	18.60
2Mile Score	8.00	100.00	80.77	17.98
APFT total	80.00	300.00	250.47	43.08

Note. Global Pittsburgh Sleep Quality Index Score (Global PSQI); Epworth Sleepiness Scale (ESS); Rosenkind Formula (Sleep Quantity); Competitive Trait Anxiety Index – 2 (CTAI-2); Self-Efficacy Push-Up (SE PU); Self-Efficacy Sit-Up (SE SU); Self-Efficacy 2 Mile Run (SE 2M); Self-Efficacy Total APFT (SE APFT).

PSQI total scores ranged from 0 to 17 with a mean score of 8.20 (*SD* = 3.46). A score of >5 indicated those with greater sleep disturbances (approximately 24.8% of this sample). Sleep quantity scores ranged from 0.45 to 1.67 and 53.4% of the sample had a sleep quantity score > .90 showing that they did not have sleep debt (1.0) or had very little sleep debt (.90-1.0) in the 5 days leading up to the test. ESS scores ranged from 0 to 18, and 54.14% of the sample had a score of greater than 6 suggesting normal sleepiness, 23.3% had a score greater than 10

indicating abnormal sleepiness, and 1.5% had a score 16 and greater, suggesting pathological sleepiness.

According to responses on the CTAI-2, the mean was 23.44 indicating the sample was fairly confident. When analyzed by each question asked the average answer was 2.60 (out of 4) indicating that the average question was met with the answer "*moderately so*." Self-efficacy measures also indicated that the sample was confident in their abilities – all self-efficacy mean scores were above 8 on the 10 point scale.

Performance measures means indicated that the sample scored on average about 80 points on each individual test. Scores >60 are required for a passing score; 2.3 percent failed the Push-up event, 12.0 percent failed the Sit-up event, 8.3 percent failed the 2-mile run event. The APFT cannot be passed without a score >60 in each event and a total score of 180, 16 percent did not either pass 1 event or scored below 180 on the APFT. Generally, failure of the APFT would result in a re-test, no retests were included in the data.

Before running the main analyses, ANOVAs were run to see if female cadets would have better sleep quality when compared to their male counter parts, and if there were gender differences in confidence and self-efficacy (Feltz, Short, & Sullivan, 2008). The descriptive statistics for each measure, and corresponding p value, according to gender are in Table 2. Only the Competitive Trait Anxiety Inventory-2 (CTAI-2) and Self-efficacy two-mile (SE 2M) were statistically significant (CTAI-2: F (1, 131) = 16.40, p = .00; SE 2M: F (1,131) = 16.20 p = 0.04) with males scoring higher than females.

Table 2
Descriptive Statistics for Gender Differences

	Male(*n* =89)				Female(*n* =44)					
	Mean	SD	Min	Max	Mean	SD	Min	Max	*p*	*t*
Global PSQI	8.04	3.41	0.00	17.00	8.50	3.57	2.00	16.00	0.48	-0.71
ESS	7.17	3.96	0.00	18.00	8.43	3.72	0.00	18.00	0.08	-1.77
Sleep Quantity	0.90	0.17	0.50	1.67	0.87	0.16	0.45	1.23	0.31	1.02
CTAI2	25.00	6.53	9.00	36.00	20.30	5.81	9.00	33.00	**0.00**	4.05
SE PU	8.20	1.86	1.30	10.00	7.96	1.74	3.20	10.00	0.48	0.71
SE SU	8.48	1.85	2.05	10.00	8.14	1.38	3.55	10.00	0.28	1.09
SE 2M	8.38	1.86	1.45	10.00	7.64	2.10	1.00	10.00	**0.04**	2.07
SE APFT	8.25	1.98	1.73	10.00	7.85	1.87	1.15	10.00	0.26	1.13
Pushup Score	86.55	15.45	41.00	100.00	89.91	11.37	62.00	100.00	0.20	-1.34
Situp Score	82.73	19.73	22.00	100.00	80.32	17.79	29.00	100.00	0.50	0.49
2Mile Score	80.92	19.63	8.00	100.00	80.82	13.80	48.00	100.00	0.98	0.09
APFT total	250.20	46.58	80.00	300.00	250.93	35.63	159.00	300.00	0.93	-0.18

Note. Global Pittsburgh Sleep Quality Index Score (Global PSQI); Epworth Sleepiness Scale (ESS); Rosenkind Formula (Sleep Quantity); Competitive Trait Anxiety Index – 2 (CTAI-2); Self-Efficacy Push-Up (SE PU); Self-Efficacy Sit-Up (SE SU); Self-Efficacy 2 Mile Run (SE 2M); Self-Efficacy Total APFT (SE APFT).

Correlations were computed among the variables (see Table 3). All sleep measures correlated with each other. The PSQI and ESS were positively correlated because in both measures higher numbers mean a worse sleep quality. Sleep duration was correlated negatively with both PSQI and ESS, in the sleep duration measure a higher number means that the participant is getting more sleep, so a negative correlation is fitting. The CTAI-2 and the scores from the self-efficacy measures were all positively correlated. The performance measures were all significantly correlated.

With respect to the correlations among sleep and confidence and self-efficacy scores, the PSQI was significantly negatively correlated with all scores except the SE 2M. These correlations show that participants who had poorer sleep quality also had lower self-efficacy. For the ESS, the only significant correlation was with the CTAI-2. A higher number on the ESS, like the PSQI indicates worse sleep quality, so this value and direction indicates that those with

increased fatigue were less confident. There were no significant correlations among sleep quantity and confidence and self-efficacy measures.

