An Example of Military Physical Readiness Transformation: Development and Field Testing of the Army Combat Fitness Test

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This report has been updated in alignment with Executive Orders and to ensure consistency with DOD policies in public health reporting.

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Agenda

- Previous Army Physical Fitness Test (APFT)
- Development of the Army Combat Fitness Test (ACFT)
  - Baseline Soldier Readiness Study
- Results from field testing of the ACFT
  - Before and after field testing of the ACFT

Previous Test of Record: Army Physical Fitness Test

- The APFT was initiated in 1980.
  - 2-mile run for time
  - Maximum number of push-ups in 2 minutes
  - Maximum number of sit-ups in 2 minutes
- APFT concerns over the last couple of decades:
  - Meeting the APFT standards may not accurately reflect a Soldier's physical capability to conduct critical military operations.

Baseline Soldier Physical Readiness Study

- In 2012, the Chief of Staff of the Army directed the execution of a more comprehensive scientific study of physical assessments, with the Commanding General of the U.S. Army Training and Doctrine Command as the lead.
- Purpose: Develop a physical readiness test or tests that accurately predict Soldier performance on warrior tasks and battle drills (WTBD).

Baseline Soldier Physical Readiness Minimum Requirements

- To be successful, the Baseline Soldier Physical Readiness Test must identify the following requirements, at a minimum:
  - The component physical demands of combat/WTBD.
  - Field-expedient events that replicate the physical demands of Soldiers in combat, and the baseline Soldier skills required to perform WTBD.
  - Field-expedient events that accurately predict Soldiers' ability to execute relevant combat tasks in WTBD.
  - The minimum threshold of performance necessary to execute WTBD.

Five Phases of the Soldier Baseline Study

- Phase I: Study Plan Development
- Phase II: WTBD Physical Demands Analysis
- Phase III: Test Development
- Phase IV: Test Validation – transitioned to ACFT
- Phase V: Develop the Standards

Phase II: WTBD Physical Demands Analysis (1 of 2)

- Purpose: To break down each WTBD into its component physical parts to identify, describe, and quantify those aspects of physical fitness relevant to performing WTBD.
  - Determine and analyze physical requirements of WTBD.
  - Conduct a literature review of physical fitness and performance of military tasks.
  - Review these requirements.

Phase II: WTBD Physical Demands Analysis (2 of 2)

- Approximately 113 Warrior Skill Level Tasks within 18 subject areas were listed in the *Soldier's Manual of Common Tasks: Warrior Skills Level 1,* August 2015.
- Conducted focus groups and administered surveys inquiring about physically demanding, commonly occurring, and critical WTBD
- Reduced the 113 WTBD to 11 WTBD based on Soldier and subject matter expert feedback
- Used these 11 WTBD to establish **5 common warrior task constructs**

Phase II WTBD Physical Demands Analysis: Five Warrior Task Constructs

- Five warrior task constructs:

1. Move over long distances under heavy loads.
2. Build a hasty fighting position.
3. Move over/under/around/through obstacles on uneven/urban terrain.
4. React to hand-to-hand contact (combatives).
5. Extract and transport a casualty.

Example – Phase II WTBD Physical Demands Analysis: Five Warrior Task Constructs

- React to hand-to-hand contact (combative simulation)
  - Physical Capacity Characteristics:
    - Push power (upper/lower body)
    - Pull power (upper/lower body)
    - Grip strength
    - Speed
    - Lifting power
    - Rotational power
  - Possible Simulations:
    - 450-pound (lb.), 55-gallon (gal.) barrel turn
    - Tire flip
    - Power throw
    - Weighted sled drag

Phase II WTBD Physical Demands Analysis: Systematic Review

- Identify and review existing literature on relationships between physical fitness tests and performance of military-relevant tasks.
- Four systematic review subject areas were identified:
  - Subject #1: Lab and field tests to assess physical fitness
  - Subject #2: Correlations between physical fitness tests and performance of military- relevant tasks
  - Subject #3: Association of military-relevant task performance and injury
  - Subject #4: Association of components of physical fitness and injury

Phase II WTBD Physical Demands Analysis: Systematic Review Summary

Articles/Studies	Subject 1 Task→ Fitness	Subject 2 Fitness tests	Subject 3 Task→ Injury	Subject 4 Fitness →Injury	TOTALS
# Literature search finds	**17,404**	**31,566**	**6,001**	**2,513**	**57,484**
# Duplicates removed	-3,472	-23,421	-1,063	-633	-28,589
# Title/Abstracts reviewed	13,932	8,145	4,938	1,880	28,895
# Exclusion removals	-13,473	-7,988	- 4,708	-1,657	-27,826
# Full-text from literature	189	157	230	223	799
# Additional from SMEs	+84	na	+7	+5	+96
# Total full-text reviews	273	157	237	228	895
# Excluded after full review	-240		-213	-62	-515
# Studies selected (data extracted, quality scored)	**33**		**24**	**166**	**223**
# Removed (data limitation)	-6		na		-6
# Added (from references)	na		+5		5
# Total Studies (data used)	**27**	157	**29**	166	**379**

Example – Subject Area 1: Lab vs. Field Tests to Assess Physical Fitness (1 of 2)

- Aerobic Tests – Gold Standard: Measured VO_2 max performed on treadmill. Timed runs and multistage stage shuttle runs showed excellent reproducibility and good-to-excellent validity when correlated with VO_2 max.
- Anaerobic Tests – Gold Standard: Wingate Test. Sprints and shuttle runs showed excellent reproducibility and fair-to-good validity when correlated with VO_2 max.
- Muscular Strength and Endurance Tests – Gold Standard for Muscular Strength: one repetition maximum. There is no Gold Standard for muscular endurance.
  - One repetition maximum, horizontal jump, dips, hand grip strength, pull-ups and flexed arm hang, squats, push-ups, and rope climb showed excellent reproducibility.
  - Maximum repetitions and sit-ups had fair to good reproducibility.

