

**Modifiable Characteristics Associated with
Training Success Among
US Air Force Tactical Air Control Party Candidates**

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March 2010

Final Report for April 2008 - February 2010

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REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 24-03-2010		2. REPORT TYPE Final Report		3. DATES COVERED (From - To) April 2008 – February 2010	
4. TITLE AND SUBTITLE Battlefield Airmen Study, Part B				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Timothy S. Wells, Col, USAF, BSC ¹ Christopher J. Knerl ² Timothy S. Webb, MS, PhD ¹				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ¹ Vulnerability Branch, 2800 O. Street, Building 824 Room 206. Wright-Patterson AFB, OH 45433-7947 ² Henry M. Jackson Foundation for the Advancement of Military Medicine 720 th Special Tactics Group, Hurlburt Field, FL				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Nereyda Sevilla, MPH, CAsP, PMP Senior Analyst/Aerospace Physiologist AF Medical Research Program CTR, Planned Systems International, Inc. Office of the Air Force Surgeon General Directorate for Modernization, SGRS 5201 Leesburg Pike, Suite 1206 Falls Church, VA 22041				10. SPONSOR/MONITOR'S ACRONYM(S) 711 HPW/RHXX	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution A. Approved for public release; distribution unlimited.					
13. SUPPLEMENTARY NOTES					
Objective To understand personal characteristics associated with passing qualification training for entry into the US Air Force Tactical Air Control Party career field. Methods Candidates were enrolled at initiation of training and participation in outdoor activities, high school sports, size of home town, use of dietary supplements, exercise regimens prior to training initiation, and demographic data was collected through a survey. Univariate and multivariate analyses were conducted to explore characteristics associated with training success. Results In multivariable logistic regression modeling, candidates who successfully completed training were significantly more likely to have body mass indexes of 25 or more, to not have reported use of dietary supplements, and to have spent ten or more hours per week strength training in the three months prior to survey completion. Conclusions Potentially modifiable personal characteristics were identified that may positively influence training success among Tactical Air Control Party candidates.					
15. SUBJECT TERMS Military personnel, biomechanics, epidemiology, occupational diseases, biomedical enhancements					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Timothy S. Wells, Col, USAF
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SUMMARY

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Methods Candidates were enrolled at initiation of training and participation in outdoor activities, high school sports, size of home town, use of dietary supplements, exercise regimens prior to training initiation, and demographic data was collected through a survey. Univariate and multivariate analyses were conducted to explore characteristics associated with training success.

Results In multivariable logistic regression modeling, candidates who successfully completed training were significantly more likely to have body mass indexes of 25 or more, to not have reported use of dietary supplements, and to have spent ten or more hours per week strength training in the three months prior to survey completion.

Conclusions Potentially modifiable personal characteristics were identified that may positively influence training success among Tactical Air Control Party candidates.

INTRODUCTION

To date, little has been published on relations between individual characteristics and the ability to pass qualification training for US Special Forces. Studies have been accomplished studying US Air Force (USAF) trainees and other recruit populations. A study of over 32,000 USAF recruits undergoing basic military training (BMT) observed a 6.2% failure rate, with the most common reasons for failure being medical (33.6%), psychiatric (21.3%), legal (20%), and poor performance (13.1%).¹ Demographic, lifestyle and psychosocial variables that predicted discharge across all four reasons included low levels of physical activity and rebelliousness. A study among USAF enlisted air traffic control candidates found direct correlations between the Armed Services Vocational Aptitude Battery (ASVAB) scores with training completion, and suggested raising the ASVAB qualification score to reduce training failures.² Another study that utilized USAF BMT recruits found that the Temperament and Character Inventory³ successfully predicted 82%, 25%, and 64% of recruits who were controls, at-risk for early separation for psychological reasons, or psychiatrically hospitalized, respectively.⁴ Finally, over 29,000 USAF Airmen were followed for the first year after entry, with smoking identified as the strongest predictor of early separation. In this study, smokers were almost twice as likely as non-smokers to be separated early.⁵ Finding a negative association between cigarette smoking and training success was also observed in a study of over 640 US Army recruits undergoing basic and advanced infantry training.⁶