Table 3
Pearson Correlations

	1	2	3	4	5	6	7	8	9	10	11
1 Global PSQI	1.00										
2 ESS	0.35**	1.00									
3 Sleep Quantity	-0.26**	-0.24**	1.00								
4 CTAI2	-0.35**	-0.26**	0.14	1.00							
5 SE PU	-0.20*	0.02	-0.02	0.29**	1.00						
6 SE SU	-0.20*	-0.06	0.04	0.34**	0.79**	1.00					
7 SE 2M	-0.14	0.07	0.08	0.32**	0.63**	0.70**	1.00				
8 SE APFT	-0.17*	0.02	0.04	0.40**	0.78**	0.85**	0.86**	1.00			
9 Pushup Score	-0.13	0.07	-0.19*	0.29**	0.59**	0.51**	0.31**	0.52**	1.00		
10 Situp Score	-0.18*	-0.05	-0.03	0.36**	0.53**	0.70**	0.48**	0.57**	0.59**	1.00	
11 2Mile Score	-0.25**	0.11	-0.06	0.24**	0.39**	0.46**	0.62**	0.58**	0.51**	0.58**	1.00**
12 APFT total	-0.23**	0.05	-0.01	0.36**	0.59**	0.70**	0.57**	0.66**	0.80**	0.88**	0.84**

** Correlation is significant at the 00.01 level (2-tailed)0. * Correlation is significant at the 00.05 level (2-tailed)
Note. Global Pittsburgh Sleep Quality Index Score (Global PSQI); Epworth Sleepiness Scale (ESS); Rosenkind Formula (Sleep Quantity); Competitive Trait Anxiety Index – 2 (CTAI-2); Self-Efficacy Push-Up (SE PU); Self-Efficacy Sit-Up (SE SU); Self-Efficacy 2 Mile Run (SE 2M); Self-Efficacy Total APFT (SE APFT).

Correlations between sleep and performance were statistically significant for the PSQI and Sit-up score, 2mile score, and APFT total, showing that poorer sleep was associated with poorer performance. The only other correlation that was statistically significant was between sleep quantity and push-up performance. The negative correlation shows that the more sleep a participant got, the less push-ups were performed on the push-up performance portion. Note that as PSQI and the ESS number's go up, the worse of an outcome it is.

All measures of confidence and self- efficacy were significantly correlated with all of the performance measures. As expected, in terms of measurement, the correlations between each self-efficacy and performance "pair" were the highest. The correlations show the positive relationships between self-efficacy and performance (the cadets who were more confident were also more likely to score higher on their performance measure).

If self-efficacy/confidence and sleep are related to performance, then a combination of the scores from these measures should predict a significant proportion of variance in performance scores (as based on the correlations). To maximize the prediction of performance, a

hierarchical multiple regression was used. From a theoretical perspective, self-efficacy/confidence should be the strongest predictors of performance, so they were entered first (block 1). All sleep measures were entered together next (block 2). The rationale for this order of entry was based on self-efficacy theory. Self-efficacy should predict performance, and sleep, as a physiological state, is a source of self-efficacy. These regressions were run separately for push-ups, sit-ups, mile run and total performance.

For push-ups, the 5 variables (PSQI, Sleep Quantity, ESS, CTAI-2, SE) predicted a significant proportion of variance in performance (64%, Adjusted $R^2 = .39$), F (5, 127) = 17.64, $p = .00$). Examination of the unique contribution of the variables to the total variance accounted for by the model indicated that self-efficacy, the CTAI-2, and sleep duration were significant predictors (see Table 4). Self-efficacy was a positive predictor (more confidence, the better you do); but sleep quantity was negative (too much sleep, the worse a person performed).

For sit-ups, the 5 variables (PSQI, SD, ESS, CTAI-2, SE) predicted a significant proportion of variance in performance (72%, Adjusted $R^2 = .49$), F (5, 127) = 26.63, $p = .00$). Examination of the unique contribution of the variables to the total variance accounted for by the model indicated that the only significant predictors were self-efficacy and the CTAI-2 (more confidence, the better you do).

For the 2 mile run, the 5 variables (PSQI, SD, ESS, CTAI-2, SE) predicted a significant proportion of variance in performance (67%, Adjusted $R^2 = .42$), F (5, 127) = 20.31, $p = .00$). Examination of the unique contribution of the variables to the total variance accounted for by the model indicated that self-efficacy was a significant predictor, and so was PSQI and sleep duration. Self-efficacy was a positive predictor (more confidence, the better you do); but the

PSQI and sleep quantity were negative (too much sleep/or poor sleep quality effected performance negatively).

Table 4
Regression Analysis

	Block 1			Block 2		
Variable	Beta	t	Sig.	Beta	t	Sig.
Push-up						
CTAI2	0.13	1.72	0.09	0.16	2.13	0.04*
SE PU	0.56	7.61	0.00*	0.53	7.34	0.00*
Global PSQI				-0.04	-0.55	0.58
ESS				0.07	0.86	0.39
Sleep Quantity				-0.20	-2.83	0.01*
Sit-up						
CTAI2	0.14	2.12	0.04*	0.15	2.06	0.04*
SE SU	0.65	9.91	0.00*	0.65	9.74	0.00*
Global PSQI				-0.04	-0.51	0.61
ESS				0.02	0.33	0.74
Sleep Quantity				-0.08	-1.19	0.24
2 mile Run						
CTAI2	0.05	0.66	0.51	0.03	0.33	0.74
SE 2m	0.60	8.31	0.00*	0.58	8.14	0.00*
Global PSQI				-0.24	-3.15	0.00*
ESS				0.13	1.69	0.09
Sleep Quantity				-0.14	-1.98	0.05
Total APFT						
CTAI2	0.11	1.50	0.14	0.10	1.39	0.17
SE APFT	0.62	8.67	0.00*	0.60	8.47	0.00*
Global PSQI				-0.16	-2.19	0.03*
ESS				0.08	1.15	0.26
Sleep Quantity				-0.16	-2.35	0.02*