Example – Subject Area 1: Lab vs. Field Tests to Assess Physical Fitness (2 of 2)

- Functional Tests – No Gold Standard.
  - Agility and hop tests showed excellent reproducibility.
  - Obstacle course:
    - No reproducibility measurements performed.
    - Performance was found to have fair-to-good validity when correlated with VO_2 max.
    - Equipment needed and more difficult to administer.

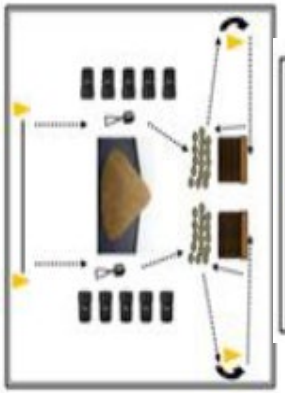
Phase III: Test Development

- Construct a WTBD functional proxy simulation test that reflects the physical demands of the five WTBD/common Soldier tasks constructs.

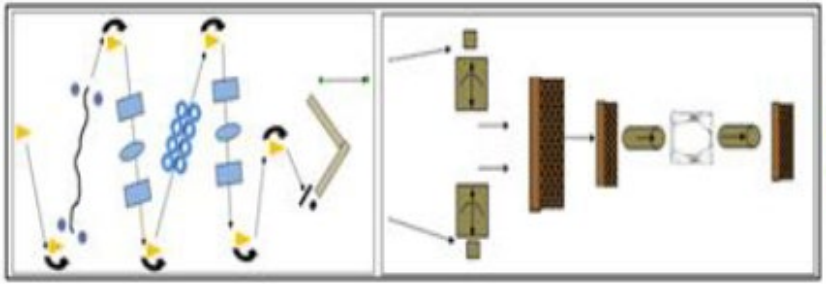
WTBD Course Layout

START

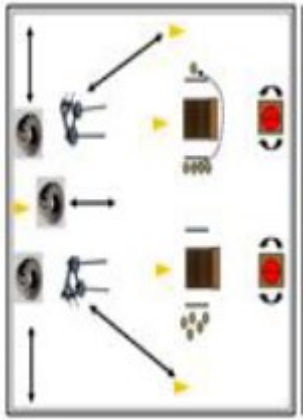
Prepare a Fighting Position



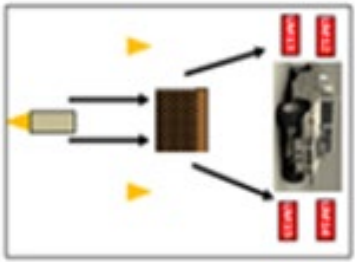
Move Over/Under/Around/Through Obstacles



Perform Combatives

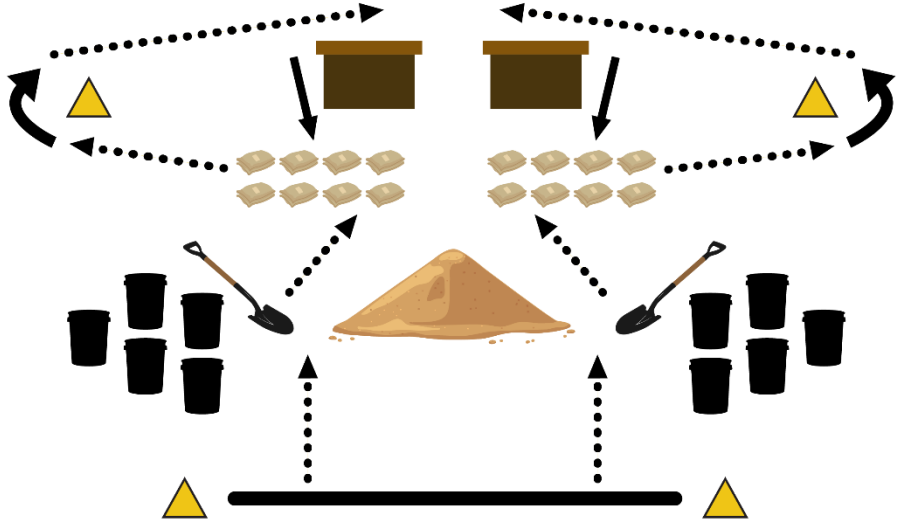


Casualty Extraction and Drag



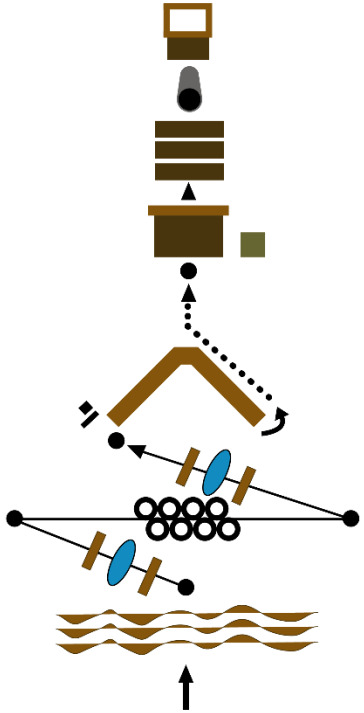
WTBD Course – Prepare a Fighting Position

- Fill 5, 5-gallon buckets with sand.
- Carry and stack 16, 40-pound sandbags from the ground to a platform 32 inches high located 10 meters away.