Other relevant literature describes the mental health, healthcare needs, or physical fitness qualities of those who pass military training verses those who fail. Having mental health problems,⁷⁻¹⁰ a lack of motivation,¹⁰ poor optimism or a history of physical abuse,⁹ having elevated baseline stress levels or poor coping styles,¹¹ or having differences in attribution style and propensities to dissociate significantly,¹² were all associated with decreased likelihood of training completion. Recruits that suffered lower extremity injuries,¹³ or had frequent visits to a medical clinic,⁹ were also less likely to complete training. Results for physical fitness have been varied, with three studies finding positive associations between fitness and passing training,^{6, 11, 13} whereas one study using 100 USAF recruits found no significant associations between pre-BMT run times or cycle ergometry scores and successful completion.¹⁴

Tactical Air Control Party (TAC-P) qualification training is conducted at Hurlburt Field, which is an USAF special operations base located in Northwest Florida. The objectives of this study were to determine what individual characteristics contributed to successful completion of TAC-P training. This is the final report to the funding agency on 223 Tactical Air Command and Control Specialist (TAC-P) Course trainees that consented to participate between 1 April 2008 and 17 March 2009. The pass/fail status had been determined for all participants by 20 January 2010.

METHODS

Trainees were consented during initial in-processing at the TAC-P Specialist Course, Hurlburt Field, Florida. Those who consented, completed a questionnaire that gathered information regarding high school sports played, participation in outdoor activities, use of dietary supplements, physical activity level in the three months prior to beginning training, and

urban/rural residency during high school. Trainees were classified on outdoors expertise based upon response to this question: “What level of expertise do you have with the following outdoor activities?” Available responses included: none, novice, intermediate, and advanced for hunting, fishing, camping, hiking, scouting, and other. Outdoor activities were coded as “No” if the response was none, and coded as “Yes” if the response was novice, intermediate, or advanced. Trainees were asked whether they participated in high school sports, and asked to respond by listing up to five sports and during what years (i.e. freshman, sophomore, junior, senior) each sport was played. Trainees were classified as having played varsity sports if they reported playing in either their junior or senior year. Any supplement use was coded as positive whenever the use of energy, body building, or weight loss supplements was noted. Twenty four study participants declined to answer questions on supplement use, and rather than omitting the 24 from the multivariable logistic regression, a separate category was created for “Missing”. Body mass index (BMI) was calculated based upon self-reported height and weight and published formulas [(weight in pounds * 703)/(height in inches squared)]. BMI was developed in the mid-19th century and is still used to estimate healthy body weight, with BMIs < 18.5 considered to be underweight; BMIs of 18.5-24.9, normal weight; BMIs of 25-29.9, overweight; and BMIs of 30, or greater, categorized as obese. In this study, BMI was assessed as a continuous variable, dichotomously as < 25 or ≥ 25, and categorically by each point from 18-29 for the Cochran-Armitage two-sided test for trend. Information on the number of miles ran per week and hours spent strength training each week were based upon the three months prior to questionnaire completion. Data were analyzed to assess relations between the above characteristics and pass/fail status. A multivariable logistic regression model was developed to simultaneously adjust for a number of the characteristics listed above. All analyses were conducted using SAS software (version 9.2, SAS Institute, Inc., Cary, North Carolina). This study was approved by the Wright-Site Institutional Review Board prior to the collection of data.

RESULTS

Of the 223 trainees enrolled in the study, pass/fail information was available for 221 participants. The other two trainees were lost to follow-up. Among those who completed follow-up, 111 trainees (50.2%) passed and 110 trainees (49.8%) failed. The passing rate among consenting participants was 50.2%, compared to 46% and 38%, for all TAC-P trainees enrolled during fiscal years 2008 and 2009, respectively. The response rate was approximately 75%, but could not be exactly determined as trainees were often rolled back into subsequent classes when required to drop out of training for medical and other reasons. In unadjusted analyses, trainees who passed were less likely to have used any supplements (Odds Ratio (OR) = 0.44, 95% Confidence Interval (CI) = 0.23, 0.83), energy supplements (OR = 0.51, 95% CI = 0.29, 0.90) and were more likely to have strength trained for ten or more hours per week in the three months prior to survey completion (OR = 2.10, 95% CI = 1.03, 4.04) (Table 1). Additionally, BMI, assessed as a continuous variable, was positively associated with passing, as evidenced by a 14% increased odds of passing for each one point increase in BMI (OR = 1.14, 95% CI = 1.01, 1.29). Figure 1 shows the relations between BMI and percent passing, with a significant increase in passing likelihood as BMI increased each point from 18 to 29 (Cochran-Armitage two-sided test for trend $P > |Z| = 0.039$).

