

**The Relationship between Leadership Support
and Injury Risks:
Motivation for improving safety climate and safety
culture**

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14. ABSTRACT This document details analyses that have been conducted to characterize the relationship between injury risks, physical fitness, and Soldier responses to survey questions regarding leadership support for injury prevention. Among a population of 831 Infantry Soldiers, a reported lack of leadership support for injury prevention was found to be significantly associated with higher injury risk (p<0.05). For example, respondents who reported that leadership rarely provided the status of unit injuries had more than double the odds of injury compared to those who said their leadership routinely did so (OR: 2.19, 95%CI 1.13-4.87). These results indicate that responses about leadership support may have been biased by other factors unrelated leadership actions. Recommendations for better survey assessment of leadership support for safety and injury prevention are provided, which are less likely to reflect biases. Additional recommendations are suggested, such as training for leaders in safety-specific transactional and transformational leadership styles to improve safety climate and safety culture, education for unit leaders about preventing training-related injuries and implementing balanced training techniques, and use of Army Wellness Centers for health education and improving readiness.				
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1	Organizational Relationships between Leadership, Safety, and Injuries; Adapted from Previous Studies (Griffin and Neal 2000; Christian et al 2009; Neal and Griffin 2006; Sawhney and Cigularov 2016; Sorensen et al 2016; Barling, Loughlin, and Kelloway 2002).....	3
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THE RELATIONSHIP BETWEEN LEADERSHIP SUPPORT AND INJURY RISKS

PHIP NO. 12-02-0419

1 REFERENCES

Appendix A provides the references cited within this document.

2 PURPOSE

This document details analyses that have been conducted to characterize the relationships between injury risks, physical fitness, and Soldier responses to survey questions regarding leadership support for injury prevention.

3 INTRODUCTION

“Leadership is the process of influencing people by providing purpose, direction, and motivation to accomplish the mission and improve the organization” (DA 2012a). Department of Defense (DoD) instruction defines the core competencies of leaders as those who lead change, lead people, are results driven, have business acumen, build coalitions, and have enterprise-wide technical perspective (DoD 2009).

The integral association between leadership, organizational safety culture, safety climate, and injury prevention has been studied for several decades (Zohar 2010, Cohen 1977, Zohar 1980, Geller 1994, Pidgeon 1991, Daniel 2018). Organizational norms, beliefs, and practices for handling hazards and risks (or “safety culture” (Pidgeon 1991)) and employees’ shared perceptions of leadership support for safety initiatives (or “safety climate” (Zohar 1980)) have been shown to influence safety within organizations. Leadership support for injury prevention can affect the following:

- Employee risk perception (Nielsen et al. 2013, Mullen and Kelloway 2009).
- Safety compliance, motivation, and behaviors (Kapp 2012, Schneider, Ehrhart, and Macey 2013, Huang et al. 2014, Sawhney and Cigularov 2016, Clarke and Ward 2006, Clarke 2013).
- The occurrence and frequency of occupational injuries (Kelloway and Barling 2010, Christian et al. 2009, Clarke and Taylor 2018, Martínez-Córcoles and Stephanou 2017, Huang et al. 2014, Vredenburg 2002, Cook et al. 2016, Zohar 2000, Anderson, Smith, and Byrd 2017).

These effects have been shown across a variety of industries, including the military (Bullock et al. 2010, Martínez-Córcoles and Stephanou 2017). A summary of these relationships is shown in **Figure 1**. This model is conceptually similar to the foundational public health ‘host-agent-

environment' paradigm (Runyan 2003). Leadership development is an essential part of both the Army structure (DA 2012a, b, 2017) and the public health approach (Jones, Canham-Chervak, and Sleet 2010).

Because it is important to measure leadership effectiveness and identify areas for future improvement (Daniel 2018), a recent electronic survey of 831 infantry Soldiers assessed injury risks, fitness, health behaviors and evaluated respondents' perceptions of leadership support (APHC 2017a). Subsequent analysis investigated relationships between self-reported leadership support and the occurrence of injuries. These responses provided previously unexplored information about Soldiers' assessment of leadership support for injury prevention initiatives.

As has been reported elsewhere, a lack of leadership support for injury prevention was found to be significantly associated with injury risk (APHC 2017a). The purpose of the current investigation is to look more closely at the association of leadership support with increased injury risk and lower physical fitness.

