Effect of an Injury Reduction Intervention during Army Initial Entry Training

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ABSTRACT

Injuries are a leading cause of morbidity and attrition during U.S. Army Initial Entry Training (IET). In May 2011, an injury reduction intervention was implemented: each IET unit was staffed with either an athletic trainer (AT) or a musculoskeletal action team (MAT), including an athletic trainer, a physical therapist and a strength trainer.

PURPOSE: To determine and compare odds of injury for recruits who began Basic Combat Training (BCT) at Ft. Leonard Wood in the baseline period (BASE, Oct. 2009 - April 2011) with recruits who began BCT in the intervention period (INT, May 2011 – Sept. 2011).

METHODS: Personal identifiers and demographics for all recruits were obtained from unit rosters and linked with injury data. Traumatic and overuse injuries were identified by diagnostic codes. Demographics for the BASE and INT were compared with independent sample T-tests and Pearson χ^2 tests. Injury incidence (% injured) was compared using χ^2 tests. Logistic regression was used to determine odds of injury (OR) with 95% confidence intervals (CI).

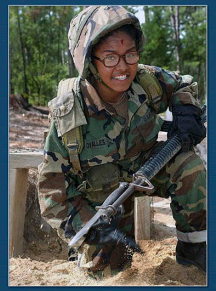
RESULTS: A total of 31,929 males (BASE: n=25,622; INT: n=6,307) and 8,814 females (BASE: n=6,825; INT: n=1,989) were included in the analysis. Soldiers in the BASE period were slightly older (men: 21.5 vs. 20.6 years, women: 21.4 vs. 20.5 years) and heavier (men: 78.8 vs. 77.2 kgs, women: 61.9 vs. 61.3 kgs) than soldiers in the INT period. A higher percentage of males was injured in INT (35.7%) compared with BASE (32.2%) (p<0.001); there was no significant change in injury incidence for females (INT: 60.4% and BASE: 60.0%, p=0.373). For men, training during INT was associated with 19% increased odds of injury compared with training during BASE when controlling for age group, BMI category, and race (OR=1.19, 95% CI=1.12-1.26). Odds of injury were not different for females in INT when compared with BASE, controlling for the same factors (OR=1.02, 95% CI=0.92-1.13).

CONCLUSIONS: During this intervention, injury incidence was 3.5% higher for males but only as slight difference was reported for females (increase of 0.4%). Odds of injury during the INT were 19% higher for males, but were unchanged for females. Other risk factors for injury must be examined to understand the complete effect of the interventions.

INTRODUCTION

Injuries that occur during initial entry training (IET) courses are a serious problem for the Army. Musculoskeletal injuries and the associated recovery time can reduce combat readiness. The injury surveillance component of the IET Soldier Athlete Initiative monitors injuries during training and identifies some injury risk factors.

In May 2011, the IET Soldier-Athlete Initiative was implemented at Fort Leonard Wood to track and prevent injuries during IET. One component of this intervention was a staffing model that assigned an athletic trainer (AT, assigned to one BCT battalion) or a musculoskeletal action team (MAT, assigned to the other two BCT battalions; one MAT for both battalions). The MAT was comprised of a physical therapist, a physical therapy assistant, two ATs and two strength conditioning coaches. The intent of this intervention was to reduce serious injuries preemptively by 1) ensuring the standardized PT program was being followed, 2) making on-the-spot corrections when exercises were performed incorrectly by soldiers, 3) identifying unsafe training practices and conditions, 4) ensuring injured soldiers were evaluated as soon as possible to avoid missed training events, and 5) providing initial evaluation, treatment and referrals for injured soldiers.



METHODS

Data Acquisition

Electronic rosters with demographic data (age, height, weight, and race) were provided by the Training and Doctrine Command (TRADOC) for each recruit beginning BCT at Ft. Leonard Wood. Demographic records were linked to injury data (visit dates and injury ICD-9 diagnosis codes) from the Defense Medical Surveillance System. Injuries included traumatic and overuse injuries. Data were collected on recruits who began training during the baseline period (BASE, October 2009 through April 2011) before the ATs and MAT were assigned and during the intervention period (INT, May 2011 through September 2011) after the introduction of the AT and MAT.