* regression is significant

Note. Global Pittsburgh Sleep Quality Index Score (Global PSQI); Epworth Sleepiness Scale (ESS); Rosenkind Formula (Sleep Quantity); Competitive Trait Anxiety Index – 2 (CTAI-2); Self-Efficacy Push-Up (SE PU); Self-Efficacy Sit-Up (SE SU); Self-Efficacy 2 Mile Run (SE 2M); Self-Efficacy Total APFT (SE APFT).

For total performance, the 5 variables (PSQI, SD, ESS, CTAI-2, SE) predicted a significant proportion of variance in performance (70%, Adjusted $R^2 = .47$), F (5, 127) = 24.00, $p = .00$). Examination of the unique contribution of the variables to the total variance accounted for by the model indicated that self-efficacy was a significant predictor, and so was PSQI and sleep quantity.

Chapter IV

Discussion

To answer the research question of: Are cadets who have poorer sleep quality less efficacious in their abilities and score lower on their APFT; correlations and regressions were primarily used in the analyses. The results of the study showed the self-efficacy had a positive and significant effect on the performance of the cadets taking the APFT. Researchers have explored the links between sleep and performance in athletes (e.g., Halson & Juliff, 2017), but few have explored the same research in a military setting. Wagstaff (2015) is one exception who has drawn similarities between athletes and military members.

The results were consistent with many of the findings by other researchers. The fatigue rates of the participants were 23.3% (ESS scores). This number is well below the findings of authors such as Aliyu (2007) who stated that 37.9 of their population was fatigued, and above Aritake et. Al. (2014) which stated their population had a fatigue prevalence of 17.2. It is also noted that as poor sleep quality persists, a higher rate of fatigue is present. In this study, participants scored greater than 5 on the PSQI 24.8% of the time suggesting higher disturbances of sleep also demonstrating the previously published sleep trends.

According to Bandura (1997), the impact of physiological states on efficacy beliefs will depend on things such as situational factors and the meaning given to them. Most participants in

the sample were confident, if not very confident. It's due noting the need to perform on the APFT may have affected the confidence level of the participants. If a participant failed any test it effected their grade, added extra training and the participant had to retake the test again. Generally, participants are tested three times a semester: once at the beginning, middle, and end, with the expectation of improvement each time. Researchers have shown that if a person is more confident, than they will perform better on the subsequent test (Hays, Thomas, Maynard, & Bawden, 2009).

There were no significant differences between men and women in this study with the exception of two confidence measures. In this study, men demonstrated higher confidence compared to women on the 2 mile run (SE 2M) and the CTAI-2. These results show that males tend to be more confident when asked about the tasks they are perform under the same pressures that females face. When comparing sleep scores from each measure on average, women's sleep scores were on average (comparing means) worse than their male counter parts, but the ANOVA was insignificant for each measure. Due to the ANOVAs being insignificant analysis continued without comparing gender.

The relationships among each variables through correlations exemplified normal expectations, confidence and self-efficacy variables were positively correlated and so were the correlations between each self-efficacy measure and its subsequent performance measure. The CTAI-2 was also positively correlated with all performance outcomes demonstrating that all measures were effective tools for measuring the efficacy the participants had with regards to the upcoming APFT. The correlation analyses revealed a trend that those with lower sleep quality (scoring higher on the Global PSQI, and ESS) had lower self-efficacy, although the population demonstrated overall confidence. When analyzing the correlations between Sleep Quantity and

the confidence measures, only Pushup score was significant, but all performance measures were negatively correlated. The negative correlations between Sleep Quantity and performance measures demonstrated if participants slept more than the time they felt the most rested than their performance scores suffered; this result is an example of how too much sleep can effect performance. Sleeping too much or too little effected performance negatively. When participants got the amount of sleep they felt was effective for them, they performance better.

The multiple regression analysis showed that the self-efficacy measures were the most useful in predicting the subsequent performance outcome. The second step, that included all sleep measures, showed that for three of the four performance outcomes, the global PSQI was a significant predictor followed by sleep quantity. Beta weights from each step raise a question about the potential mediating effect of self-efficacy on sleep and performance. Overall, although sleep and self-efficacy were significant predictors of performance, they accounted for only a small proportion of variance.

In conclusion, sleep is important and an integral part of life, especially in the military. The participants in this study were cadets on their way to becoming Army officers and commanding troops. The value of sleep and sleep quality is usually an overlooked part of everyday life. How we sleep can affect our confidence toward a given task and effect our output when it comes to said performance or physical tests. Further implications of this study may include a bigger emphasis on sleep education for military students that they can pass down to their subordinates.