4 METHODS

4.1 Data Collection

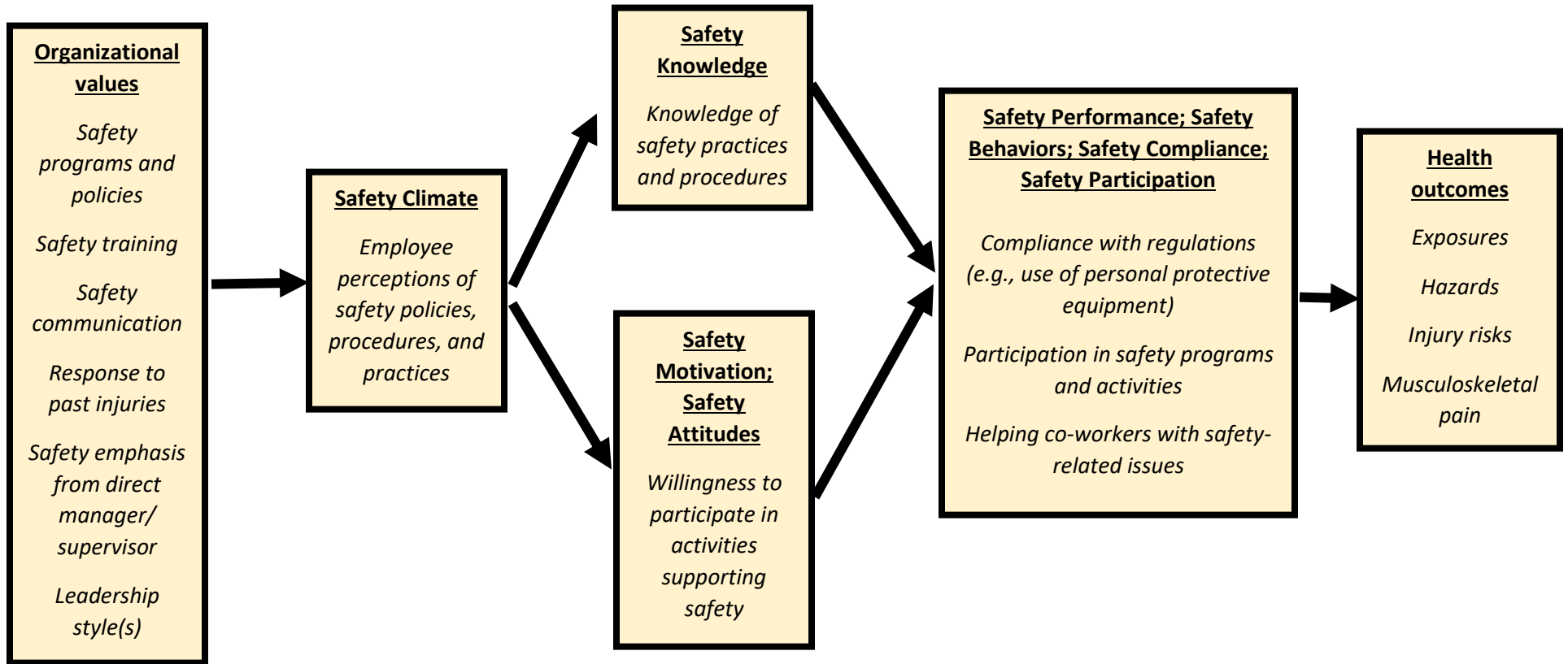
An electronic survey was administered to non-deployed Soldiers in two infantry battalions, November 2014 through January 2015, with the intent of assessing recent injury types, causes, and risk factors. Information collected included injury history, Soldier physical fitness test scores, unit and personal physical training programs, health behaviors (e.g., smoking), and perceptions of leadership and medical support related to injury. A comprehensive assessment of results has been published (APHC 2017a). The project was approved by the APHC Public Health Review Board as public health practice.

The project was originally intended to measure changes in leadership behavior as a result of implementing a program to educate leadership on injury prevention. As a result of unit operational tempo (optempo) in preparation for deployment, the program could not be executed, and a second follow-up survey was not administered.

For the leadership assessment section of the survey, survey respondents were asked to report their perceptions of unit support for injury prevention using a five-point Likert scale (strongly agree, agree, neither agree or disagree, disagree, strongly disagree) with the following prompts:

1. Your unit leadership encourages physical training in a safe way that strives to increase fitness but reduce or minimize injuries.
2. Your current unit has a higher than normal rate of physical training injuries.

Figure 1. Organizational Relationships between Leadership, Safety, and Injuries; Adapted from Previous Studies (Griffin and Neal 2000, Christian et al. 2009, Neal and Griffin 2006, Sawhney and Cigularov 2016, Sorensen et al. 2016, Barling, Loughlin, and Kelloway 2002)



Additionally, with option choices of Routinely, Occasionally, Rarely, and Never, respondents were asked to assess the frequency of leadership activities demonstrating injury prevention support:

3. Does your unit or physical training leader describe common causes of training injury and provide recommendations to reduce injuries?
4. Does your unit or physical training leader provide information about status of unit injuries and causes?

And finally, with Yes/No response options:

5. Are new Soldiers given time to adapt to unit PT?

4.2 Data Analysis

Data analysis methods were described previously (APHC 2017a). Data were exported from the survey software and analyzed with the Statistical Program for Social Sciences (SPSS®), Version 19.0. Data were cleaned in SPSS.

