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Correlation of Performance on USMC Physical
Fitness Test and Combat Fitness Test Events to
Physically Demanding Military Occupational
Specialty Tasks



Brian J. McGuire, MS ATC CSCS
Colonel, USMCR
USMC Training and Education Command

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- Any Media Present?
 - Non-attribution
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Purpose / Endstate

- Purpose: To provide an overview of the methodology and findings of a study that examined the correlation of performance on USMC Physical Fitness Test (PFT) and Combat Fitness Test (CFT) events to physically demanding Military Occupational Specialty (MOS) tasks
- Endstate:
 - TSAC attendees with an understanding of how performance on USMC PFT and CFT correlates to physically demanding tasks.
 - TSAC attendees with an enhanced understanding of how to assess whether existing fitness tests in their respective agencies correlate to actual job demands.

Agenda

- Bottom Line Up Front
- Overview of USMC PFT and CFT
- Development of tests for physically demanding MOS tasks
- Testing
- Results
- Questions

Bottom Line Up Front

- Performance on most USMC PFT and CFT events can serve as a sound basis for making valid inferences about a Marine's capability to perform physically demanding MOS tasks.

Overview of PFT and CFT

PFT

The PFT is a collective measure of general fitness Marine Corps-wide. The PFT was specifically designed to test the strength and stamina of the upper body, midsection, and lower body, as well as efficiency of the cardiovascular and respiratory systems.

Events:

- Pullups (females currently have option to do pullups or Flexed Arm Hang)
- Crunches
- 3 mile run

Notes:

- Conducted annually for all Marines regardless of age gender, grade or duty assignment
- Conducted between 1 January and 30 June of each year

CFT

The CFT is a complement to the PFT and measures the functional elements of combat fitness through execution of a series of events that represent every Marine's combat experience, emphasizing our ethos of "every Marine a rifleman."

Events

- 880 yd run
- Ammo Lift (repetitive lift of 30 lb ammo can from shoulder to overhead for two minutes)
- Maneuver Under Fire (300 yd shuttle run that includes crawls, sprints, fireman's carry, simulated grenade throw, ammo carry, etc)

Notes:

- Conducted annually for all Marines regardless of age gender, grade or duty assignment
- Conducted between 1 July and 31 December of each year

HISTORY OF MARINE CORPS-WIDE PHYSICAL TESTING*

1775-1908	No evidence of Physical Readiness Test (PRT) policy	
1909-1917	Pres. Roosevelt Exec Ord	{ Line Officers - 50 mi walk / Staff Officers - 90 mi horseback ride Conducted over 3 consecutive days
1918-1955	Walk/Ride suspended due to WWI. No evidence of PRT policy during this period	
1956-1959	<u>Males</u> LtCol or below or <40 yrs	Chin ups, Pushups, Situps, 1 min squat thrusts, Broad jump, 50 yd Duck Waddle, 880 yd run for 30-40 yrs (no time limit), 440 yd run for <30 yrs (Sat-<75 sec)
1960-1968	<u>Males</u> <40 yrs (regardless of rank)	Step Test, 20' Rope Climb, Fireman's Carry, Fire/Maneuver, 3M Forced March
1969-1971	<u>Males <46 yrs:</u> Tested on 5 of 9 events (1 from each group, no advance notice on test events) Grp I- Pullups, Pushups or 20' Rope Climb, Grp II-Situps or Leg Lifts, Grp III- Squat Thrusts, Grp IV-Broad Jump or Vertical Jump, Grp V-3M Run Uniform: Boots/Utes	<u>Females <35 yrs:</u> 120' shuttle run, Vertical Jump, Knee pushups, 600 yd run/walk, Situps Uniform-Shorts, shirt, athletic shoes
1972-1974	<u>Males <46 yrs:</u> Pullups, Situps, 3M Run	Females no change
1975-1996	<u>Males <46 yrs:</u> No change	<u>Females <46 yrs:</u> Flexed Arm Hang, Situps, 1.5M Run
1996	Males- "No Kip"	Females- 1.5M to 3M Run
1997	All Marines (regardless of age) take PFT, Situp to Crunch, Altitude waiver	
2007	MCMAP Tan Belt min reqt for All Marines	
2009	Combat Fitness Test introduced	
2013	Phase 1 of Female Marine Pull-up implementation	