Multivariable logistic regression modeling was used to calculate adjusted odds ratios. The best model included any supplement use, BMI, and average hours per week spent strength training in the three months prior to survey completion (Table 2). In this model, trainees who self-reported using any supplement (energy, body building, weight loss) were only about one-third as likely to pass as those who did not report supplement use after adjusting for BMI and strength training (OR=0.37, 95% CI=0.19, 0.73). Additionally, TAC-P trainees who were categorized as overweight (BMI $\geq$ 25) were almost twice as likely to pass training as those who met criteria for normal or under weight (BMI < 25) (OR=1.96, 95% CI=1.09, 3.52). Finally, those who strength trained for ten or more hours per week in the three months prior to survey completion were over twice as likely to pass training (OR = 2.32, 95% CI = 1.14, 4.74) as those who reported less than five hours per week.

DISCUSSION

This analysis included 211 consenting TAC-P trainees who were followed to determine pass or fail status. Three characteristics were observed to be associated with training success. Included were overweight BMI, strength training for ten or more hours per week, and not using supplements for energy, weight loss, or body building. Finding that overweight BMI was associated with training success appears to be somewhat novel. One other study using USAF recruits assessed training success and BMI.¹⁵ This study followed over 32,000 male and female recruits through basic training, and for one year afterwards. Underweight airmen were 63% more likely to be medically discharged during basic training and 22% more likely to separate during the first year of service than were those with normal BMI. Overweight airmen were 24% more likely to be medically discharged during basic training, but were 15% less likely to be discharged within the first year of service, compared to airmen of normal BMI. There are several studies that found associations between overweight or obese service members and training injuries.¹⁶⁻²⁰ It is plausible that training injuries are more likely to lead to training failures, suggesting that overweight or obese service members would be at increased risk of training failure due to increased risk for injuries. In contrast, when 218 light infantry soldiers were subjected to a 100-mile road march with backpacks weighing up to 110 pounds, having a body weight of less than 155 pounds was associated with an increased risk for injury.²¹ The authors speculated that soldiers with low body mass may not have adequate muscle mass to properly support heavy loads, which may affect gait and posture, thus increasing injury risk. In another study that conducted a systematic review of the epidemiology of lower extremity stress fractures, the authors suggested a bimodal association between BMI and stress fracture, whereby the least fat and most fat individuals were at greatest risk.²² With increased technology, US service members are carrying much heavier loads than in the past.²³ Modern-day loads for USAF Battlefield Airmen can often range from 140-160 pounds^{24, 25} The range for BMI among TAC-P trainees who participated in this study was 18.47-29.97, with 35.3% of the total and 41.4% of those who passed, respectively, being categorized as overweight. Although we were unable to capture specific reasons for failure, we do know from other unpublished work, that approximately 60% of acute injuries to TAC-P trainees are to the lower extremity, and that field exercises carrying heavy loads (i.e. ruck marching) was the leading contributing factor, accounting for approximately 40% of all acute injuries. It is very likely that TAC-P training differentially favors trainees with larger body masses who may be better suited to carry heavy loads in a field environment, than are their normal weight peers. This theory is supported by the

observation that trainees who spent ten or more hours per week strength training in the three months prior to survey completion were twice as likely to pass training as those who spent less than five hours per week.