Future researchers should address the more complicated pathways that connect these variables. They may also consider using more accurate ways to measure sleep; for example, wearable technology like FitBit. Different performance measures could also be used. The Army

has a new physical fitness test that includes more events and shorter break times. Limitations of this study include the sleep measures, small sample size, and lack of independence in the data (the survey used in this study was taken multiple times by some individuals but at different points in time ranging two to three months apart). When measuring sleep, the most effective way is in a lab as self-reports may be inaccurate, and participants tend to overestimate their quality of sleep. Due to the data being only collected in one location the sample size was small, and the sample's scores did not have a lot of variance so collecting data at different locations and maybe under different conditions (filed tests during boot camp) may be more helpful. However, this study was the first of its kind exploring sleep and self-efficacy and performance.

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Appendix A

Questions About Your Sleep

The following questions relate to your usual sleep habits during the PAST Month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past week.

During the PAST MONTH, what time have you usually gone to bed at night?
Bed time:
Hour
Minute
AM/PM

During the PAST MONTH , how long has it usually taken you to fall asleep each night?
Hours
Minutes

During the PAST MONTH, what time have you usually gotten up in the morning?
Getting up time:
Hour
Minute
AM/PM

During the PAST Month, how many hours of actual sleep did you usually get at night?
(This may be different than the number of hours you spent in bed.)
Hours of sleep per night:
Hours
Minutes

During the PAST MONTH, How many hours were you in bed
Hours spent in Bed:
Hours
Minutes

During the PAST MONTH, how often have you had trouble sleeping because you...

	Not During the past Month (0)	Less than once a week (1)	Once or Twice a Week (2)	Three or more times a week
Cannot get to sleep within 30 minutes	○	○	○	○
Wake up in the middle of the night or early morning	○	○	○	○
Have to get up to use the bathroom	○	○	○	○
Cannot breathe comfortably	○	○	○	○
Cough or snore loudly	○	○	○	○
Feel too cold	○	○	○	○
Feel too hot	○	○	○	○
Have bad dreams	○	○	○	○
Have pain	○	○	○	○
Other reason (s), please describe, including how often you have had trouble sleeping because of this reason (s):	○	○	○	○

	Not During the past Month (0)	Less than once a week (1)	Once or Twice a Week (2)	Three or more times a week
During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?	○	○	○	○
During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity	○	○	○	○
During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?	○	○	○	○

During the PAST MONTH, how would you rate your sleep quality overall?

○ Very Good
○ Fairly Good
○ Fairly Bad
○ Very Bad

Appendix B

How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. Even if you have not done some of these things recently try to work out how they would have affected you. Use the following scale to choose the most appropriate number for each situation:

	No chance of dozing	Slight chance of dozing	Moderate chance of dozing	High chance of dozing
Sitting and reading	○	○	○	○
Watching TV	○	○	○	○
Sitting inactive in a public place (e.g a theater or a meeting)	○	○	○	○
As a passenger in a car for an hour without a break	○	○	○	○
Lying down to rest in the afternoon when circumstances permit (not napping)	○	○	○	○
Sitting and talking to someone	○	○	○	○
Sitting quietly after a lunch without alcohol	○	○	○	○
In a car, while stopped for a few minutes in traffic	○	○	○	○

Appendix C

Report the amount of sleep obtained each night for the last 5 consecutive nights

Thursday, June 20th	Friday, June 21st	Saturday, June 22nd	Sunday, June 23rd	Monday, June 24th
▼	▼	▼	▼	▼

For the next question please indicate the number of hours of sleep obtained when you have felt the most alert and performed your best. If this amount is unknown, report 8 hours.

Appendix D

The following are several statements that you can use to describe your feelings before The APFT. **Read** each statement and mark the appropriate box to indicate how you feel right now, **at this moment**. There are no right or wrong answers. Do not spend too much time on any one statement

	Not at all	Somewhat	Moderately so	Very much so
I feel at ease.	○	○	○	○
I feel comfortable.	○	○	○	○
I feel self-confident.	○	○	○	○
I feel secure.	○	○	○	○
I'm confident I can meet the challenge.	○	○	○	○
I'm confident about the APFT	○	○	○	○
I feel mentally relaxed.	○	○	○	○
I'm confident because I mentally picture myself reaching my goal.	○	○	○	○
I'm confident of coming through under pressure	○	○	○	○

Appendix E

How sure you are in Achieving the score on the Push-up portion of the APFT in the condition you currently are in?

1= small degree of certainty 10= High degree of certainty

	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **5** points on the Push-up portion of the APFT										
I am certain I will achieve **10** points on the Push-up portion of the APFT										
I am certain I will achieve **15** points on the Push-up portion of the APFT										
I am certain I will achieve **20** points on the Push-up portion of the APFT										
I am certain I will achieve **25** points on the Push-up portion of the APFT										
I am certain I will achieve **30** points on the Push-up portion of the APFT										
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **35** points on the Push-up portion of the APFT										
I am certain I will achieve **40** points on the Push-up portion of the APFT										
I am certain I will achieve **45** points on the Push-up portion of the APFT										
I am certain I will achieve **50** points on the Push-up portion of the APFT										
I am certain I will achieve **55** points on the Push-up portion of the APFT										
I am certain I will achieve **60** points on the Push-up portion of the APFT										
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **65** points on the Push-up portion of the APFT										
I am certain I will achieve **70** points on the Push-up portion of the APFT										
I am certain I will achieve **75** points on the Push-up portion of the APFT										
I am certain I will achieve **80** points on the Push-up portion of the APFT										
I am certain I will achieve **85** points on the Push-up portion of the APFT										
I am certain I will achieve **90** points on the Push-up portion of the APFT										
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **95** points on the Push-up portion of the APFT										
I am certain I will achieve **100** points on the Push-up portion of the APFT										
I am certain I will achieve **100+** points on the Push-up portion										

How sure you are in Achieving the score on the Sit-up portion of the APFT in the condition you currently are in?

