NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

THE PERCEIVED RELATIONSHIP AMONG PERSONNEL READINESS, JOB PERFORMANCE AND WORK DEMANDS: A CASE FOR PHYSICAL ABILITY TESTING

by

Donaciano Munoz Jr.

September 2012

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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 instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the 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 Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.			
1. AGENCY USE ONLY ***(Leave blank)***	**2. REPORT DATE** September 2012	**3. REPORT TYPE AND DATES COVERED** Master's Thesis	
4. TITLE AND SUBTITLE The Perceived Relationship Among Personnel Readiness, Job Performance and Work Demands: A Case for Physical Ability Testing		**5. FUNDING NUMBERS**	
6. AUTHOR(S) Donaciano Munoz Jr.			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000		**8. PERFORMING ORGANIZATION REPORT NUMBER**	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A		**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number NPS.2012.0061–IR–EP7–A.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited		**12b. DISTRIBUTION CODE** A	

13. ABSTRACT

The military screening process entails meeting general physical and cognitive standards and then primarily matching candidates with a specialization based on cognitive test scores. Little consideration is given to the physical abilities required to perform tasks in that specialization. An online survey was used to explore the perceived relationship among personnel readiness, job performance and work demands for Boatswain's Mates (BM) and Damage Controlmen (DC). This study explored four research questions to evaluate physical ability testing. Descriptive statistics showed that the participants had a wide range of experience levels. The results from the logistic model indicated no factors were significant of evaluation trait averages. The chi-square tests showed a difference in level of physical demands in three different modes of operations for both BMs and DCs. Both groups support the use of a physical ability testing in the selection process for job placement. Efforts to develop a physical ability test for use in the selection process, a physical remediation program for those who do not meet the standards, as well as a maintenance program to verify personnel still meet physical abilities are recommendations that should be considered for future research.

14. SUBJECT TERMS Physical Ability Testing, Job Demands, Military Selection Process, Human Systems Integration			**15. NUMBER OF PAGES** 115
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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THE PERCEIVED RELATIONSHIP AMONG PERSONNEL READINESS, JOB PERFORMANCE AND WORK DEMANDS: A CASE FOR PHYSICAL ABILITY TESTING

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN HUMAN SYSTEMS INTEGRATION

from the

NAVAL POSTGRADUATE SCHOOL
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LIST OF ACRONYMS AND ABBREVIATIONS

ACRT	Army Combat Readiness Test
AFROTC	Air Force Reserve Officer Training Corps
AL	Ammunition Lift
AN	Airman
APFT	Army Physical Fitness Test
APRT	Army Physical Readiness Test
AS	Auto & Shop Information
ASVAB	Armed Services Vocational Aptitude Battery
BCA	Body Composition Assessment
BM	Boatswain's Mate
BMI	Body Mass Index
BUD/S	Basic Underwater Demolition/SEAL
CBRNE	Chemical, Biological, Radiological and Nuclear Explosive
CC	Unit/Squadron Commanders
CCP	Combat Conditioning Program
CFL	Command Fitness Leader
CFT	Combat Fitness Test
CO	Commanding Officer
COMDESRON	Commander Destroyer Squadron
COMPHIBRON	Commander Amphibious Squadron
DC	Damage Controlman
DDG	Destroyer
DoA	Department of the Army

DoD	Department of Defense
DoDI	Deparmtnet of Defense Instruction
DoN	Department of the Navy
EVAL	Evaluation
FA	Fitness Assessment
FCA	Fleet Concentration Area
FEP	Fitness Enhancement Program
FM	Field Manual
FN	Fireman
HSI	Human Systems Integration
IA	Individual Augment
IRB	Institutional Review Board
KSA	Knowledge, Skills and Abilities
MANUF	Maneuver Under Fire
MC	Mechinical Comprehension
MCPFP	Marine Corps Physical Fitness Program
MCRCO	Marine Corps Recruit Command Order
MEPS	Military Entrance Process Station
MOS	Military Occupation Specialty
MTC	Movement to Contact
NAVPERS	Navy Personnel
NETC	Naval Education and Training Command
NPS	Naval Postgraduate School
OIC	Officer in Charge
OPCON	Operational Commands