Data Analysis

Statistical analyses were performed using SPSS, version 19. Body mass index (BMI) was calculated as weight in kilograms/height in meters squared and soldiers were grouped according to accepted BMI categories. Demographic data were compared using independent sample T-tests and Pearson χ^2 tests. Injury cumulative incidences ([recruits with ≥1 injury/total recruits] x 100) and injury rates (number injured/100 person-months [p-mos]) for BASE and INT were compared using χ^2 tests. Person-time was calculated based on the 10-week training period for soldiers in BCT units. It was assumed that all soldiers stayed with their unit and completed the full training period. Logistic regression was used to determine factors associated with odds of injury, and 95% CIs were calculated for the odds ratios. Intervention period, training type, age category, BMI group, and race were included in all multivariate models.

RESULTS

This cohort included 31,929 male soldiers and 8,814 female soldiers. Table 1 compares demographic characteristics for soldiers in the BASE and INT periods. Men in the BASE period were slightly older (21.5 vs. 20.6 years) and heavier (78.8 vs. 77.2 kgs), with a higher BMI (25.5 vs 25.0) than men in the INT period. Women in the BASE period were also slightly older (21.4 vs. 20.5 years) and heavier (61.9 vs. 61.3 kg), with a higher BMI (23.5 vs.23.3) than women in the INT period.

Table 1. Demographic and training characteristics for males and females in the baseline and intervention periods by intervention type

	Males			Females		
	Baseline (n=25,622)	Intervention (n=6,305)	*p-value*	Baseline (n=6,825)	Intervention (n=1,989)	*p-value*
Age in years (mean ± SD)	21.53 ± 4.28	20.56 ± 3.98	<0.001	21.41 ± 4.41	20.47 ± 4.09	<0.001
Age Groups						
17 - 22 years	18,609 (72.6%)	5,120 (81.2%)		5,042 (73.9%)	1,622 (81.5%)	
23 - 28 years	5,083 (19.7%)	831 (13.2%)	<0.001	1,268 (18.6%)	237 (11.9%)	<0.001
29 years and older	1,975 (7.7%)	354 (5.6%)		515 (7.5%)	130 (6.5%)	
Height in m (mean ± SD)	1.76 ± 6.91	1.76 ± 6.86	0.259	1.62 ± 6.31	162.3 ± 6.40	0.416
Weight in kg (mean ± SD)	78.8 ± 14.0	77.2 ± 13.5	<0.001	61.9 ± 8.65	61.3 ± 8.67	0.007
BMI	25.5 ± 3.97	25.0 ± 3.82	<0.001	23.5 ± 2.7	23.3 ± 2.7	0.008
BMI category						
Underweight (below 18.5)	393 (1.5%)	113 (1.8%)		186 (2.7%)	68 (3.4%)	
Normal (18.5-24.9)	11,902 (46.5%)	3,249 (51.6%)	<0.001	4,363 (64.2%)	1,317 (66.5%)	0.024
Overweight (25.0-29.9)	9,630 (37.6%)	2,212 (35.1%)		2,210 (32.5%)	587 (29.7%)	
Obese (30.0 and above)	3,667 (14.3%)	728 (11.6%)		40 (0.6%)	7 (0.4%)	
Race						
White	17,323 (67.6%)	4,215 (66.9%)		3,797 (55.6%)	1,057 (53.1%)	
Black	4,104 (16.0%)	1,015 (16.1%)	0.143	1,772 (26.0%)	570 (28.7%)	0.009
Hispanic	2,941 (11.5%)	739 (11.7%)		845 (12.4%)	262 (13.2%)	
Other	1,235 (4.8%)	327 (5.2%)		405 (5.9%)	95 (4.8%)	

RESULTS (Cont.)

Table 2 shows the cumulative injury incidence (percent injured) and injury rates (number of injured soldiers per 100 person-months of training) in the study periods. For men, the injury incidence was higher during the INT period compared to the BASE (p<0.001). There was very little difference in cumulative injury incidence for women comparing the two training periods and the difference was not statistically significant (p=0.373). Compared to the BASE, the injury rate was higher during the INT period for men (RR=1.11, 95% CI=1.06-1.16).