Following data collection, responses for age and rank were grouped into accepted categories. Each respondent's body mass index (BMI) was calculated from self-reported height and weight data and categorized according to the Centers for Disease Control and Prevention (CDC) classifications for underweight (BMI <18.5), normal (18.5-24.9), overweight (25.0-29.9), and obese (≥ 30) (CDC 2015). The "overweight" category was further split into "low overweight" and "high overweight" categories with cut points consistent with the highest allowable BMI for male Army Soldiers (27.5), according to Army Regulation 600-9 (Department of the Army 2006). Current cigarette smokers, current smokeless tobacco users, and current e-cigarette users were defined as those Soldiers who reported using these products in the past 30 days.

In preparation for multivariate risk factor analysis, the occurrence of at least one injury during the 6 months prior to the survey was coded as a binary variable to identify Soldiers with one or more injury. Correlation coefficients between injury, demographic, fitness, health behavior, and injury values were calculated. Spearman's rank correlation coefficients were used because not all variables were normally distributed (Mukaka 2012). Traditionally, variables with correlation coefficients above 0.70–0.80 are considered strongly correlated (Mukaka 2012), though coefficients above 0.30 can be considered noteworthy in many applications (Hemphill 2003).

Univariate risk ratios and 95% confidence intervals (CIs) are reported for each risk factor variable. Variables were entered into a backward-stepping multivariate logistic regression analysis if they were found to be significant in univariate logistic regression assessments of injury risk ($p \leq 0.10$).

5 RESULTS

5.1 Survey Responses

Most survey respondents in this population were male (99%), Active Duty (99.8%), 25 years of age or younger (64%), lower enlisted ranks E1-E4 (67%), and were in a Combat Arms military occupation specialty (67%). Comprehensive descriptive statistics of demographics and other survey responses have been provided elsewhere (APHC 2017a).

Tables 1-3 summarize the previously reported responses to survey questions regarding leadership support for injury prevention (APHC 2017a). Most Soldiers reported that their unit leadership encourages safe physical training (PT) (76%), their unit does not have a higher than normal rate of PT injuries (or they do not know) (65%), leadership routinely or occasionally describe causes of injuries and provides recommendations to reduce injuries (75%), and leadership routinely or occasionally provides information about the status of unit injuries and causes (67%). No significant differences were seen among battalions or companies.

Table 1. Leadership Support Injury Responses (n=831)

	Strongly Agree n (%)	Agree n (%)	Neither agree or disagree n (%)	Disagree n (%)	Strongly Disagree n (%)
1) Your unit leadership encourages PT in a safe way that strives to increase fitness but reduce or minimize injuries	352 (42)	276 (33)	132 (16)	47 (6)	24 (3)
2) Your current unit has a higher than normal rate of physical training injuries	106 (13)	184 (22)	266 (32)	76 (9)	199 (24)

Table 2. Leadership Support Injury Status Responses (n=831)

	Routinely n (%)	Occasionally n (%)	Rarely n (%)	Never n (%)
3) Does your unit or physical training leader describe common causes of training injury and provide recommendations to reduce injuries?	313 (38)	312 (38)	123 (15)	83 (10)
4) Does your unit or physical training leader provide information about status of unit injuries and causes?	241 (29)	314 (38)	140 (17)	136 (16)

Table 3. Leadership Support PT Responses (n=774, Unit PT Participants)

	Yes n (%)	No n (%)
5) Are new Soldiers given time to adapt to unit PT?	503 (65)	271 (35)

5.2 Association between Leadership Support and Injury Risk

5.2.1 Associations between Injury, Fitness, Personal Characteristics, and Health Behaviors

Injuries have frequently been associated with older age, higher BMI, lower physical fitness, and tobacco use among Army Soldiers (Jones and Hauschild 2015, Jones, Hauschild, and Canham-Chervak 2018). Correlations among these variables in the current population are shown in Table 4. Though some variables had statistically significant correlations ($p < 0.10$), injury had negligible correlations with all of the variables (< 0.30).

Table 4. Correlations of Injury, Age, BMI, Fitness, and Tobacco Responses

	Injury	Age	BMI	2-mile runtime	Push-up reps	Sit-up reps	Cigarette smoking	Smokeless tobacco use	E-cigarette use
Injury	-	0.11***	0.10***	0.12***	-0.06*	-0.08**	-0.03	-0.04	-0.03
Age	0.11***	-	0.23***	0.20***	0.18***	0.04	-0.05	-0.02	0.13***
BMI	0.10***	0.23***	-	0.31***	-0.02	-0.09**	<0.01	-0.03	0.02
2-mile run time	0.12***	0.20***	0.31***	-	-0.37***	-0.35***	-0.14***	-0.02	-0.07*
Push-up reps	-0.06*	0.18***	-0.02	-0.37***	-	0.64***	0.12***	-0.03	0.10***
Sit-up reps	-0.08**	0.04	-0.09**	-0.35***	0.64***	-	0.12***	-0.02	0.10***
Cigarette smoking	-0.03	-0.05	<0.01	-0.14***	0.12***	0.12***	-	0.46***	0.46***
Smokeless tobacco use	-0.04	-0.02	-0.03	-0.02	-0.03	-0.02	0.46***	-	0.30***
E-cigarette use	-0.03	0.13***	0.02	-0.07*	0.10***	0.10***	0.46***	0.30***	-

Note: Cells with significant correlations are highlighted, with level of significance further denoted: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Correlation values between responses to fitness-related questions and responses to leadership questions are shown in Table 5, along with an interpretation of associations. Respondents were less likely to give favorable responses about leadership if they had a recent injury; some responses were also affected by high BMI and poor physical fitness test performance. None of the correlations among variables were strong.