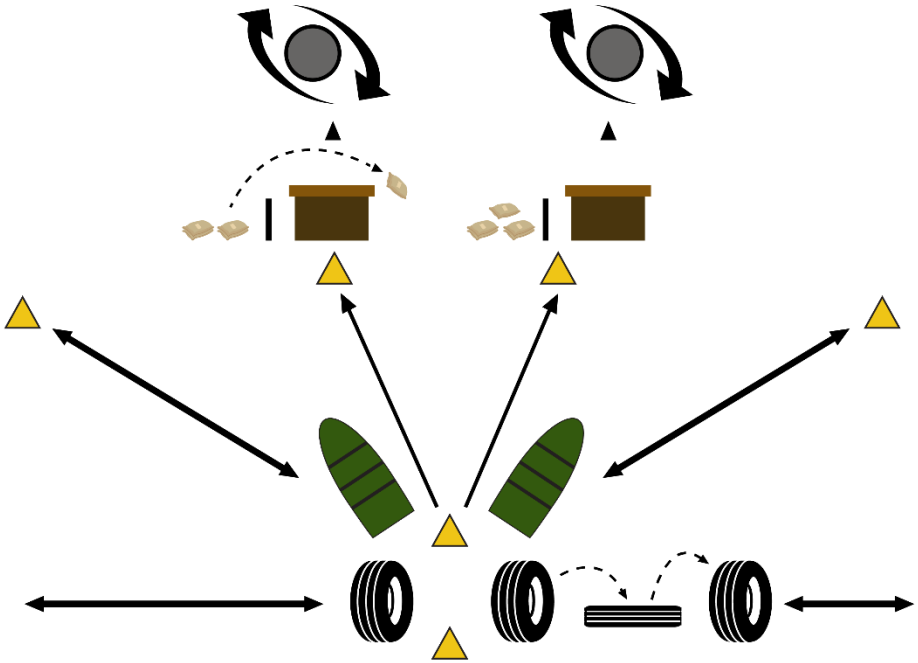
WTBD Course – Move Over/Under/Around/Through Obstacles

- 75 meters of obstacles:
  - Sprint 15 meters.
  - High crawl 10 meters.
  - Zigzag run 45 meters while jumping over 4 low obstacles, 2 simulated ditches, and negotiating 8 tires.
  - Traverse a 24-foot, v-shaped balance beam while carrying an automatic weapon and ammo can (20 lbs. each).
  - Sprint 10 meters.
  - Lift a 50-pound ruck sack onto a 4-foot platform and back down to the ground.
  - Traverse over and under barriers as well as through a tunnel and window.



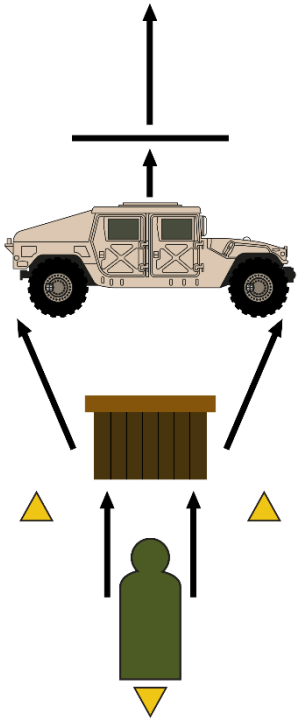
WTBD Course – Perform Combatives

- Flip a 107-pound tire 4 times.
- Drag a 163-pound weighted sled 5 meters.
- Lift and throw 5, 30-pound sandbags over a 54-inch wall behind a 1-meter restraining line.
- Barrel turn – Rotate or spin a 300-pound barrel 2 times to the right and 2 times to the left.



WTBD Course – Casualty Extraction and Drag

- Begin in a prone position
- 5-meter sprint to barrier, take a knee, and look around barrier
- 5-meter crouch run to HUMVEE
- Extract training dummy (182 pounds) from HUMVEE
- Drag training dummy 20 meters
- Sprint 60 meters to complete course



Phase IV: Test Validation

- Predictive Validation – Administer the WTBD proxy simulation test and the 23 common physical fitness tests.
- The 23 common physical fitness tests were selected based on the results of the systematic review.