*Ref: USMC Historical Division

General Physical Attribute Comparison PFT v. CFT

General Physical Attributes	PFT				CFT		
	Pullups	Flexed Arm Hang	Crunches	3 Mile Run	Movement to Contact	Ammo Lift	Maneuver Under Fire
Cardiovascular Endurance	√√		√	√√√√√	√√√	√√√	√√√√
Stamina	√	√	√	√√√√√	√√	√√√	√√√√√
Power	√√√		√√			√√√√√	√√√√
Strength	√√√√√	√√	√		√	√√√√	√√√√
Flexibility	√			√√√	√√	√√√	√√√√
Balance	√				√	√√	√√√√
Agility	√				√	√	√√√√√
Coordination	√			√	√	√√√	√√√√√
Speed	√√		√√√	√√√√	√√√√√	√√	√√√√
Accuracy	√						√√√

√√√√	Maximum need for attribute
√√√	Extreme need for attribute
√√	Moderate need for attribute
√	Some need for attribute
√	Little need for attribute
No checks	No need for specific attribute

- The PFT and CFT collectively assess a broad spectrum of physical capacities necessary for military tasks and activities of daily living
- Easy to administer and safe
- Does not require great skill
- Training for tests can occur in garrison and austere environments

PFT

CFT



CRITERIA FOR SELECTING TEST EVENTS*

- a. For military purposes, tests selected should measure the various factors in physical fitness which are essential to military fitness. The most important of these are muscular strength, muscular endurance, cardio-respiratory endurance, agility, and coordination.
- b. Test events should be selected which require a minimum of equipment. Necessary equipment must be easy to procure and set up.
- c. Test events should be capable of administration with a maximum economy of time.
- d. Test events which are dangerous to the unskilled or poorly conditioned men should not be included.
- e. Test events used should depend as little as possible upon previously learned skills. The purpose of physical fitness tests is to measure the various components of physical fitness, not to measure acquired skills.
- f. Test events should be such as can be scored on a point table. When tests are scored with points, men are strongly motivated to improve their scores.
- g. The test in its entirety should be such as to distinguish clearly between the fit and unfit individuals. Test results obtained from fit groups should be consistently better than those obtained from poorer groups.
- h. Testing on Mondays or on the day after pay day should be avoided.

*1946 Army Physical Fitness Manual

Development of Tests to Assess Performance on Physically Demanding MOS Tasks

- Validated standards enabled the development of a Test Battery to assess physical performance tasks
 - Tests simulated and direct combat related physical tasks
 - Tasks linked to existing physical standards
 - Replicated physical movements and weight requirements
 - Subject Matter Expert and incumbent agreement
- Naval Health Research Center (NHRC) analyzed Test Battery results and correlated these to performance PFT and CFT events

Development of Tests to Assess Performance on Physically Demanding MOS Tasks

- 2012 analysis validated 170 physical standards (Training & Readiness Manuals) and 278 associated physical tasks (Closed-MOS School Programs of Instruction)

0311	RIFLEMAN	0203	GROUND INTELLIGENCE OFFICER
0313	LAV CREWMAN	0302	INFANTRY OFFICER
0321	RECONNAISSANCE MAN	1802	TANK OFFICER
0331	MACHINE GUNNER	1803	ASSAULT AMPHIBIOUS VEHICLE (AAV) OFFICER
0341	MORTARMAN	7204	LOW ALTITUDE AIR DEFENSE OFFICER
0351	INFANTRY ASSAULTMAN		
0352	ANTITANK MISSILEMAN	0369	INFANTRY UNIT LEADER *
0811	FIELD ARTILLERY CANNONEER	0842	FIELD ARTILLERY RADAR OPERATOR *
0847	FIELD ARTILLERY SENSOR SUPPORT MAN	0844	FIELD ARTILLERY FIRE CONTROL MAN *
1812	M1A1 TANK CREWMAN	0848	FIELD ARTILLERY OPERATIONS MAN *
1833	ASSAULT AMPHIBIOUS VEHICLE (AAV) CREWMAN	0861	FIRE SUPPORT MAN *
2131	TOWED ARTILLERY SYSTEMS TECHNICIAN	2149	ORDNANCE VEHICLE MAINTENANCE CHIEF *
2141	ASSAULT AMPHIBIOUS VEHICLE (AAV) REPAIRER/TECHNICIAN	0306	INFANTRY WEAPONS OFFICER *
2146	MAIN BATTLE TANK (MBT) REPAIRER/TECHNICIAN	0802	FIELD ARTILLERY OFFICER *
2147	LIGHT ARMORED VEHICLE (LAV) REPAIRER/TECHNICIAN	0803	TARGET ACQUISITION OFFICER *
7212	LOW ALTITUDE AIR DEFENSE (LAAD) GUNNER	0803	TARGET ACQUISITION OFFICER *
		2110	ORDNANCE VEHICLE MAINTENANCE OFFICER *