Table 5. Correlation between Fitness Variables and Perceptions of Leadership

<i>Continuous variables</i>	Your unit leadership encourages PT in a safe way that strives to increase fitness but reduce or minimize injuries <i>(Decreasing agreement)</i>	Your current unit has a higher than normal rate of physical training injuries <i>(Decreasing agreement)</i>	Does your unit or physical training leader describe common causes of training injury and provide recommendations to reduce injuries? <i>(Decreasing frequency)</i>	Does your unit or physical training leader provide information about status of unit injuries and causes? <i>(Decreasing frequency)</i>	Are new Soldiers given time to adapt to unit PT? <i>(Yes-No)</i>
At least one recent injury <i>(No-Yes)</i>	0.12***	-0.08**	0.17***	0.17***	0.13***
2-mile Run time <i>(Fast-Slow)</i>	0.03	-0.03	0.04	0.10***	0.07*
Push-up repetitions <i>(Increasing)</i>	-0.11***	-0.01	-0.09**	-0.12***	-0.09***
Sit-up repetitions <i>(Increasing)</i>	-0.11**	0.05	-0.08**	-0.10***	-0.02
BMI <i>(Increasing)</i>	-0.07*	-0.06*	0.00	0.04	-0.01
Age <i>(increasing)</i>	-0.29***	-0.05	0.30***	0.33***	-0.04
<u>Interpretation</u>	Respondents were more likely to disagree if they had: <ul style="list-style-type: none"> • An injury • Fewer push-ups • Fewer sit-ups • Higher BMI • Younger age 	Respondents were more likely to disagree if they had: <ul style="list-style-type: none"> • An injury • Higher BMI 	Respondents were more likely to report lower frequency if they had: <ul style="list-style-type: none"> • An injury • Fewer sit-ups • Older age 	Respondents were more likely to report lower frequency if they had: <ul style="list-style-type: none"> • An injury • Lower physical fitness (slower run time, fewer push-ups, fewer sit-ups) • Older age 	Respondents were more likely to respond "no" if they had: <ul style="list-style-type: none"> • An injury • Slower run time • Fewer push-ups

Note: Cells with significant correlations are highlighted, with level of significance further denoted: *p<0.10; **p<0.05; ***p<0.01

5.2.2 Univariate Analysis of Leadership Factors Associated with Injury

Thirty-seven percent of respondents reported experiencing an injury within the 6 months prior to survey administration, and additional details were collected about 412 total injuries. Commonly reported injuries were sprains and strains (46%); injuries to the knee (23%), back (17%), or ankle (12%); occurred as a result of overuse or repetitive activities (46%); and were attributed to running (27%), road marching with a load (22%), or weight lifting (10%) (APHC 2017a).

Among other factors such as older age, higher rank, low or high BMI, low self-assessed fitness, slow Army Physical Fitness Test (APFT) run times, and too much or too little unit and personal PT participation, all leadership questions were found to be significantly ($p < 0.05$) or marginally ($p < 0.10$) associated with injury (APHC 2017a). Specifically, the following responses were associated with injury:

- Your unit leadership encourages physical training in a safe way that strives to increase fitness but reduce or minimize injuries: responses of 'Neither agree or disagree', 'Disagree', or 'Strongly disagree'
- Your current unit has a higher than normal rate of physical training injuries: responses of 'Agree' or 'Strongly agree'
- Does your unit or physical training leader describe common causes of training injury and provide recommendations to reduce injuries?: responses of 'Occasionally', 'Rarely', or 'Never'
- Does your unit or physical training leader provide information about status of unit injuries and causes?: responses of 'Rarely' or 'Never'
- Are new Soldiers given time to adapt to unit PT?: response of 'No'

Complete univariate analyses for leadership responses are shown in Table 6.