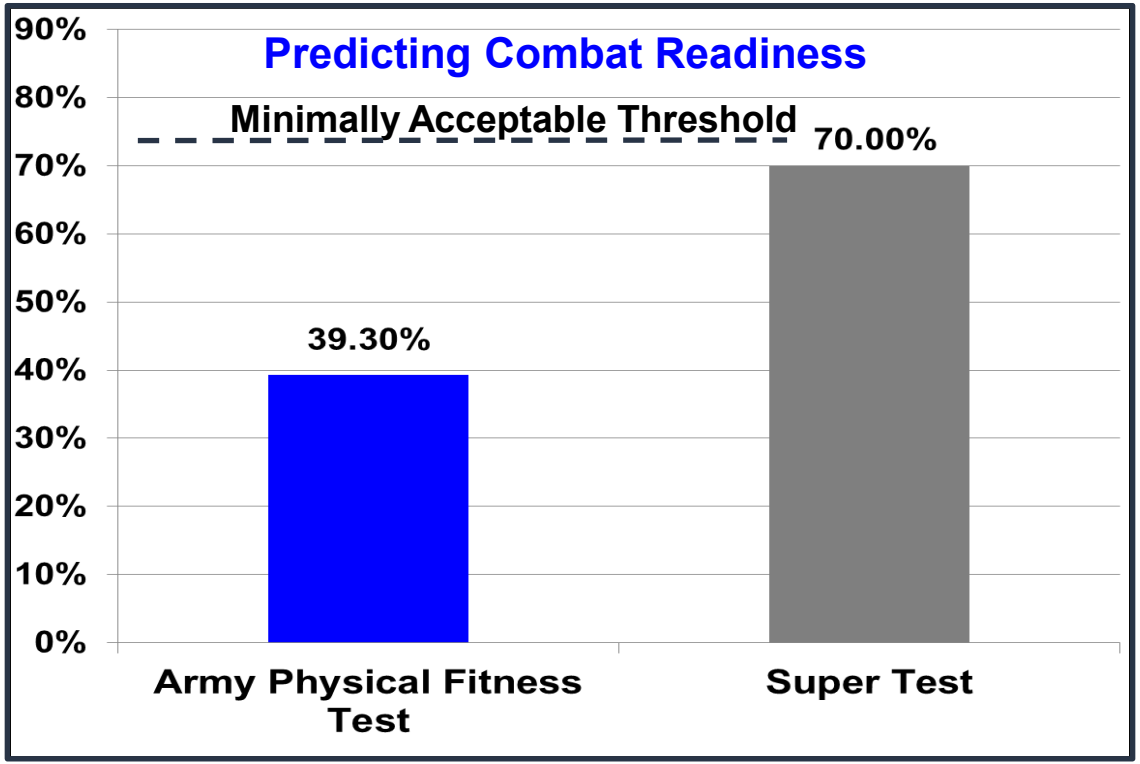
Phase IV Test Validation Field-Expedient Test Events (1 of 3)

- Measures of Muscular Strength:
  - Sumo squat
  - Bench press
  - Hexbar deadlift
  - Leg tuck
  - Pull-ups
- Measures of Explosive Power:
  - Standing long jump
  - Vertical jump
  - 20-pound power throw
  - 50-meter sled push
  - 50-meter power drag
- Measures of Muscular Endurance:
  - Dips
  - Bench press endurance
  - Push-ups
  - Kettlebell squat endurance
  - Modified sit-ups
  - Weighted trunk rotations
  - Modified ab rower
  - Sit-ups

Phase IV Test Validation Field-Expedient Test Events (2 of 3)

- Measures of Cardiovascular Endurance:
  - 2-mile run
- Measures of Speed and Agility:
  - 21-pound loaded shuttle run
  - 300-meter shuttle run
  - Illinois agility test
  - 400-meter sprint

Phase IV Test Validation Field-Expedient Test Events (3 of 3)



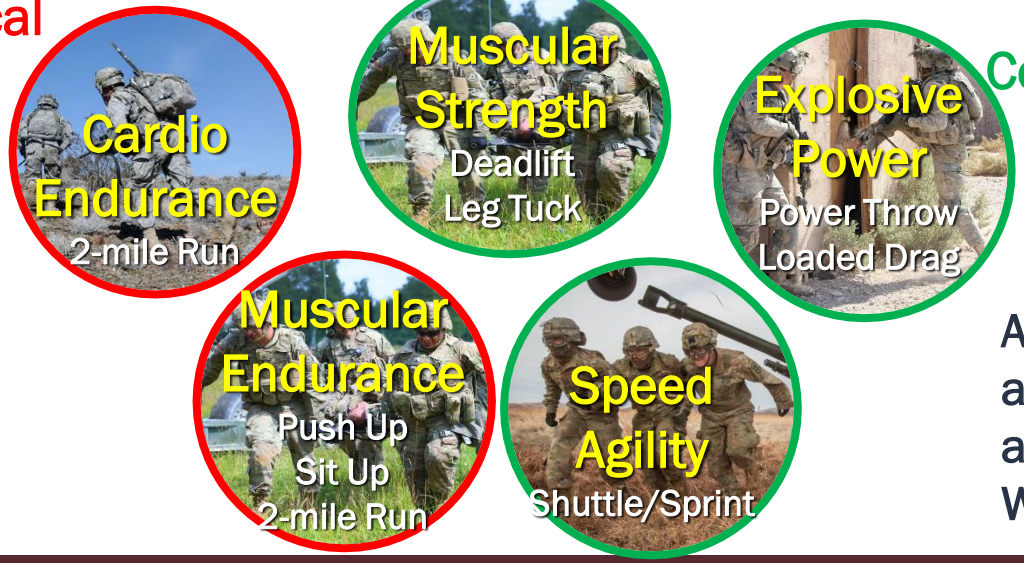
Army Combat Fitness Test Events (1 of 2)

Army Combat Fitness Test Events (2 of 2)

- ACFT assesses physical readiness

(across five components of physical fitness required for combat-specific physical task performance)

1980 Army Physical Fitness Test



2017 Army Combat Readiness Test

1980 APFT measures about 40% of ability to perform WTBD

ACFT measures about 81% of ability to perform WTBD

Phase V: Develop the Standards

- ACFT – First implemented as an age- and sex-neutral test

ACFT 3.0
Scoring Standards

6 Event standard
Moderate level is the Army Minimum standard to be a Soldier
Plank is added as an alternative event scaled from 0-100 points
No requirement for MOS / AOC ACFT performance