* Denotes an MOS with no associated physical tasks

Physical Tasks to Test Event Relationships

PROXY	CLOSED MOS PHYSICAL TASKS / ACTION / WEIGHT	MOS / SOURCE DOCUMENTS
CLEAN AND PRESS	INSTALL/REMOVE/LOAD UGWS (MK19, M2 50 CAL) @ 60-84 LBS LIFT INTERNAL INTAKE PLENUM COVER @ 50 LBS OPEN INTAKE PLENUMS (2-MAN) – 110 LBS OF FORCE @ 55 LBS EACH OPEN EXHAUST PLENUMS (3-MAN) - 310 LBS OF FORCE TO LIFT 600 LBS @ 103 LBS EACH UNLOAD STUCK ROUND @ 100 LBS OPEN M1A1 TC & LDR HATCHES @ 70 LBS STOW ORDNANCE - CARRY M1A1 ROUND 50M @ 55 LBS TRACK/RANGE AERIAL TARGET – SHOULDER STINGER OR TRACKER HEAD TRAINER @ 53 LBS ASSIST EVAC OF PERSONNEL: MARINE BELOW TURRET ‘PUSHING’ CREWMAN UP/OUT) @ 115 LBS	- MOS 1833: NAVMC 3500.2A AAV T&R AAV CREWMAN POI (CID# M10AHY3) - MOS 1812: NAVMC 3500.1A TANK T&R TANK CREWMAN POI (CID# A03TBM2) - MOS 7212, 7204: NAVMC 3500.57A LAAD T&R; LAAD GUNNER POI (CID# A042141); LAAD OFFICER POI (CID# A04ANS1)
DEAD LIFT	LIFT/INSTALL 300 LB TOW BAR (3-MAN) @ 100 LBS EACH ASSIST EVAC OF PERSONNEL: MARINE OUTSIDE TURRET ‘LIFTING’ CREWMAN UP/OUT) @ 115 LBS REPAIR TRACK BLOCK (AAV) @ 35 LBS REPAIR ROAD WHEEL @ 84 LBS REPAIR SUSPENSION (2-MAN) @ 100 LBS EACH REPAIR STARTER (1-MAN IN CONFINED SPACE) @ 50 LBS REPLACE TRACK BLOCK (M1A1) @ 60 LBS LIFT/MOVE TOOL BOX / TEST EQUIPMENT @ 60 LBS LOAD M1A1 BATTERIES @ 70 LBS REMOVE/INSTALL M1A1 GENERATOR @70 LBS LIFT/LOWER RTNB AND REMOVE HULL TURRET SLIP RING (M1A1) @ 100 LBS REMOVE M1A1 TORSION BAR AND REPLACE ROAD WHEEL @ 100 LBS LOAD/UNLOAD LAAD MANPAD VEHICLE - (4) STINGER CONTAINERS (120 LBS EA) (2-MAN) @ 60 LBS LOAD /UNLOAD (4) STINGER WPN CONTAINERS – MOVE 50M & EMLACE 40M APART @ 60 LBS EACH MOVE/CARRY 213 LB NITROGEN BOTTLE (2-MAN) @ 105 LBS EACH LIFT (LAV) 400 LB STRUT ASSEMBLY: (3-MAN) @ 135 LBS EACH LIFT LAV CONTROL ARM @ 70 LBS REMOVE/INSTALL LAV COMPONENTS - M242 GUN : 59 LB FEEDER, 90 LB RECEIVER, 95 LB BARREL REMOVE/INSTALL (160 LB) LAV TIRE (2-MAN) @ 80 LBS EACH	- MOS 1833: NAVMC 3500.2A AAV T&R AAV CREWMAN POI (CID# M10AHY3) - MOS 1812: NAVMC 3500.1A TANK T&R TANK CREWMAN POI (CID# A03TBM2) - MOSs 2131, 2146: NAVMC 3500.33A GROUND ORD MAINT T&R; ARTILLERY TECH POI (CID# A140806); TANK TECHNICIAN POI (CID# A03GBN2) -MOS 2147: NAVMC 3500.33A GROUND ORD MAINT T&R; LAV REPAIRMAN POI (CID# A14GBD6) - MOS 7212, 7204: NAVMC 3500.57A LAAD T&R; LAAD GUNNER POI (CID# A042141); LAAD OFFICER POI (CID# A04ANS1)
155MM LIFT/CARRY	STOW ORDNANCE/LOAD HOWITZER: LIFT/CARRY 155MM RD (@ 95 LBS) 50M < 2 MIN LIFT & CARRY 100 LB GENERAL MECHANICS TOOLBOX @ 100 LBS	- MOSs 0811: NAVMV 3500.67 ARTILLERY T&R; ARTILLERY CANNONEER POI (CID# A200821) - MOS 2131: NAVMC 3500.33A GROUND ORD MAINT T&R; POI (CID# A140806)
120MM LIFT/LOAD	GUNNERY SKILLS TEST: LOAD M1A1 ROUNDS FOR TIME - LIFT/TURN/LOAD(STACK) 5X RDS < 35 SEC	- MOS 1812, 1802: NAVMC 3500.1A, TANK CREW T&R; NAVMC 3500.2A, TANK OFFICER T&R; POIs (CID# A03TBM2, CID# A03T612)
EXECUTE LOWER LEVEL ENTRY	NEGOTIATE OBSTACLE COURSE WALL	MOS 0300, 0311: NAVMC3500.44A, INF T&R; POI (CID# M030314, M100312)