Table 6. Univariate Logistic Regression Results: Leadership Support Responses

Variable category		Total n	% injured (past 6 months)	Rate Ratio (95% CI)	Odds Ratio (95% CI)	p-value
1. Leadership encourages safe PT	Strongly agree	352	32	1.00	1.00	
	Agree	276	36	1.12 (0.90-1.39)	1.19 (0.85-1.65)	0.32
	<i>Neither agree or disagree</i>	132	45	1.38 (1.08-1.76)	1.69 (1.12-2.54)	0.01
	<i>Disagree</i>	47	53	1.64 (1.21-2.23)	2.37 (1.28-4.39)	<0.01
	<i>Strongly disagree</i>	24	50	1.54 (1.01-2.37)	2.09 (0.91-4.79)	0.08
2. Your unit has a higher than average injury rate	<i>Strongly agree</i>	106	43	1.50 (0.99-2.27)	1.88 (1.01-3.52)	0.05
	<i>Agree</i>	184	48	1.65 (1.13-2.42)	2.25 (1.27-3.99)	<0.01
	Neither agree or disagree	199	38	1.30 (0.88-1.93)	1.30 (0.88-1.93)	0.18
	Disagree	266	30	1.03 (0.69-1.53)	1.04 (0.59-1.82)	0.90
	Strongly disagree	76	29	1.00	1.00	
3. Leadership provides recommendations to reduce injury	Routinely	313	29	1.00	1.00	
	<i>Occasionally</i>	312	37	1.27 (1.01-1.58)	1.42 (1.02-1.99)	0.04
	<i>Rarely</i>	123	44	1.49 (1.15-1.94)	1.88 (1.22-2.89)	<0.01
	<i>Never</i>	83	58	1.97 (1.53-2.53)	3.29 (2.00-5.43)	<0.01
4. Leadership provides status of unit injuries	Routinely	241	28	1.00	1.00	
	Occasionally	314	34	1.21 (0.94-1.56)	1.32 (0.91-1.89)	0.14
	<i>Rarely</i>	140	49	1.75 (1.34-2.27)	2.47 (1.60-3.82)	<0.01
	<i>Never</i>	136	49	1.72 (1.32-2.24)	2.40 (1.55-3.72)	<0.01
5. New Soldiers are given time to adapt to Unit PT	Yes	502	30	1.00	1.00	
	<i>No</i>	272	43	1.42 (1.18-1.72)	1.75 (1.29-2.37)	<0.01

Legend

CI = Confidence Interval

Note: Significant categories (p≤0.10) are in bold and italics.

5.2.3 Multivariate Analysis Assessment of Leadership Factors Associated with Injury

Because each of the leadership support questions had at least one response category that was significantly associated with injury in the univariate analysis, all leadership variables were entered into a multivariate regression model by themselves (Table 7), as well as a model adjusting for all significant univariate variables from any category (Table 8). Because only 774 respondents reported participating in unit PT, the population considered was 774. In all cases, the following questions had at least one response category that were significantly ($p \leq 0.05$) or marginally ($p \leq 0.10$) associated with injury; the percentage of Soldiers reporting injuries tended to increase along with the degree of leadership support:

- Your current unit has a higher than normal rate of PT injuries.
- Does your unit or PT leader describe common causes of training injury and provide recommendations to reduce injuries?
- Does your unit or PT leader provide information about status of unit injuries and causes?

Table 7. Multivariate Association of Leadership Support with Injury (n=774)

Variable Category		Total n	% Injured	Odds Ratio (95% CI)	Category p-values	Variable p-value
Leadership provides status of unit injuries	Routinely	233	26	1.00		0.04
	Occasionally	293	32	1.29 (0.78-2.13)	0.32	
	<i>Rarely</i>	129	48	2.28 (1.23-4.21)	<0.01	
	Never	119	45	1.35 (0.66-2.73)	0.41	
Your unit has a higher than average injury rate	Strongly agree	100	42	1.83 (0.95-3.55)	0.07	0.02
	Agree	162	44	1.65 (0.89-3.07)	0.11	
	Disagree	254	28	0.95 (0.53-1.72)	0.87	
	Strongly disagree	74	28	1.00		
	Not sure	184	35	1.11 (0.60-2.05)	0.75	
Leadership provides recommendations to reduce injury	Routinely	302	28	1.00		<u>0.06</u>
	Occasionally	288	34	1.09 (0.68-1.74)	0.72	
	Rarely	107	42	1.18 (0.63-2.23)	0.60	
	<i>Never</i>	77	57	2.57 (1.22-5.41)	0.01	

Notes:

Significant variables ($p \leq 0.05$) are in bold. Significant categories ($p \leq 0.05$) are in bold and italics. Marginally significant categories and variables ($p \leq 0.10$) are underlined.

Variables entered: Are new Soldiers given time to adapt to Unit PT?; Leadership encourages safe PT; Leadership provides recommendations to reduce injury; Leadership provides status of unit injuries; Your unit has a higher than average injury rate.

Table 8. Multivariate Association of Leadership Support with Injury, Adjusting for Demographic, Fitness, and Health Behaviors Variables (n=831)