Points	MDL	SPT	HRP	SDC	LTK	Plank	2MR
100	340	12.5	60	1:33	20	4:20	13:30
99		12.4	59	1:36		4:17	13:39
98		12.2	58	1:39	19	4:14	13:48
97	330	12.1	57	1:41		4:11	13:57
96		11.9	56	1:43	18	4:07	14:06
95		11.8	55	1:45		4:04	14:15
94	320	11.6	54	1:46	17	4:01	14:24
93		11.5	53	1:47		3:58	14:33
92	310	11.3	52	1:48	16	3:54	14:42
91		11.2	51	1:49		3:51	14:51
90	300	11.0	50	1:50	15	3:48	15:00
89		10.9	49	1:51		3:44	15:09
88	290	10.7	48	1:52	14	3:41	15:18
87		10.6	47	1:53		3:38	15:27
86	280	10.4	46	1:54	13	3:35	15:36
85		10.3	45	1:55		3:31	15:45
84	270	10.1	44	1:56	12	3:28	15:54
83		10.0	43	1:57		3:25	16:03
82	260	9.8	42	1:58	11	3:21	16:12
81		9.7	41	1:59		3:18	16:21
80	250	9.5	40	2:00	10	3:15	16:30
79		9.4	39	2:01		3:12	16:39
78	240	9.2	38	2:02	9	3:08	16:48
77		9.1	37	2:03		3:05	16:57
76	230	8.9	36	2:04	8	3:02	17:06
75		8.8	35	2:05		2:58	17:15
74	220	8.6	34	2:06	7	2:55	17:24
73		8.5	33	2:07		2:52	17:33
72	210	8.3	32	2:08	6	2:49	17:42
71		8.2	31	2:09		2:45	17:51
70	200	8.0	30	2:10	5	2:42	18:00
69		7.8	28	2:14		2:39	18:12
68	190	7.5	26	2:18	4	2:35	18:24
67		7.1	24	2:22		2:32	18:36
66		6.8	22	2:26		2:29	18:48
65	180	6.5	20	2:30	3	2:26	19:00
64	170	6.2	18	2:35		2:22	19:24
63	160	5.8	16	2:40		2:19	19:48
62	150	5.4	14	2:45	2	2:16	20:12
61		4.9	12	2:50		2:12	20:36
60	140	4.5	10	3:00	1	2:09	21:00
59				3:01		2:06	21:01
58				3:02		2:03	21:03

- ACFT - Current test is age- and gender-specific

Max Deadlift (MDL) - Three-Repetitions (LBS)

Points	17-21 M	17-21 F	22-26 M	22-26 F	27-31 M	27-31 F	32-36 M	32-36 F	37-41 M	37-41 F	42-46 M	42-46 F	47-51 M	47-51 F	52-56 M	52-56 F	57-61 M	57-61 F	Over 62 M	Over 62 F	Points
100	340	210	340	230	340	230	340	230	340	210	340	210	330	190	290	190	250	170	230	170	100
99	330	---	330	220	330	220	330	220	330	200	330	200	320	180	280	180	240	160	220	160	99
98	---	200	---	210	---	210	---	210	---	---	---	190	310	---	270	170	230	---	210	---	98
97	---	190	---	---	---	---	---	---	---	190	320	---	300	170	260	160	220	---	---	---	97
96	320	---	---	200	---	---	---	200	---	---	310	180	290	---	250	---	210	---	---	---	96
95	310	---	---	---	---	200	---	190	320	180	300	170	280	---	240	---	---	---	200	---	95
94	---	180	---	190	---	190	---	---	310	---	290	---	270	---	230	---	200	---	190	---	94
93	300	---	---	---	---	---	320	180	300	170	280	---	260	---	220	---	190	---	180	---	93
92	---	---	320	---	---	---	---	---	290	---	270	---	250	---	---	---	---	---	170	---	92
91	290	170	---	180	320	180	310	170	280	---	260	---	240	---	---	---	180	---	---	---	91
90	280	---	310	---	310	---	300	---	270	160	---	160	230	160	210	150	---	150	---	150	90
89	---	---	290	170	300	170	290	---	---	---	250	---	220	---	---	---	170	---	---	---	89
88	---	---	280	---	290	---	280	160	260	---	---	---	---	---	200	---	---	---	---	---	88
87	270	160	---	160	280	---	270	---	---	---	240	---	210	---	---	---	---	---	---	---	87
86	---	---	270	---	---	160	---	---	250	---	---	---	---	---	190	---	---	---	---	---	86
85	---	---	---	---	270	---	260	---	---	---	230	---	200	---	180	---	---	---	---	---	85
84	260	---	260	---	260	---	---	---	240	---	220	---	---	---	170	---	---	---	---	---	84
83	250	---	---	---	---	---	250	---	---	---	---	---	190	---	---	---	---	---	---	---	83
82	240	---	---	---	---	---	---	---	230	---	---	---	---	---	---	---	---	---	160	---	82
81	---	---	250	---	250	---	240	---	220	---	210	---	180	---	---	---	---	---	---	---	81
80	---	---	---	---	---	---	---	---	---	---	---	---	170	---	---	140	---	140	---	140	80
79	230	---	240	---	240	150	230	150	---	150	200	150	---	150	160	---	160	---	---	---	79
78	---	150	---	150	---	---	---	---	210	---	---	---	160	---	---	---	---	---	---	---	78
77	220	---	230	---	230	---	220	---	---	---	190	---	---	---	---	---	---	---	---	---	77
76	---	---	---	---	---	---	---	---	200	---	180	---	---	---	---	---	---	---	---	---	76
75	---	---	220	---	220	---	210	---	---	---	170	---	---	---	---	---	---	---	---	---	75
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72	200	---	---	---	---	---	---	---	180	---	---	140	---	---	---	---	---	---	150	130	72
71	---	140	200	140	200	140	190	140	170	140	---	---	---	---	---	---	150	130	---	---	71
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69	190	---	180	---	190	---	170	---	---	---	150	---	---	---	---	---	---	---	---	---	69
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67	170	---	170	---	---	---	---	---	---	---	---	---	---	130	---	---	---	---	---	---	67
66	---	---	---	---	---	---	150	---	---	---	---	---	---	---	---	---	---	---	---	---	66
65	---	---	160	---	160	---	---	---	---	130	---	130	---	---	---	---	---	---	---	---	65
64	160	130	---	130	---	130	---	130	---	---	---	---	---	---	---	---	---	---	---	---	64
63	---	---	---	---	150	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	63
62	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	62
61	150	---	150	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	61
60	140	120	140	120	140	120	140	120	140	120	140	120	140	120	140	120	140	120	140	120	60
50	130	110	130	110	130	110	130	110	130	110	130	110	130	110	130	110	130	110	130	110	50
40	120	100	120	100	120	100	120	100	120	100	120	100	120	100	120	100	120	100	120	100	40
30	110	90	110	90	110	90	110	90	110	90	110	90	110	90	110	90	110	90	110	90	30
20	100	80	100	80	100	80	100	80	100	80	100	80	100	80	100	80	100	80	100	80	20
10	90	70	90	70	90	70	90	70	90	70	90	70	90	70	90	70	90	70	90	70	10
0	80	60	80	60	80	60	80	60	80	60	80	60	80	60	80	60	80	60	80	60	0