Testing Background

- 409 males, 379 females
 - Active duty, Permanent personnel (non-recruits), fit for full duty
 - Marine Corps Recruit Depot Parris Island SC
 - School of Infantry East, Camp Lejeune NC
 - The Basic School, Quantico VA

GENDER	N	MEAN	SD	SE
AGE M	409	22.50	4.342	.215
F	379	22.27	4.551	.234
HT M	409	69.42	2.665	.132
F	379	64.29	2.715	.139
WT M	409	167.57	25.442	1.258
F	379	132.95	15.517	.797

- Test events were part of physical training for the day, participation mandatory. Allowing data to be used for research was voluntary.
- Informed consent
- Protocol approved by Marine Corps IRB and Department of the Navy Human Research Protection Program
- Dynamic Warm-up, Pre-event instruction/practice, Cueing during event and Remediation
- Besides pullups, PFT and CFT scores mined from existing performances
- No injuries reported during testing

Test Battery

1. **Deadlift** (lower body movement, anaerobic, strength)
 - 1 rep max progressing ladder (60, 70, 80, 95, 115, 135 lbs)
 - Little variance in performance
2. **Clean and Press** (lower/upper body movement, anaerobic, strength)
 - 1 rep max progressing ladder (70, 80, 95, 115 lbs and 6x65 lbs)
 - High variance among participants
3. **120mm Tank Round Lift & Load** (lower/upper body movement, anaerobic, strength/ endurance)
 - Lift and load five (5) 120mm projectiles (@ 55lbs) <35 sec
 - High variance among participants
4. **155mm Artillery Round Lift & Carry** (lower/upper body movement, anaerobic, strength/ endurance)
 - Pick up and carry a 155mm projectile (@95lbs) 50m < 2 minutes wearing 40lb fighting load
 - Moderate variance among participants
5. **Execute Lower-Level Entry** (upper body movement, anaerobic, strength)
 - Negotiate Obstacle Course 7' Wall with 20" box assist wearing 40lb fighting load
 - Moderate variance among participants