1= small degree of certainty 10= High degree of certainty

	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **5** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **10** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **15** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **20** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **25** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **30** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **35** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **40** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **45** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **50** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **55** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **60** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **65** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **70** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **75** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **80** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **85** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **90** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **95** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **100** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **100+** points on the Sit-up portion of the APFT	○	○	○	○	○	○	○	○	○	○

How sure you are in Achieving the score on the 2-mile run portion of the APFT in the condition you currently are in?

1= small degree of certainty 10= High degree of certainty

	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **5** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **10** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **15** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **20** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **25** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **30** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **35** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **40** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **45** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **50** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **55** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **60** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **65** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **70** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **75** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **80** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **85** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **90** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **95** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **100** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **100+** points on the 2-Mile run portion of the APFT	○	○	○	○	○	○	○	○	○	○

How sure you are in Achieving the score on the Overall **APFT** score in the condition you currently are in?

1= small degree of certainty 10= High degree of certainty

	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **50** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **60** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **70** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **80** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **90** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **100** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **110** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **120** points on the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **130** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **140** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **150** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **160** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **170** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **180** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **190** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **200** points on the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **210** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **220** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **230** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **240** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **250** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **260** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **270** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **280** points on the APFT	○	○	○	○	○	○	○	○	○	○
	1	2	3	4	5	6	7	8	9	10
I am certain I will achieve **290** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **300** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **310** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **320** points on the APFT	○	○	○	○	○	○	○	○	○	○
I am certain I will achieve **320+** points on the APFT	○	○	○	○	○	○	○	○	○	○

Appendix F

PUSH-UP STANDARDS

AGE GROUP	17-21		22-26		27-31		32-36		37-41		AGE GROUP	42-46		47-51		52-56		57-61		62+		AGE GROUP
Repetitions	M	F	M	F	M	F	M	F	M	F	Repetitions	M	F	M	F	M	F	M	F	M	F	Repetitions
77					100						77											77
76					99						76											76
75			100		98		100				75											75
74			99		97		99				74											74
73			98		96		98		100		73											73
72			97		95		97		99		72											72
71	100		96		94		96		98		71											71
70	99		94		93		95		97		70											70
69	97		93		92		94		96		69											69
68	96		92		91		93		95		68											68
67	94		91		89		92		94		67											67
66	93		90		88		91		93		66	100										66
65	92		89		87		90		92		65	99										65
64	90		87		86		89		91		64	98										64
63	89		86		85		88		90		63	97										63
62	88		85		84		87		89		62	96										62
61	88		84		83		86		88		61	94										61
60	85		83		82		85		87		60	93										60
59	83		82		81		84		86		59	92		100								59
58	82		81		80		83		85		58	91		99								58
57	81		79		79		82		84		57	90		98								57
56	79		78		78		81		83		56	89		96		100						56
55	78		77		77		79		82		55	88		95		99						55
54	77		76		76		78		81		54	87		94		98						54
53	75		75		75		77		79		53	86		93		97		100				53
52	74		74		74		76		78		52	84		92		96		99				52
51	72		73		73		75		77		51	83		91		94		98				51
50	71		71		72	100	74		76		50	82		89		93		97		100		50
49	70		70		71	99	73		75		49	81		88		92		95		99		49
48	68		69		69	98	72		74		48	80		87		91		94		98		48
47	67		68		68	96	71		73		47	79		86		90		93		96		47
46	66		67	100	67	95	70		72		46	78		85		89		92		95		46
45	64		66	99	66	94	69	100	71		45	77		84		88		91		94		45
44	63		65	97	65	93	68	99	70		44	76		82		87		90		93		44
43	61		63	96	64	92	67	97	69		43	74		81		86		89		92		43
42	60	100	62	94	63	90	66	96	68		42	73		80		84		87		91		42
41	59	98	61	93	62	89	65	95	67		41	72		79		83		86		89		41
40	57	97	60	92	61	88	64	93	66	100	40	71		78		82		85		88		40
39	56	95	59	90	60	87	63	92	65	99	39	70		76		81		84		87		39
38	54	93	58	89	59	85	62	91	64	97	38	69		75		80		83		86		38
37	53	91	57	88	58	84	61	89	63	96	37	68	100	74		79		82		85		37
36	52	90	55	86	57	83	60	88	62	94	36	67	98	73		78		81		84		36
35	50	88	54	85	56	82	59	87	61	93	35	66	97	72		77		79		82		35
34	49	86	53	83	55	81	58	85	60	91	34	64	95	71	100	76		78		81		34
33	48	84	52	82	54	79	57	84	59	90	33	63	94	69	98	74		77		80		33
32	46	83	51	81	53	78	56	83	58	88	32	62	92	68	97	73		76		79		32
31	45	81	50	79	52	77	55	81	57	87	31	61	90	67	95	72	100	75		78		31
30	43	79	49	78	50	76	54	80	56	85	30	60	89	66	93	71	98	74		76		30
29	42	77	47	77	49	75	53	79	55	84	29	59	87	65	92	70	96	73		75		29
28	41	76	46	75	48	73	52	77	54	82	28	58	86	64	90	69	95	71	100	74		28
27	39	74	45	74	47	72	51	76	53	81	27	57	84	62	88	68	93	70	98	73		27
26	38	72	44	72	46	71	50	75	52	79	26	56	82	61	87	67	91	69	96	72		26
25	37	70	43	71	45	70	49	73	51	78	25	54	81	60	85	66	89	68	94	71	100	25
24	35	69	42	70	44	68	48	72	50	76	24	53	79	59	83	64	87	67	92	69	98	24
23	34	67	41	68	43	67	47	71	49	75	23	52	78	58	82	63	85	66	90	68	96	23
22	32	65	39	67	42	66	46	69	48	73	22	51	76	56	80	62	84	65	88	67	93	22
21	31	63	38	66	41	65	45	68	47	72	21	50	74	55	78	61	82	63	86	66	91	21
20	30	62	37	64	40	64	44	67	46	70	20	49	73	54	77	60	80	62	84	65	89	20
19	28	60	36	63	39	62	43	65	45	69	19	48	71	53	75	59	78	61	82	64	87	19
18	27	58	35	61	38	61	42	64	44	67	18	47	70	52	73	58	76	60	80	62	84	18
17	26	57	34	60	37	60	41	63	43	66	17	46	68	51	72	57	75	59	78	61	82	17
16	24	55	33	59	36	59	39	61	42	64	16	44	66	49	70	56	73	58	76	60	80	16
15	23	53	31	57	35	58	38	60	41	63	15	43	65	48	68	54	71	57	74	59	78	15
14	21	51	30	56	34	56	37	59	39	61	14	42	63	47	67	53	69	55	72	58	76	14
13	20	50	29	54	33	55	36	58	38	60	13	41	62	46	65	52	67	54	70	56	73	13
12	19	48	28	52	32	54	35	56	37	59	12	40	60	45	63	51	65	53	68	55	71	12
11	17	46	27	50	31	52	34	54	36	57	11	39	58	44	62	50	64	52	66	54	69	11
10	16	44	26	49	29	50	33	52	35	56	10	38	57	42	60	49	62	51	64	53	67	10
9	14	43	25	49	28	49	32	50	34	54	9	37	55	41	58	48	60	50	62	52	64	9
8	13	41	23	48	27	49	31	49	33	53	8	36	54	40	57	47	58	49	60	51	62	8
7	12	39	22	46	26	48	30	49	32	51	7	34	52	39	55	46	56	47	58	49	60	7
6	10	37	21	45	25	47	29	48	31	50	6	33	50	38	53	44	55	46	56	48	58	6
5	9	36	20	43	24	45	28	47	30	48	5	32	49	36	52	43	53	45	54	47	56	5
4	8	34	19	42	23	44	27	45	29	47	4											4
3	6	32	18	41	22	43	26	44	28	45	3											3
2	5	30	17	39	21	42	25	43	27	44	2											2
1	3	29	15	38	20	41	24	41	26	42	1											1
Repetitions	M	F	M	F	M	F	M	F	M	F	Repetitions	M	F	M	F	M	F	M	F	M	F	Repetitions
AGE GROUP	17-21		22-26		27-31		32-36		37-41		AGE GROUP	42-46		47-51		52-56		57-61		62+		AGE GROUP