Another unexpected finding was that TAC-P trainees who used supplements were less likely to pass training. The use of dietary supplements to improve performance remains controversial. The complexity of this issue led to an Institute of Medicine report on dietary supplement use within the military. This report identified areas of concern, including no established policies within the Department of Defense governing the use of dietary supplements, and that the effects of dietary supplement use may be different within certain military populations, such as special forces and aviators.²⁶ Among the 187 TAC-P trainees that answered the questions on supplement use, 60% reported using body building supplements, 55% reported using energy supplements, and slightly less than 10% reported using weight loss supplements. Finding a high prevalence of supplement use in military populations is not uncommon. In a study among US Army special forces and ranger candidates, 85% reported past or current use of a supplement.²⁷ Another study among US Army personnel found 90% of special forces reporting supplement use compared to 76% of support personnel, with multivitamins, sports bars/drinks, and vitamin C reported as those most commonly used.²⁸ Studies of military populations have reported positive associations between post-exercise protein supplement use and health,²⁹ as well as creatine supplementation and strength.³⁰ Recently, the American College of Sports Medicine, the American Dietetic Association, and the Dietitians of Canada issued a joint statement on dietary supplement use, which stated: “Dietary supplements or ergogenic aids will never substitute for genetic makeup, years of training, and optimum nutrition.”³¹ However, the statement also listed ergogenic aids that performed as claimed, which included creatine, caffeine, sports drinks, gels, bars, sodium bicarbonate, and protein/amino acid supplements. Clearly, the literature supports the judicious use of certain supplements to enhance strength and endurance.³² It is unclear why TAC-P trainees who utilized supplements were less likely to pass training in this study. It is plausible that those TAC-P trainees that were struggling to meet the physical challenges of training, and therefore more likely to fail, were utilizing supplements as a means to mitigate shortcomings due to genetics, improper training, or inadequate nutrition. However, there were no significant associations between supplement use and weight lifting or running ($p > 0.05$). It is likely that supplement use is a surrogate for some other yet-to-be determined characteristic associated with training success, or an artifact caused by 24 participants failing to answer questions on supplement use. This finding warrants further study to ensure the proper use of supplements among these elite athlete warriors.

Findings must be interpreted within study limitations. It is possible that study participants are not representative of all TAC-P trainees. Slightly over 50% of trainees who participated in this study passed in comparison to 46% and 38%, for all TAC-P trainees enrolled during fiscal years 2008 and 2009, respectively. This observation may suggest that those who abstained from participation were less motivated than those who consented to participate. If real, the effect of consenting less motivated trainees on study findings is challenging to interpret. Significant relations were observed for the category of overweight BMI and passing. Body mass index was developed to provide an approximation of body fat. However, some argue that BMI is not an accurate measure of body fat for certain populations, including athletes and military personnel whose body compositions are skewed towards proportionally more muscle

mass and less body fat for a given BMI compared to the general population.³³ The ability to more accurately measure muscle mass versus body fat would further efforts to understand the relation between body composition and passing TAC-P training. However, this study is the first to utilize self-reported data to explore relations between passing TAC-P qualification training and a number of individual characteristics. It is reasonable that these findings are generalizable to other US special forces with similar qualification training.

In summary, passing TAC-P training was associated with overweight BMI, strength training for more than 10 hours per week during the three months prior to survey completion, and omitting the use of dietary supplements. Recommend this study be continued to further research key issues identified. Doing so has the potential to identify modifiable characteristics that will enhance passing among TAC-P trainees.

ACKNOWLEDGEMENTS

We thank Mr. Stephen Kalinowsky for his preliminary data analyses.

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Table 1. Association between Activities and Pass/Fail Status among TAC-P Trainees, April 2008 – December 2009.

Activity	Pass n = 111 n (%)	Fail n = 110 n (%)	OR (95% CI)
Age			
< 20	37 (33.3)	45 (40.9)	1.00
20-21	21 (18.9)	28 (25.5)	0.91 (0.45, 1.86)
≥22	53 (47.8)	37 (33.6)	1.74 (0.95, 3.19)
Body mass index			
< 25	65 (58.6)	78 (70.9)	1.00
≥ 25	46 (41.4)	32 (29.1)	1.73 (0.99, 3.02)
Scouting proficiency*			
No	50 (45.5)	60 (54.5)	1.00
Yes	60 (54.5)	50 (45.5)	1.44 (0.85, 2.45)
Hiking proficiency*			
No	13 (11.8)	21 (19.1)	1.00
Yes	97 (72.1)	89 (80.9)	1.76 (0.83, 3.72)
Fishing proficiency*			
No	14 (12.7)	21 (19.1)	1.00
Yes	96 (87.3)	89 (80.9)	1.62 (0.78, 3.38)
Hunting proficiency*			
No	43 (39.1)	50 (45.5)	1.00
Yes	67 (60.9)	60 (54.5)	1.30 (0.76, 2.22)
Camping proficiency*			
No	9 (8.2)	17 (14.9)	1.00
Yes	101 (91.8)	93 (85.1)	2.05 (0.87, 4.83)
Played any high school sports			
No	13 (11.7)	19 (17.3)	1.00
Yes	98 (88.3)	91 (82.7)	1.57 (0.74, 3.37)
Played any varsity sports			
No	33 (29.7)	44 (40.0)	1.00
Yes	78 (70.3)	66 (60.0)	1.58 (0.90, 2.75)
Played varsity track			
No	92 (82.9)	91 (82.7)	1.00
Yes	19 (17.1)	19 (17.3)	0.99 (0.49, 1.99)
Played varsity soccer			
No	101 (91.0)	101 (91.8)	1.00
Yes	10 (9.0)	9 (8.2)	1.11 (0.37, 2.59)
Played varsity football			
No	78 (70.3)	64 (73.6)	1.00
Yes	33 (29.7)	23 (26.4)	1.18 (0.43, 2.85)
Played varsity basketball			
No	101 (91.0)	95 (86.4)	1.00