PARFQ	Physical Activity Risk Factor Questionnaire
PAT	Physical Ability Test
PEP	Personnel Exchange Program
PFA	Physical Fitness Assessment
PHA	Physical Health Assessment
OPCON	Operational Control
OPGUIDE	Physical Readiness Program Operating Guide
OPM	Office of Personnel Management
OPNAV	Office of the Chief of Naval Operations
OPTEMP	Operating/Operations Tempo
PARFQ	Physical Activity Risk Factor Questionnaire
PFT	Physical Fitness Test
PRT	Physical Readiness Test
RCP	Remedial Conditioning Program
SCBA	Self-Contained Breathing Apparatus
SEAL	Sea Air and Land
SME	Subject Matter Experts
SN	Seaman
TIS	Time in Service
USN	United States Navy
VE	Verbal Expression
VO_2	Volume Oxygen Max

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EXECUTIVE SUMMARY

The Department of Defense allocates significant resources, time and effort to ensure that qualified personnel are selected to enlist into the military. In the recruitment process it is determined if a person possesses the cognitive capacity to peform an assigned job. Although a medical examination is conducted, no consideration is given to evaluating the person in terms of physical abilities that are required to perform the tasks associated with the job. The present research reviewed the military recruitment process, military fitness standards, the use of physical ability testing in the public and private sector selection processes and the Navy's physical readiness program to examine two enlisted sea-going rates, Boatswain Mate and Damage Controlman, and the relationship perceived by sailors with these rates among personnel readiness, job performance and work demands.

The follwing research questions were used to explore whether physical ability testing should be included as part of the recruitment process and used in rate selection:

1. Is there a correlation between personnel evaluation trait averages and Physical Readiness Test (PRT) scores?
2. Are PRT scores and BCA components predictive of personnel self–reported evaluation trait averages?
3. Does the selection process consider physical ability testing for job placement?
4. How can a continuous assessment process of physical standards assist the DoD?

An online survey was the instrument used in this research. Boatswain's Mates and Damage Controlmen served as participants because of their frequency of participation in physical jobs related to shipboard operations. Following a command approval, the survey was sent to 151 sailors on eight surface ships with a 44% response rate. The design of the survey allowed the researcher to obtain quantifiable data to answer the research questions.

The descriptive statistics provided a summary of the participants' level of experience and anthropometric measurements. It also identified the top three tasks performed during various operations, which could serve as tasks in a future candidate

physical ability test. The Spearman's rank correlation coefficient was used to determine the strength of relationship between PRT scores and personnel evaluation trait averages with both groups having a positive and statistically significant coefficient. The results from the logistic regression models showed that no factors achieved significance and no factors were considered as predictors of evaluation trait averages. A chi-square test of independence showed that there was a difference in levels of physical demand between three modes of operations for both BMs and DCs. Additionally, a chi-square goodness-of-fit test showed that both groups of participants support a physical ability test being included in the selection process for job placement.

Efforts to develop a physical ability test for use in the selection process, a physical remediation program for those who do not meet the standards, as well as a maintenance program to verify personnel still meet physical abilities are recommendations that should be considered for future research.

ACKNOWLEDGMENTS

I would like to first thank my loving wife, Valerie Munoz. She sacrificed so much for me to be here. I am eternally grateful for the love and support she gave me. Thank you for never giving up on me. I love you Val.

I would like to thank my mom, Annie Munoz, for all the thoughts and prayers she sent me from Navasota, Texas.

I would like to thank my dad, Don Munoz, for being my first advisor. I appreciate all the hard lessons he put me through and it shows in my discipline and strong work ethic. I would not be where I am today if it wasn't for my Dad.

I would also like to thank my daughter, Isabella Grace Munoz, for being so adorable and making me smile.

I would finally like to thank my brother and sister, Chris and Candy, for being supportive of my career since I left Navasota. I hope I have made you proud.