Scoring standards are used to convert raw scores to point scores after test events are completed. Male point scores are indicated by the M at the top and bottom of the shaded column. Female point scores are indicated by the F at the top and bottom of the unshaded column. To convert raw scores to point scores, find the number of repetitions performed in the left-hand column. Next, move right along that row and locate the intersection of the soldiers appropriate age column. Record that number in the Push-Up points block on the front of the scorecard.

SIT-UP STANDARDS

AGE GROUP	17-21	22-26	27-31	32-36	37-41	AGE GROUP	42-46	47-51	52-56	57-61	62+	AGE GROUP
Repetitions	MF	MF	MF	MF	MF	Repetitions	MF	MF	MF	MF	MF	Repetitions
82			100			82						82
81			99			81						81
80		100	98			80						80
79		99	97			79						79
78	100	97	96			78						78
77	98	96	95			77						77
76	97	95	94	100	100	76						76
75	95	93	92	99	99	75						75
74	94	92	91	98	98	74						74
73	92	91	90	96	97	73						73
72	90	89	89	95	96	72	100					72
71	89	88	88	94	95	71	99					71
70	87	87	87	93	94	70	98					70
69	86	85	86	92	93	69	97					69
68	84	84	85	91	92	68	96					68
67	82	83	84	89	91	67	95					67
66	81	81	83	88	89	66	94	100	100			66
65	79	80	82	87	88	65	93	99	99			65
64	78	79	81	86	87	64	92	98	98	100		64
63	76	77	79	85	86	63	91	97	97	99	100	63
62	74	76	78	84	85	62	90	96	96	98	99	62
61	73	75	77	82	84	61	89	94	95	97	98	61
60	71	73	76	81	83	60	88	93	94	96	97	60
59	70	72	75	80	82	59	87	92	93	95	96	59
58	68	71	74	79	81	58	86	91	92	94	95	58
57	66	69	73	78	80	57	85	90	91	92	94	57
56	65	68	72	76	79	56	84	89	89	91	92	56
55	63	67	71	75	78	55	83	88	88	90	91	55
54	62	65	70	74	77	54	82	87	87	89	90	54
53	60	64	69	73	76	53	81	86	86	88	89	53
52	58	63	68	72	75	52	80	84	85	87	88	52
51	57	61	66	71	74	51	79	83	84	86	87	51
50	55	60	65	69	73	50	78	82	83	85	86	50
49	54	59	64	68	72	49	77	81	82	84	85	49
48	52	57	63	67	71	48	76	80	81	83	84	48
47	50	56	62	66	69	47	75	79	80	82	83	47
46	49	55	61	65	68	46	74	78	79	81	82	46
45	47	53	60	64	67	45	73	77	78	79	81	45
44	46	52	59	62	66	44	72	76	77	78	79	44
43	44	50	58	61	65	43	71	74	76	77	78	43
42	42	49	57	60	64	42	70	73	75	76	77	42
41	41	48	56	59	63	41	69	72	74	75	76	41
40	39	47	55	58	62	40	68	71	73	74	75	40
39	38	45	54	56	61	39	67	70	72	73	74	39
38	36	44	52	55	60	38	66	69	71	72	73	38
37	34	43	51	54	59	37	65	68	69	71	72	37
36	33	41	50	53	58	36	64	67	68	70	71	36
35	31	40	49	52	57	35	63	66	67	69	70	35
34	30	39	48	50	56	34	62	64	66	68	69	34
33	28	37	47	49	55	33	61	63	65	66	68	33
32	26	36	46	48	54	32	60	62	64	65	66	32
31	25	35	45	47	53	31	59	61	63	64	65	31
30	23	33	44	46	52	30	58	60	62	63	64	30
29	22	32	43	45	50	29	57	59	61	62	63	29
28	20	31	42	44	49	28	56	58	60	61	62	28
27	18	29	41	42	48	27	55	57	59	60	61	27
26	17	28	39	41	47	26	54	56	58	59	60	26
25	15	27	38	40	46	25	53	54	57	58	59	25
24	14	25	37	39	45	24	52	53	56	57	58	24
23	12	24	36	38	44	23	51	52	55	56	57	23
22	10	23	35	36	43	22	50	51	54	55	56	22
21	9	21	34	35	42	21	49	50	53	54	55	21
Repetitions	MF	MF	MF	MF	MF	Repetitions	MF	MF	MF	MF	MF	Repetitions
AGE GROUP	17-21	22-26	27-31	32-36	37-41	AGE GROUP	42-46	47-51	52-56	57-61	62+	AGE GROUP