Yes	10 (9.0)	15 (13.6)	0.63 (0.27, 1.46)
Played varsity baseball			
No	94 (84.7)	100 (90.9)	1.00
Yes	17 (15.3)	10 (9.1)	1.81 (0.79, 4.51)
High school community*			
Rural	24 (21.8)	22 (20.0)	1.48 (0.68, 3.22)
Population < 10,000	25 (22.7)	21 (19.1)	1.62 (0.75, 3.52)
Population 10,000 – 100,000	33 (30.0)	29 (26.4)	1.55 (0.76, 3.17)
Moved around a lot	3 (2.7)	4 (3.6)	1.02 (0.21, 4.97)
Population >100,000	25 (22.7)	34 (30.9)	1.00
Any supplement use [†]			
No	34 (30.6)	19 (17.3)	1.00
Yes	63 (56.8)	81 (73.6)	0.44 (0.23, 0.83)
Missing	14 (12.6)	10 (9.1)	0.78 (0.29, 2.10)
Use of body building supplements			
No	47 (42.3)	37 (33.6)	1.00
Yes	50 (45.0)	63 (57.3)	0.63 (0.35, 1.10)
Missing	14 (12.6)	10 (9.1)	1.10 (0.44, 2.76)
Use of energy supplements			
No	55 (49.5)	40 (36.4)	1.00
Yes	42 (37.8)	60 (54.6)	0.51 (0.29, 0.90)
Missing	14 (12.6)	10 (9.1)	1.02 (0.41, 2.52)
Use of weight loss supplements			
No	88 (79.3)	91 (82.7)	1.00
Yes	9 (8.1)	9 (8.2)	1.04 (0.39, 2.73)
Missing	14 (12.6)	10 (9.1)	1.45 (0.61, 3.43)
Avg miles ran/week [‡]			
< 6	20(18.0)	26 (23.6)	1.00
6-10	39 (35.1)	50 (45.6)	1.01 (0.50, 2.08)
≥ 11	52 (46.9)	34 (30.9)	1.99 (0.96, 4.11)
Avg hours/week strength training [‡]			
< 5	29 (26.1)	42 (38.2)	1.00
5-9	44 (39.6)	41 (37.3)	1.55 (0.82, 2.94)
≥ 10	38 (34.2)	27 (24.6)	2.04 (1.03, 4.04)
Age (years) [§]	22.7 (3.9)	21.7 (4.2)	1.06 (0.99, 1.14)
Height [§]	70.5 (2.4)	70.1 (2.9)	1.05 (0.95 1.16)
Weight [§]	171.9 (19.1)	166.1 (19.4)	1.02 (1.00, 1.03)
Body mass index [§]	24.3 (2.1)	23.7 (2.1)	1.14 (1.01, 1.29)
Avg miles run/week ^{‡§}	11.5 (6.4)	10.1 (7.2)	1.03 (0.99, 1.07)
Avg hours strength training ^{‡§}	7.7 (4.7)	6.6 (5.5)	1.04 (0.99, 1.10)

Abbreviations: Tactical Air Control Party, TAC-P; odds ratio, OR; confidence interval, CI; average, Avg.

* Missing data on one individual who passed training

[†] Includes supplements for energy, body building, and weight loss.

[‡] Within the three months prior to questionnaire completion.

[§] Shown as mean and standard deviation.

Table 2. Multivariable Logistic Regression, TAC-P Trainees, April 2008 - May 2009.

Characteristic	OR* (95% CI)
Body mass index	
< 25	1.00
≥ 25	1.96 (1.09, 3.52)
Any supplement use [†]	
No	1.00
Yes	0.37 (0.19, 0.73)
Missing	0.60 (0.21, 1.67)
Average hours/week strength training [‡]	
< 5	1.00
5-9	1.74 (0.89, 3.37)
≥ 10	2.32 (1.14, 4.74)

Abbreviations: TAC-P, Tactical Air Control Party; OR, odds ratio; CI, confidence interval.