Variable Category		Total n	% Injured	Odds Ratio (95% CI)	Category p-values	Variable p-value
Your unit has a higher than average injury rate	Strongly agree	106	43	1.91 (0.99-3.69)	0.05	0.01
	<u>Agree</u>	<u>184</u>	<u>48</u>	<u>1.80 (0.97-3.33)</u>	<u>0.06</u>	
	Disagree	266	30	0.97 (0.54-1.75)	0.92	
	Strongly disagree	76	29	1.00		
	Not sure	199	38	1.16 (0.62-2.14)	0.65	
Leadership provides recommendations to reduce injury	Routinely	313	29	1.00		<u>0.08</u>
	Occasionally	312	37	1.02 (0.63-1.63)	0.95	
	Rarely	123	44	1.15 (0.62-2.13)	0.67	
	Never	83	58	2.35 (1.13-4.87)	0.02	
Leadership provides status of unit injuries	Routinely	241	28	1.00		0.05
	Occasionally	314	34	1.23 (0.74-2.04)	0.42	
	Rarely	140	49	2.19 (1.18-4.07)	0.01	
	Never	136	49	1.29 (0.65-2.57)	0.46	
Age	≤25	474	34	1.00		0.01
	26-34	297	40	1.20 (0.86-1.69)	0.29	
	≥35	60	52	2.41 (1.33-4.39)	<0.01	
BMI	≤18.4	8	63	5.39 (1.15-25.34)	0.03	0.03
	18.5-24.9	295	34	1.00		
	25-27.5	280	33	1.00 (0.69-1.46)	0.99	
	27.6-29.9	154	40	1.34 (0.86-2.07)	0.19	
	≥30	84	56	2.02 (1.18-3.46)	0.01	
	Not able to calculate	10	40	1.65 (0.43-6.36)	0.46	
APFT Sit-up repetitions	≤60	180	38	1.04 (0.61-1.78)	0.88	0.05
	61-68	197	44	1.49 (0.92-2.42)	0.11	
	69-77	206	36	1.12 (0.70-1.78)	0.64	
	≥78	221	31	1.00		
	Not reported	27	48	0.19 (0.04-0.86)	0.03	
Smokeless tobacco status	Current user	240	37	1.09 (0.76-1.53)	0.66	<u>0.06</u>
	Former user	157	46	1.61 (1.08-2.40)	0.02	
	Never used	434	35	1.00		

Notes:

Significant variables ($p \leq 0.05$) are in bold. Significant categories ($p \leq 0.05$) are in bold and italics.

Marginally significant categories and variables ($p \leq 0.10$) are underlined.

Variables entered into the backward stepping logistic regression model: Leadership provides recommendations to reduce injury; Leadership provides status of unit injuries; Your unit has a higher than average injury rate, Age, BMI, APFT pushup repetitions, APFT sit-up repetitions, APFT 2-mile run time, and Smokeless tobacco status.

6 DISCUSSION

For this population, all five of the questions about leadership were correlated with some combination of recent injury, age, body composition, physical fitness (APFT performance), and tobacco use. While correlation values were low, when these variables were put into a multivariable regression model, the survey responses to three of the five leadership questions had a statistically significant association with whether or not they had experienced an injury in the previous 6 months. As the degree of confidence in leadership support decreased for each question, the association with injury increased.

These regression results indicate that the responses to these questions may have reflected biases based on prior injury and/or other circumstantial factors. Other studies have also found that prior injury negatively influences employee's perceptions of organizational safety (Beus et al. 2010, Oah, Na, and Moon 2018, Huang et al. 2007).

6.1 Better Assessment of Safety Climate and Safety Culture

When measuring the effects of leadership support perceptions on health outcomes like injuries, questions should be carefully posed so that biases have little influence on responses. Because multiple environmental and experiential factors affect safety climate and ultimately injury outcomes, all of these aspects should be addressed in future leadership assessments.

Questionnaire items from previously published leadership safety assessments are shown in Table 9. These questions are examples that could be used to evaluate employees' assessment of their own safety knowledge, safety behaviors, and perceived safety climate at the organizational and direct management levels (Griffin and Neal 2000, Barling, Loughlin, and Kelloway 2002, Martínez-Córcoles and Stephanou 2017, Neal, Griffin, and Hart 2000, Sorensen et al. 2018, Kines et al. 2011, Zohar and Luria 2005). Five- or seven-point Likert-style scales are suggested to gauge respondents' agreement with each statement. In general, it is recommended that survey questions about leadership support evaluate the frequency and quality of specific safety actions taken by leadership and management so that responses are more likely to be more objective and not clouded by personal feelings (Zohar 2000, Zohar and Luria 2005). Indeed, as shown in Table 5, the current population was biased by fewer personal characteristics and circumstantial variables when asked to report the frequency of leadership actions (describing common causes of training injury and providing recommendations to reduce injuries, or providing information about status of unit injuries and causes).

This list of questions is not all-encompassing; a comprehensive literature search would need to be done before selecting future survey questions. If these prompts are posed to Soldiers, they will need to be rephrased to reflect military policies, appropriate command structure, and specific exposures/hazards of interest. In addition to ad-hoc investigations of leadership support, these suggested questions could also be used for routine military safety assessments, such as the Navy's Command Safety Assessment Survey (Buttrey et al. 2010, Adamshick 2007).