Scoring standards are used to convert raw scores to point scores after test events are completed. To convert raw scores to point scores, find the number of repetitions performed in the left-hand column. Next, move right along that row and locate the intersection of the soldiers appropriate age column. Record that number in the Sit-Up points block on the front of the scorecard.

2-MILE RUN STANDARDS

AGE GROUP	17-21		22-26		27-31		32-36		37-41		AGE GROUP	42-46		47-51		52-56		57-61		62+		AGE GROUP
Time	M	F	M	F	M	F	M	F	M	F	Time	M	F	M	F	M	F	M	F	M	F	Time
12:54											12:54											12:54
13:00	100		100								13:00											13:00
13:06	99		99								13:06											13:06
13:12	97		98								13:12											13:12
13:18	96		97		100		100				13:18											13:18
13:24	94		96		99		99				13:24											13:24
13:30	93		94		98		98				13:30											13:30
13:36	92		93		97		97		100		13:36											13:36
13:42	90		92		96		96		99		13:42											13:42
13:48	89		91		95		95		98		13:48											13:48
13:54	88		90		94		95		97		13:54											13:54
14:00	86		89		92		94		97		14:00											14:00
14:06	85		88		91		93		96		14:06	100										14:06
14:12	83		87		90		92		95		14:12	99										14:12
14:18	82		86		89		91		94		14:18	98										14:18
14:24	81		84		88		90		93		14:24	97		100								14:24
14:30	79		83		87		89		92		14:30	97		99								14:30
14:36	78		82		86		88		91		14:36	96		98								14:36
14:42	77		81		85		87		91		14:42	95		98		100						14:42
14:48	75		80		84		86		90		14:48	94		97		99						14:48
14:54	74		79		83		85		89		14:54	93		96		98						14:54
15:00	72		78		82		85		88		15:00	92		95		98						15:00
15:06	71		77		81		84		87		15:06	91		95		97						15:06
15:12	70		76		79		83		86		15:12	90		94		96						15:12
15:18	68		74		78		82		86		15:18	90		93		95		100				15:18
15:24	67		73		77		81		85		15:24	89		92		95		99				15:24
15:30	66		72		76		80		84		15:30	88		91		94		98				15:30
15:36	64	100	71	100	75		79		83		15:36	87		91		93		97				15:36
15:42	63	99	70	99	74		78		82		15:42	86		90		92		97		100		15:42
15:48	61	98	69	98	73	100	77		81		15:48	85		89		91		96		99		15:48
15:54	60	96	68	97	72	99	76	100	80		15:54	84		88		91		95		98		15:54
16:00	59	95	67	96	71	98	75	99	80		16:00	83		87		90		94		97		16:00
16:06	57	94	66	95	70	97	75	99	79		16:06	83		87		89		93		96		16:06
16:12	56	93	64	94	69	97	74	98	78		16:12	82		86		88		92		95		16:12
16:18	54	92	63	93	68	96	73	97	77		16:18	81		85		87		91		94		16:18
16:24	53	90	62	92	66	95	72	97	76		16:24	80		84		87		91		93		16:24
16:30	52	89	61	91	65	94	71	96	75		16:30	79		84		86		90*		93		16:30
16:36	50	88	60	90	64	93	70	95	74		16:36	78		83		85		89		92		16:36
16:42	49	87	59	89	63	92	69	94	74		16:42	77		82		84		88		91		16:42
16:48	48	85	58	88	62	91	68	94	73		16:48	77		81		84		87		90		16:48
16:54	46	84	57	87	61	91	67	93	72		16:54	76		80		83		86		89		16:54
17:00	45	83	56	86	60	90	66	92	71	100	17:00	75		80		82		85		88		17:00
17:06	43	82	54	85	59	89	65	92	70	99	17:06	74		79		81		84		87		17:06
17:12	42	81	53	84	58	88	65	91	69	99	17:12	73		78		80		83		86		17:12
17:18	41	79	52	83	57	87	64	90	69	98	17:18	72		77		80		83		85		17:18
17:24	39	78	51	82	56	86	63	90	68	97	17:24	71	100	76		79		82		84		17:24
17:30	38	77	50	81	55	86	62	89	67	96	17:30	70	99	76		78		81		83		17:30
17:36	37	76	49	80	54	85	61	88	66	96	17:36	70	99	75	100	77		80		82		17:36
17:42	35	75	48	79	52	84	60	88	65	95	17:42	69	98	74	99	76		79		81		17:42
17:48	34	73	47	78	51	83	59	87	64	94	17:48	68	97	73	99	76		78		80		17:48