* Odds ratios adjusted for all variables in the model.

[†] Includes supplements for energy, body building, and weight loss.

[‡] Within the three months prior to questionnaire completion.

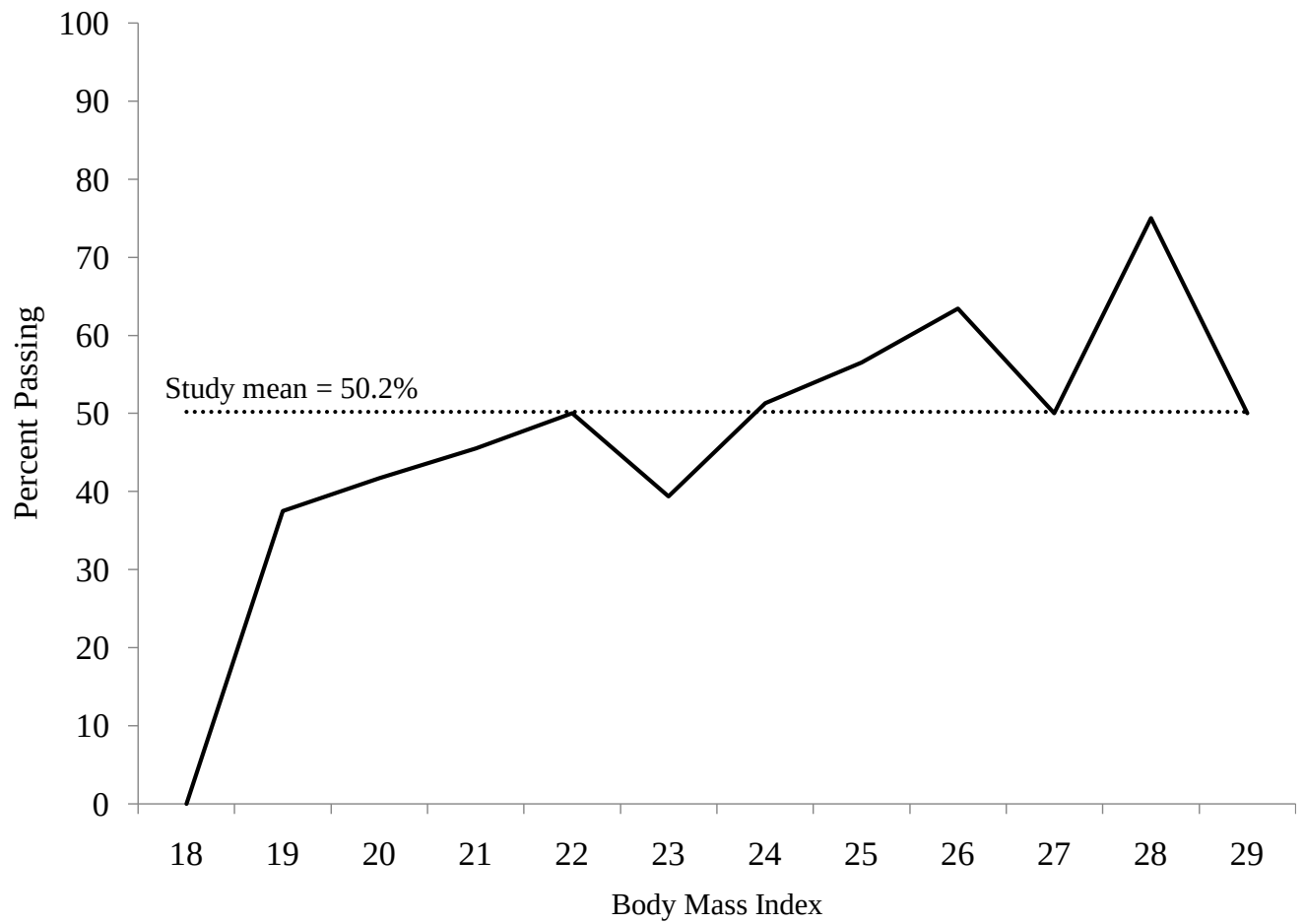


Figure 1. Relation between BMI and percent passing