Summary of Selected Results from the ACFT Evaluation

- The ACFT was initially field tested (1 October 2018 – September 2019) and consisted of the following events: deadlift, power throw, hand release push-ups, sprint-drag-carry, leg tuck, and 2-mile run.
- The following are selected results for men and women who completed both the baseline and follow-up survey.
- **Unit physical training after the ACFT implementation:**
  - Men spent more time performing cross-training and resistance training and less time performing calisthenics.
  - Women spent more time performing resistance training and less time running.

Unit Physical Training for Men After Field-Testing the ACFT

Unit PT (Men)	n	Before field-testing the ACFT	n	After field-testing the ACFT	p-value (t-test)
Run – Minutes per week	581	68.6±33.4	484	65.5±48.1	0.22
Sprinting – Minutes per week	578	44.5±37.2	484	42.1±35.1	0.28
Calisthenics – Minutes per week	**575**	**51.8±49.6**	**484**	**44.4±45.0**	**0.01**
Cross-Training – Minutes per week	**571**	**42.6±42.1**	**484**	**50.9±49.8**	**<0.01**
Agility Training – Minutes per week	574	30.1±36.0	484	31.6±35.6	0.50
Resistance – Minutes per week	**574**	**43.1±47.8**	**484**	**53.3±57.5**	**<0.01**
Total Exercise Time per week	581	281.1±130.5	484	294.0±130.5	0.11

Unit Physical Training for Women After Field-Testing the ACFT

Unit PT (Women)	n	Before field-testing the ACFT	n	After field-testing the ACFT	p-value (t-test)
Run – Minutes per week	**146**	**65.7±35.3**	**110**	**56.5±35.3**	**0.04**
Sprinting – Minutes per week	152	41.4±34.0	110	46.7±37.6	0.23
Calisthenics – Minutes per week	151	41.2±48.6	110	46.0±43.9	0.32
Cross-Training – Minutes per week	**152**	**45.3±48.3**	**110**	**56.0±50.5**	**0.08**
Agility Training – Minutes per week	151	25.7±35.3	110	29.8±36.2	0.36
Resistance – Minutes per week	**153**	**38.7±46.7**	**110**	**63.5±59.4**	**<0.01**
Total Exercise Time per week	**154**	**256.3±132.1**	**110**	**300.8±129.0**	**<0.01**

Summary of Selected Results – Injury

- Injury after the field-testing the ACFT:
  - Musculoskeletal injuries increased after field-testing the ACFT for 1 year.
  - For men, weight training injuries increased while running injuries decreased.
  - Low performance on five of the six ACFT events for men and two of the six ACFT events for women was associated with greater musculoskeletal injury risk when compared to high performers controlling for age and body mass index (BMI).
    - Men – deadlift; hand release push-up; sprint, drag and carry; leg tuck; 2-mile run
    - Women – sprint, drag, and carry; 2-mile run

Percent of Soldiers Injured Before and After Field-Testing the ACFT for 1 Year

Medical Record MSK Injury (1 year)	n	Before field-testing the ACFT	After field-testing the ACFT
Men	871	**40.8%**	**47.6%***
Women	263	**46.0%**	**55.9%***