17:54	32	72	46	77	50	82	58	86	63	94	17:54	67	97	73	98	75		77		80		17:54
18:00	31	71	44	76	49	81	57	86	63	93	18:00	66	96	72	97	74		77		79		18:00
18:06	30	70	43	75	48	80	56	85	62	92	18:06	65	96	71	97	73		76		78		18:06
18:12	28	68	42	74	47	80	55	84	61	92	18:12	64	95	70	96	73		75		77		18:12
18:18	27	67	41	73	46	79	55	83	60	91	18:18	63	94	69	96	72		74		76		18:18
18:24	26	66	40	72	45	78	54	83	59	90	18:24	63	94	69	95	71		73		75		18:24
18:30	24	65	39	71	44	77	53	82	58	89	18:30	62	93	68	94	70		72		74		18:30
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18:42	21	62	37	69	42	75	51	81	57	88	18:42	60	92	66	93	69		70		72		18:42
18:48	20	61	36	68	41	74	50	80	56	87	18:48	59	91	65	92	68		70		71		18:48
18:54	19	60	34	67	39	74	49	79	55	87	18:54	58	90	65	92	67		69		70		18:54
19:00	17	59	33	66	38	73	48	79	54	86	19:00	57	90	64	91	66	100	68		69		19:00
19:06	16	58	32	65	37	72	47	78	53	85	19:06	57	89	63	91	65	99	67		68		19:06
19:12	14	56	31	64	36	71	46	77	52	85	19:12	56	89	62	90	65	99	66		67		19:12
19:18	13	55	30	63	35	70	45	77	51	84	19:18	55	88	62	89	64	98	65		67		19:18
19:24	12	54	29	62	34	69	45	76	51	83	19:24	54	87	61	89	63	97	64		66		19:24
19:30	10	53	28	61	33	69	44	75	50	82	19:30	53	87	60	88	62	96	63		65		19:30
19:36	9	52	27	60	32	68	43	74	49	82	19:36	52	86	59	87	62	96	63		64		19:36
19:42	8	50	26	59	31	67	42	74	48	81	19:42	51	85	58	87	61	95	62	100	63		19:42
19:48	6	49	24	58	30	66	41	73	47	80	19:48	50	85	58	86	60	94	61	99	62		19:48
19:54	5	48	23	57	29	65	40	72	46	80	19:54	50	84	57	86	59	93	60	98	61		19:54
20:00	3	47	22	56	28	64	39	72	46	79	20:00	49	83	56	85	58	93	59	98	60	100	20:00
20:06	2	45	21	55	26	63	38	71	45	78	20:06	48	83	55	84	58	92	58	97	59	99	20:06
20:12	1	44	20	54	25	63	37	70	44	78	20:12	47	82	55	84	57	91	57	96	58	98	20:12
20:18	0	43	19	53	24	62	36	70	43	77	20:18	46	82	54	83	56	90	57	95	57	98	20:18
20:24		42	18	52	23	61	35	69	42	76	20:24	45	81	53	82	55	90	56	95	56	97	20:24
20:30		41	17	51	22	60	35	68	41	75	20:30	44	80	52	82	55	89	55	94	55	96	20:30
Time	M	F	M	F	M	F	M	F	M	F	Time	M	F	M	F	M	F	M	F	M	F	Time
AGE GROUP	17-21		22-26		27-31		32-36		37-41		AGE GROUP	42-46		47-51		52-56		57-61		62+		AGE GROUP

Appendix G

UNIVERSITY OF NORTH DAKOTA UND.edu

Institutional Review Board
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November 26, 2018

Principal Investigator(s):	Andrew Lautner
Project Title:	Relations Among Sleep Quality, Self Efficacy and Performance in a Military Setting
IRB Project Number:	IRB-201811-113
Project Review Level:	Exempt 2
Date of IRB Approval:	11/26/2018
Expiration Date of This Approval:	11/25/2021

The application form and all included documentation for the above-referenced project have been reviewed and approved via the procedures of the University of North Dakota Institutional Review Board.

If you need to make changes to your research, you must submit a Protocol Change Request Form to the IRB for approval. No changes to approved research may take place without prior IRB approval.

This project has been approved for 3 years, as permitted by UND IRB policies for exempt research. You have approval for this project through the above-listed expiration date. When this research is completed, please submit a Termination Form to the IRB.

Appendix H

Demographics

What is your gender?

- Male
- Female

What is your age in years?

What is your MS level?

- MS1
- MS2
- MS3
- MS4
- MS5

Name

- (This will only be used to retrieve your APFT score)

References literature review

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