Testing Results

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Pull-Ups	Male	409	15.69	6.016	.297
	Female	379	3.59	4.239	.218
PFT Crunches	Male	409	98.89	4.862	.240
	Female	379	93.50	11.058	.568
PFT 3-mile Run	Male	409	21:21	1:54	5.692
	Female	379	24:30	2:10	6.710
CFT Movement to Contact	Male	409	2:52	:15	.754
	Female	378	3:31	:21	1.109
CFT Ammunition Lift	Male	409	96.52	9.591	.474
	Female	378	56.76	14.784	.760
CFT Maneuver Under Fire	Male	409	2:24	:18	.909
	Female	378	3:19	:26	1.356

Deadlift (135 lbs)		Clean & Press (115 lbs)		120MM round		155MM round		Obstacle Course Wall	
Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
409	378	409	378	409	378	409	378	409	378
100.0%	97.1%	80.0%	8.7%	99.8%	81.5%	99.8%	71.4%	98.8%	78.6%

Overall Closed MOS Testing Score

- Used to quantify a Marine's performance across the spectrum of test events. Similar to an overall PFT or CFT score.
- More variability in the overall score allows for more meaningful correlations to PFT and CFT component tests.
- The overall Closed MOS Testing score is a simple percentage of the pass/fail proxy tasks that were successfully completed. Though there were 5 overall tests, there were a total of 14 pass/fail elements:
 - 6 for the Deadlift: 135 lbs, 115 lbs, 95 lbs, 80 lbs, 70 lbs, 60 lbs
 - 5 for the Clean and press: 115 lbs, 95 lbs, 80 lbs, 70 lbs, 65 lbs for 6 reps
 - 1 each for the Tank loading drill, 155 mm round carry and the wall obstacle
- Example 1: Marine passed all the events except the heaviest two clean and press weights (115 and 95 lbs) Pass=1, Fail=0:
 - Deadlift (1+1+1+1+1+1) + Clean and Press (0+0+1+1+1) + Tank Loading (1) + 155mm rd carry (1) + wall obstacle (1) = 12/14= .86
 - This score (.86) is correlated to all the PFT and CFT events
- Example 2: Marine passed all the events but failed all clean and press lifts and the wall obstacle:
 - Deadlift (1+1+1+1+1+1) + Clean and Press (0+0+0+0+0) + Tank Loading (1) + 155mm rd carry (1) + wall obstacle (0) = 8/14= .57
 - This score (.57) is correlated to all the PFT and CFT events
- Summary: Since the overall Closed MOS Testing Score quantifies a Marine's performance across all tasks and adds variability to the range of scores, correlations between this score and PFT / CFT events should have equal or greater consideration than correlations of individual closed MOS events to PFT / CFT events.

Correlation of PFT and CFT Events to Closed MOS Tasks

Correlation ¹ of performance on PFT/CFT to Overall Closed-MOS Physical Tasks Test Scores ^{2, 3}	
PFT	
Pull Ups	0.75
Crunches	0.38
3-mile Run	-0.61
Flexed Arm Hang	0.23
CFT	
Movement to Contact	-0.71
Ammo Lift	0.76
Maneuver Under Fire	-0.77

Very Strong*	≥.81
Strong	.49 - .80
Moderate	.25 - .48
Weak	.00 - .24

*Pett, M. A. (1997). *Nonparametric Statistics for Health Care Research: Statistics for Small Samples and Unusual Distributions*. Thousand Oaks, CA: Sage Publications, Inc.

Note 1: Spearman's ρ is a non-parametric version of the Pearson correlation, which does not require the assumption of normality, and can partially correct for range restriction.

Note 2: Overall closed-MOS physical tasks test scores were based on the percentage of 14 pass-fail tasks completed successfully on the Proxy Test Battery.

Note 3: Correlation values range from -1 to +1 with weakest correlations occurring at values near zero.

Summary

- Performance on most USMC PFT and CFT events can serve as a sound basis for making valid inferences about a Marine's capability to perform physically demanding MOS tasks.

- Questions
- Thank you!

brian.j.mcguire@usmc.mil

703-784-0098