Table 9. Examples of Likert-scale Questionnaire Items to Measure Safety Climate and Culture, Adapted from Previously Published Assessment Tools

(To be measured using a 5- or 7-point Likert agreement scale)

<p>Perceived safety culture, safety climate, and leadership styles</p> <p>(Barling, Loughlin, and Kelloway 2002, Neal, Griffin, and Hart 2000, Sorensen et al. 2018, Kines et al. 2011, Zohar and Luria 2005, Martínez-Córcoles and Stephanou 2017, Griffin and Neal 2000)</p>	<p>Organization level leadership</p>	The effects of policies and programs to promote worker safety and health are measured using data from multiple sources
		Data from multiple sources on health, safety, and well-being are integrated and presented to leadership on a regular basis
		Evaluations of policies, programs, and practices to protect and promote worker health are used to improve future efforts
		Integrated data on employee safety and health outcomes are coordinated across all relevant departments
		The organization allocates enough resources to implement policies or programs to protect and promote worker safety and health
		Upper management assigns a high priority to safety issues
		Management is concerned for the safety of employees
		Worker health and safety are part of the organization's mission, vision, and/or business objectives
		Management accepts workers taking risks when the work schedule is tight
		We who work here have confidence in the management's ability to deal with safety
		My organization regularly holds safety awareness events
		Management encourages workers to participate in decisions which affect their safety
		Management looks for causes, not guilty persons, when an accident occurs
		There is open communication about safety issues within this workplace
		I think management is sincere in its efforts to ensure safety
		Inspections in this company are effective at identifying unsafe conditions
		My organization provides members with information on safety issues
		My organization reacts quickly to solve a problem when told about safety hazards
		Management considers a person's safety behavior when promoting people
		Management requires each group manager to improve safety in his or her department
Management invests a lot of time and money in safety training for workers		
Management listens carefully to workers' ideas about improving safety		
Conditions at my workplace force me to deviate from the safety rules		
The company's leadership communicate their commitment to a work environment that supports employee safety, health, and well-being		
This company has a comprehensive approach to worker well-being, including collaborations across departments to prevent illness and injury		
<p>Direct management</p>	My supervisor says a good word whenever he/she sees a job done according to the safety rules	
	My supervisor seriously considers any worker's suggestions for improving safety	
	My supervisor gets annoyed with any worker ignoring safety rules, even minor rules	
	As long as there is no accident, my supervisor doesn't care how the work is done	
	My supervisor only keeps track of major safety problems and overlooks routine problems	
	My supervisor pays less attention to safety problems than most other supervisors in this company	
	My supervisor talks about his/her values and beliefs about the importance of safety	
	My superior focuses attention on irregularities, mistakes, exceptions, and divergence from standards	
	My superior expresses satisfaction when others meet his/her expectations	
	My supervisor emphasizes safety procedures when we are working under pressure	
	My supervisor spends time helping us learn how to see problems <i>before</i> they arise	
	Supervisors and managers initiate discussions with employees to identify hazards and other concerns in the work environment	
Managers are held accountable for implementing best practices to protect worker safety, health, and well-being		

<p>Safety knowledge, consciousness, performance, and compliance</p> <p>(Griffin and Neal 2000, Barling, Loughlin, and Kelloway 2002, Neal, Griffin, and Hart 2000, Martínez-Córcoles and Stephanou 2017)</p>	I believe that workplace health and safety is an important issue
	I know how to perform my job in a safe manner
	I know how to maintain or improve workplace health and safety
	I feel that it is important to maintain safety at all times
	I use the correct safety procedures for carrying out my job
	I ensure the highest levels of safety when I carry out my job
	I voluntarily carry out tasks or activities that help to improve workplace safety
	I help my co-workers when they are working under risky or hazardous conditions
	I understand the health and safety regulations relating to my work
	I use the correct personal protective equipment for the task I am doing
	I often take part in development of the safety requirements for my job
	I always wear the protective equipment or clothing required by my job
	I am well aware of the safety risks involved in my job
	I know where the fire extinguishers are located in my workplace
	I do not use the equipment that I feel is unsafe
	I inform management of any potential hazards I notice on the job
	I know what procedures to follow if injured on shift
	I would know what to do if an emergency occurred on shift
	I promote the safety program within the organization
	I put extra effort into improving safety in the workplace
I ignore safety regulations in order to get the job done	
I take shortcuts that involve little or no risk	
Workers who violate safety regulations upset their fellow workers even when no harm is done	

6.2 Improving Safety Climate and Safety Culture

Constructive leadership styles along the Full-Range Leadership model (Kirkbride 2006) have been strongly associated with safety outcomes (Clarke and Taylor 2018, Daniel 2018). Specifically, transformational leadership (Mullen and Kelloway 2009, Kelloway and Barling 2010, Sawhney and Cigularov 2016, Barling, Loughlin, and Kelloway 2002) and active transactional leadership (Clarke and Ward 2006, Martínez-Córcoles and Stephanou 2017), or a combination of the two (Clarke 2013), have been shown to be effective. Identifying the need for change and proactively motivating and leading others through change are essential attributes of successful Army leaders (DA 2012a). When these successful leadership styles are applied to influencing organizational safety, they seek to effect safety attitudes by expressing confidence in employees, motivate safety behavior through intellectual stimulation, and express pride and praise when safety standards are followed and safety goals are met (Sawhney and Cigularov 2016).