Table 2. Injury Incidence and Rates by Gender and Training Period

	Baseline	Intervention
Males		
Injury Incidence[α]	32.2	35.7*
Injury Rate[β]	13.8	15.3
Rate Ratio (95% CI)	1.00 (reference)	**1.11 (1.06-1.16)**
Females		
Injury Incidence[α]	60.0	60.4
Injury Rate[β]	25.7	25.9
Rate Ratio (95% CI)	1.00 (reference)	1.01 (0.94-1.07)

α - (recruits with ≥1 injury/total recruits) x 100

β – number injured/100 person-months

Note: Rate ratios in bold indicate statistical significance at the p=0.05 level

* Indicates a change in incidence with a p<0.05

Table 3 and Table 4 are multivariate models for odds of injury for men and women, respectively, accounting for training period (BASE vs. INT), age category, BMI category, and race. The odds of injury were 19% higher for males in the INT period compared with the BASE period, but there was no difference between the INT and the BASE for female soldiers. For men, being in an older age group compared to the youngest age group was associated with higher odds of injury, as was being underweight or obese compared to normal BMI. For females, significantly higher odds of injury were found only in the oldest age group and only in the obese BMI category.

Table 3. Factors associated with an injury among males recruits in IET training

	Unadjusted		*Adjusted**	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Training Period				
Baseline	1.00	--	1.00	--
Intervention	**1.17**	**1.10-1.24**	**1.19**	**1.12-1.26**
Age Group				
17-22 years	1.00	--	1.00	--
23-28 years	**1.09**	**1.03-1.16**	**1.11**	**1.04-1.18**
29 years and older	**1.51**	**1.38-1.65**	**1.52**	**1.39-1.66**
BMI Category				
Underweight (below 18.5)	**1.35**	**1.13-1.62**	**1.38**	**1.15-1.65**
Normal (18.5-24.9)	1.00	--	1.00	--
Overweight (25.0-29.9)	1.00	0.95-1.05	0.97	0.92-1.02
Obese (30.0 and above)	**1.27**	**1.18-1.36**	**1.23**	**1.14-1.32**
Race				
White	1.00	--	1.00	--
Black	1.06	1.00-1.13	1.05	0.98-1.12
Hispanic	1.05	0.97-1.13	1.02	0.95-1.10
Other	**0.87**	**0.78-0.98**	**0.84**	**0.75-0.94**

Odds ratios in bold indicate statistical significance at the p<0.05 level

* Adjusted odds: controlling for all factors in the table

Table 4. Factors associated with an injury among female recruits in IET training

	Unadjusted		*Adjusted**	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Training Period				
Baseline	1.00	--	1.00	--
Intervention	1.02	0.92-1.13	1.02	0.92-1.13
Age Group				
17-22 years	1.00	--	1.00	--
23-28 years	1.03	0.91-1.15	1.04	0.92-1.16
29 years and older	**1.49**	**1.25-1.77**	**1.52**	**1.28-1.82**
BMI Category				
Underweight (below 18.5)	1.03	0.80-1.34	1.06	0.82-1.37
Normal (18.5-24.9)	1.00	--	1.00	--
Overweight (25.0-29.9)	0.94	0.85-1.03	0.92	0.84-1.01
Obese (30.0 and above)	**0.48**	**0.27-0.86**	**0.48**	**0.26-0.86**
Race				
White	1.00	--	1.00	--
Black	**0.88**	**0.80-0.98**	**0.89**	**0.80-0.98**
Hispanic	0.97	0.85-1.10	0.97	0.85-1.11
Other	0.83	0.69-1.00	**0.81**	**0.67-0.97**

Odds ratios in bold indicate statistical significance at the p<0.05 level

* Adjusted odds: controlling for all factors in the table

DISCUSSION

The addition of imbedded medical staff in IET units was intended to reduce the number and severity of injuries occurring among new recruits. Considering soldiers who had one or more injury encounter, the injury incidence increased for men in the INT period compared with the BASE period but was unchanged for women. It is possible that this increase in odds of injury during the intervention resulted from the ATs and MAT being able to identify injured soldiers earlier and treat the soldiers in the training area, rather than referring them to the medical clinic. During the BASE, many of the injuries may have gone unrecognized.

Increased age is a known risk factor for injury and this was seen in our models. BMI is another known risk factor, where being underweight and overweight or obese compared to normal BMI resulted in increased odds of injury. Here, we saw that underweight and obese males had increased odds of injury, as did obese females.

Future studies on this intervention should include a true control group of training units that are given neither a MAT nor an AT to act as a comparison during the same training cycles. Additionally, if possible, incorporating other injury risk factors, such as physical fitness test scores, and taking injury time-loss into account, would give a clearer picture of the role of the MATs and ATs in these training units.

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