MSK = musculoskeletal
*Chi-Square $p<0.05$

Self-Reported Injury Activity for Men (Top 5) After Field-Testing the ACFT

Injury Activity (Men)	Before field-testing the ACFT		After field-testing the ACFT	
	n	% Injured	n	% Injured
Weightlifting	35	**17.5**	70	**28.3***
Running	69	**34.5**	56	**22.7***
Sports/Recreation	18	9.0	15	6.1
Occupational Injuries	11	5.5	15	6.1
Other Physical Training	7	3.5	12	4.9

*Chi-Square $p<0.05$

Self-Reported Injury Activity for Women (Top 5) After Field-Testing the ACFT

Injury Activity (Women)	Before field-testing the ACFT		After field-testing the ACFT	
	n	%	n	%
Running	27	38.0	29	36.7
Weightlifting	14	19.7	16	20.3
Other Physical Training	4	5.6	6	7.6
Occupational Injuries	1	1.4	4	5.1
Foot Marching	5	7.0	2	2.5

Association of Each ACFT Event with Musculoskeletal Injury Risk, Controlling for Age and Body Mass Index (Men) (1 of 2)

Men				
	Performance Quartile	**n**	**Odds Ratio (95%CI)**	**p-value**
Deadlift (pounds)	**≤190**	**433**	**1.51 (1.16–1.96)**	**<0.01**
	191–235	516	1.20 (0.94–1.54)	0.15
	236–295	537	1.00	
	≥296	513	1.08 (0.84–1.39)	0.55
Standing Power Throw (meters)	≤8.20	484	1.16 (0.89–1.52)	0.27
	8.20–9.30	479	1.09 (0.84–1.42)	0.52
	9.31–10.50	525	0.95 (0.74–1.23)	0.70
	≥10.51	460	1.00	
Hand Release Push-Ups (reps)	**≤29**	**464**	**1.55 (1.20–2.02)**	**<0.01**
	30–35	576	1.20 (0.94–1.54)	0.15
	36–42	441	1.24 (0.95–1.62)	0.11
	≥43	474	1.00	

Association of Each ACFT Event with Musculoskeletal Injury Risk, Controlling for Age and Body Mass Index (Men) (2 of 2)

Men				
	Performance Quartile	n	Odds Ratio (95%CI)	p-value
Sprint-Drag-Carry (minutes)	**≥2.06**	**473**	**1.38 (1.06–1.81)**	**0.02**
	1.88–2.05	479	1.10 (0.84–1.43)	0.49
	1.69–1.87	523	1.10 (0.85–1.43)	0.47
	≤1.68	442	1.00	
Leg Tuck (repetitions)	**≤3**	**456**	**1.51 (1.15–1.97)**	**<0.01**
	4–6	522	1.06 (0.82–1.36)	0.68
	7–11	530	1.12 (0.87–1.43)	0.39
	≥12	502	1.00	
2-Mile Run[2] (minutes)	**≥18.04**	**459**	**1.31 (1.00–1.72)**	**0.05**
	16.73–18.03	**457**	**1.33 (1.02–1.74)**	**0.04**
	15.43–16.72	462	1.05 (0.80–1.37)	0.73
	≤15.42	466	1.00	

Association of Each ACFT Event with Musculoskeletal Injury Risk, Controlling for Age and Body Mass Index (Women) (1 of 2)

Women				
	Performance Tertile	n	Odds Ratio (95%CI)	p-value
Deadlift (pounds)	≤140	105	0.96 (0.57–1.62)	0.87
	141–170	119	1.21 (0.74–2.00)	0.45
	≥171	138	1.00	
Standing Power Throw (meters)	≤5.10	135	1.25 (0.75–2.06)	0.39
	5.20–6.10	126	1.37 (0.82–2.27)	0.23
	≥6.2	122	1.00	
Hand Release Push-Ups (repetitions)	≤19	104	1.16 (0.69–1.98)	0.58
	20–28	142	1.50 (0.92–2.24)	0.10
	≥29	129	1.00	

Association of Each ACFT Event with Musculoskeletal Injury Risk, Controlling for Age and Body Mass Index (Women) (2 of 2)

Women				
	Performance Tertile	**n**	**Odds Ratio (95%CI)**	**p-value**
Sprint-Drag-Carry (minutes)	**≥2.54**	**137**	**2.16 (1.29–3.62)**	**<0.01**
	2.24–2.53	**118**	**1.91 (1.12–3.25)**	**0.02**
	≤2.23	110	1.00	
Leg Tuck (repetitions)	0	225	1.35 (0.81–2.25)	0.25
	1–3	79	1.18 (0.63–2.18)	0.61
	≥4	87	1.00	
2-Mile Run[2] (minutes)	**≥18.93**	**127**	**2.17 (1.26–3.75)**	**<0.01**
	17.24–18.92	120	1.59 (0.92–2.75)	0.09
	≤17.23	99	1.00	

Summary of Selected Results – Human Performance

Human performance after field testing the ACFT:

Absolute strength: Soldiers with a higher percentage of body fat had greater absolute strength but lower aerobic capacity compared to Soldiers with less body fat.

Relative strength: Soldiers deadlifting the highest percentage of their body weight (≥1.5 times for men and ≥1.25 times for women) outperformed those with lower relative strength within their own sex on all six ACFT events.