Training for leaders has been effective at improving safety climate (Kelloway and Barling 2010, Robson et al. 2012), especially safety-specific transformational and transactional leadership training (Clarke and Taylor 2018, Mullen and Kelloway 2009). Leaders should encourage safety participation through rational arguments, involvement in decision making, and generating enthusiasm for safety to affect employee safety participation and injury outcomes (Clarke and

Ward 2006). Efforts that are being made to address the causes of past injuries and reduce future injuries should be clearly communicated, so that past injuries have less of an effect on employees' current safety perceptions (Beus et al. 2010). Successful transactional and transformational leadership has been shown to positively influence unit performance in non-safety areas, as well (Bass et al. 2003).

While safety and injury prevention have been established as priorities in the Army (DA 2017, 2015), local-level implementation is important to ensure commitment at all ranks of an organization (Daniel 2018). In a needs assessment survey, Army Soldiers indicated that their unit leaders (e.g., Drill Sergeants and First Sergeants) did not seem informed about preventing training-related injuries or were not supportive of reconditioning after injury (Hauschild, Schuh, and Jones 2016). Unit-level support and interventions have been recommended for influencing a variety of military public health outcomes, such as musculoskeletal injuries (Jones, Hauschild, and Canham-Chervak 2018, Schuh, Canham-Chervak, and Jones 2017), mental health (Wright et al. 2009), and sexual assault (Gidycz et al. 2018).

6.3 Leadership Support and Fitness

According to the correlations shown in Table 10, the relationship between poor physical fitness and increased injury risk has been well-established (Jones and Hauschild 2015). The results in Table 11 indicate that physical fitness may also influence Soldiers' perceptions about their leadership's commitment to safety and injury prevention.

In a study with military hospital employees, worse physical health was reported when Soldiers experienced more barriers to physical fitness (Hearn et al. 2018), and studies have revealed that leadership and management encouragement are essential to the success of behavior-driven workplace physical activity programs (Pronk 2009, Brakenridge et al. 2018, Dodson et al. 2018). Therefore, while the current study was focused on the effect of leadership support on injury risk, it is logical to surmise that leadership support for injury prevention and physical training may encourage improved physical fitness. Military leaders may also benefit from their own support for physical fitness, as it has been shown that executives who participate in regular exercise receive significantly higher leadership assessment scores from their subordinates (McDowell-Larsen, Kearney, and Campbell 2002).

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Leadership Resource: Master Fitness Trainers

Soldiers who were more likely to answer negatively when asked about leadership in this population included those who were recently injured, had higher BMI, had worse performance on APFT events, were cigarette smokers, and/or were e-cigarette users. Unit PT leaders should consult with Master Fitness Trainers to design training routines that balance the frequency, duration, and intensity of activities (Bullock et al. 2010, DA 2012c). The Army offers an online course entitled "Injury Prevention through Leadership," which should be mandatory training for all leaders.

7.2 Leadership Resource: Army Wellness Centers

Unit Commanders should also empower at-risk Soldiers to improve their health behaviors, fitness, and injury risk through education at the Army Wellness Center. Army Wellness Centers, located at most Army Installations, provide health services to Soldiers and Army Civilians, including exercise testing, nutrition education, stress management counseling, wellness coaching, and tobacco-cessation education (Rivera et al. 2016). Army Wellness Center clients, who have at least one follow-up appointment, are most likely to experience improved medical readiness outcomes (Rivera et al. 2018).

7.3 Leadership Resource: Unintentional Injury Prevention Teams

Per U.S. Army Medical Command Operational Order (MEDCOM OPORD) 15-74, “Improving Readiness through Reduction of Unintentional Injuries,” each installation is tasked via the Regional Health Commands to form an Unintentional Injury Prevention (UIP) Team to monitor injury data and report to their installation’s Community Ready and Resiliency Council (CR2C) (APHC 2017b, 2016). The OPORD requires UIP Teams to be made up of subject matter experts in the fields of preventive medicine, occupational or physical therapy, health promotion, public health nursing, and an Army Wellness Center representative. Installation safety is also encouraged to participate.

These Teams, with the endorsement of the CR2C, have the ability to encourage and implement data-driven injury prevention strategic initiatives. This, in turn, can demonstrate leadership’s commitment to safety, impacting Soldier perceptions, safety climate, and safety culture within the units and installations.

7.4 Future Work

To improve safety climate and culture, improvements to unit-based leadership should be made. Areas of focus can be through leader education about injury risks and training for development of active transactional and/or transformational safety leadership styles.

To develop future assessments of leadership influence on injury prevention, safety, fitness, and other health outcomes, literature should be reviewed and questions should be carefully considered. Examples of questions that can be used to evaluate safety culture and safety climate are provided. Future surveys that include an assessment of Soldiers’ perceptions of leadership support should consider questionnaire items from previously published leadership assessments, as shown in Table 9. Interviews (Mullen 2004) and focus groups (Nordlöf et al. 2015) could also be considered to better understand Soldier perspectives about leadership support for injury prevention. Future investigations could also include separate but comparable questionnaires for Commanders, as perceptions of safety among supervisors may differ from those of employees (Huang et al. 2014).

8 POINT OF CONTACT

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APPENDIX A

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