DCPH-A. 2024. Defense Technical Information Center, #AD1309838.
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Body Weight Categories and Average Age, Physical Characteristics, 2-Mile Run Times, and Deadlift Performance (Men)

Men								
Weight Category (pounds)	Age (years)	Height (inches)	%Body Fat	Fat Mass (pounds)	Lean Mass (Body Weight–Fat Mass)	2-Mile Run Time (minutes)	Deadlift (pounds)	% Body Weight Deadlifted
≤ 150	25.4±5.5	67.2±2.6	14.4±3.3	20.4±5.3	120.2±7.0	16.4±2.3	204.5±44.3	1.46±0.31
151–160	26.0±6.9	68.0±2.3	17.6±2.5	27.6±4.0	129.2±4.6	16.5±2.1	221.0±48.2	1.41±0.31
161–170	27.4±7.6	69.1±2.4	18.8±2.7	31.3±4.6	135.6±4.6	16.5±2.2	233.0±55.3	1.40±0.33
171–180	28.4±7.6	69.4±2.3	20.4±2.5	36.1±4.6	140.6±4.6	16.5±1.9	242.7±57.7	1.37±0.32
181–190	29.9±7.8	69.9±2.3	21.9±2.4	40.7±4.6	145.6±4.5	16.7±2.1	250.8±56.9	1.35±0.31
191–200	30.2±7.4	70.6±2.3	22.8±2.2	44.9±4.5	151.5±4.9	17.2±2.2	251.4±61.6	1.28±0.31
201–210	30.6±8.3	71.3±2.3	23.7±2.2	49.0±4.7	157.4±4.6	17.3±2.4	265.6±63.2	1.29±0.31
≥ 211	32.0±7.4	72.1±2.3	26.0±2.3	59.8±8.1	169.2±9.0	17.9±2.4	267.8±63.4	1.17±0.28

Body Weight Categories and Average Age, Physical Characteristics, 2-Mile Run Times, and Deadlift Performance (Women)

Women								
Weight Category (pounds)	Age (years)	Height (inches)	%Body Fat	Fat Mass (pounds)	Lean Mass (Body Weight–Fat Mass)	2-Mile Run Time (minutes)	Deadlift (pounds)	% Body Weight Deadlifted
≤ 120	26.0±7.1	61.8±2.5	25.6±3.6	29.0±5.2	83.7±5.2	18.4±1.8	152.3±21.8	1.34±0.18
121–130	26.2±6.9	63.4±2.2	28.6±2.8	36.4±3.6	91.0±3.7	18.3±2.2	162.7±23.8	1.28±0.19
131–140	26.9±6.5	64.1±2.4	30.5±2.6	41.7±3.6	95.1±4.1	18.2±2.3	163.0±29.1	1.19±0.21
141–150	26.9±6.1	64.9±2.6	31.9±2.7	46.7±4.1	99.6±4.4	17.9±2.1	171.6±31.4	1.17±0.21
151–160	28.2±7.2	65.4±2.0	33.7±2.2	52.6±3.9	103.5±3.4	18.4±2.0	171.0±36.7	1.10±0.23
161–170	29.3±6.2	66.8±3.0	34.4±3.0	57.2±5.3	108.9±4.8	19.1±2.6	165.3±30.1	1.00±0.18
≥171	29.8±6.9	67.7±2.7	36.5±2.2	66.7±5.7	115.7±7.2	18.8±2.2	192.3±45.7	1.05±0.24

Average ACFT Event Performance Estimates by Category of Magnitude of Relative Body Weight Deadlifted from Multivariate Linear Regression Models for Men

ACFT Event	Magnitude of Body Weight Deadlifted	Multivariate Beta*
Deadlift (lbs)	1.00 vs. ≥1.50	-143.5
Standing Power Throw (m)	1.00 vs. ≥1.50	-1.50
Hand Release Push-Ups (reps)	1.00 vs. ≥1.50	-19.2
Sprint, Drag, Carry (min)	1.00 vs. ≥1.50	0.29
Leg Tuck (reps)	1.00 vs. ≥1.50	-9.1
2-Mile Run (min)	1.00 vs. ≥1.50	1.71

*All multivariable models included variables to adjust for age (in quartiles), percent body fat (in quartiles), and personal resistance training time (minutes per week in quartiles). $p<0.01$ (Grier et al. 2024). Univariate model n=1806, Multivariate model n=1299

Average ACFT Event Performance Estimates by Category of Magnitude of Relative Body Weight Deadlifted from Multivariate Linear Regression Models for Women

ACFT Event	Magnitude of Body Weight Deadlifted	Multivariate Beta*
Deadlift (lbs)	1.00 vs. ≥1.25	-70.8
Standing Power Throw (m)	1.00 vs. ≥1.25	-0.83
Hand Release Push-Ups (reps)	1.00 vs. ≥1.25	-14.9
Sprint, Drag, Carry (min)	1.00 vs. ≥1.25	0.29
Leg Tuck (reps)	1.00 vs. ≥1.25	-5.2
2-Mile Run (min)	1.00 vs. ≥1.25	1.93

*All multivariable models included variables to adjust for age (in quartiles), percent body fat (in quartiles), and personal resistance training time (minutes per week in quartiles); $p<0.05$ (Grier et al. 2024).

Overall Summary

- The previous APFT is a poor predictor of WTBD/CST performance: R^2=0.39.
- The new ACFT is a relatively good predictor of WTBD/CST performance: R^2=0.81.
- Physical fitness standards changed from an age- and sex-neutral test to an age- and sex-specific test.
- Injury rates, resistance training time, and resistance training injuries increased after ACFT implementation.
- Soldiers of greater relative strength had higher physical performance on the ACFT compared to Soldiers of lower relative strength.

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QUESTIONS