I would like to express my sincere gratitude to my thesis advisor, CAPT John Schmidt, USN; co-advisor, Dr. Christian "Kip" Smith and second reader Dr. Michael McCauley. Thank you for your support, guidance, patience and superivison during this process.

To the Boatswain's Mates and Damage Controlmen of the USS Boxer, Dewey, John Paul Jones, New Orleans, Pinckney, Pearl Harbor, Wayne E. Meyer and Vandegrift for participating in my survey.

To DCCS (SW) Lawerence Lopez, BMC (EXW/SW/AW/SCI) Brandon Wickersham, DC1 (SW) Jake Wright and AT1 (AW) Steven King of the Navy; and SSgt Kelvin McMillan of the Marines. Thank you for your support, time and expertise for the literature review, and in the development of my survey.

To Melton Smith of the Continental Operating Co. in Houston, TX, and Teri Phillips of Sunnyvale Human Resources in Sunnyvale, CA, thank you for your support, time and expertise for the literature review.

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I. INTRODUCTION

A. OVERVIEW

The Department of Defense (DoD) traditionally allocates significant resources to recruiting adequate numbers of qualified personnel for military service each year (Sacket & Mavor, 2003; USD, 2012). The reason for this concerted effort ranges from maintaining adequate manpower levels to controlling training costs. Recruiting candidates for military service is a difficult undertaking that not only includes a time–consuming search process, but also a series of screening procedures (e.g., drug testing), evaluations (e.g., physicals) and tests (e.g., ASVAB) to ensure that qualified personnel are enlisted (Thomas, 1997). Despite the DoD's best efforts at implementing a methodical recruitment process it is does not always place people in a job that they are capable of performing, both physically and mentally. Successful recruitment, including proper job placement, is imperative for both successful service member performance and subsequent retention.

B. BACKGROUND

DoD policies and procedures govern physical fitness and body composition standards in the Armed Services (Department of Defense [DoD], 2002). Collectively, they provide minimal standards for physically qualifying candidates for military service, mission readiness to meet physical job demands, and force protection by safeguarding against illness/injury due to inadequate physical fitness. Each service is responsible for developing and maintaining physical fitness programs to include periodic testing based on their respective standards (DoD, 2002).

Each service refers to the *DoD Physical Fitness and Body Fat Programs Procedures* instruction for guidance to develop procedures governing their respective physical fitness programs. The objective or goal of these programs is directly related to a service's role and function. Army and Marine personnel generally serve at an operational and tactical level and both have similar combat related missions (DoN, 2011a). Test items for Army and Marine Corps incorporate a longer run and pull-up for males and a

flexed-arm hang for Marine females that coincide with their service's mission. The Navy and Air Force mission is defined at the strategic level and therefore, fitness levels focus on satisfactory long-term readiness. Each service considers the same components for evaluation with the Navy including an additional factor of flexibility (Department of Navy [DoN], 2000). Navy and Air Force requirements are less rigorous than those of the Army or Marine Corps and include a shorter run and riding a stationary bike respectively. Constable and Palmer (2000) compared the characteristics of the Army, Air Force, Navy and the Marine Corps physical fitness programs (Table 1).

	Army	Air Force	Navy	Marine Corps
Reference	Regulation 350-41, 600-9, and 600-63, FM 21-20	Instruction 40-501 and 40-502	Instruction 6110.1F	Order 6100.1C
Objective/Goal	Combat and Operational Readiness Healthy Life Style Military Appearance	Motivation To Train Fit and Healthy Force	Optimal Health Stamina For Optimal Readiness	Overall Fitness Mission/Combat Readiness
Components	Aerobic Capacity Upper Body/Trunk Strength/Endurance Body Fat	Aerobic Capacity Upper Body/Trunk Strength/Endurance Body Fat	Aerobic Capacity Upper Body/Trunk Strength/Endurance Flexibility Body Fat	Aerobic Capacity Upper Body/Trunk Strength/Endurance Body Fat
Test Items	2–Mile Run Push-Ups Sit-Ups Body Fat by Tape	Submax Cycle Ergonmeter Prediction of VO_2 Max Push-Ups Ab Crunch Body Fat by Tape	1.5–Mile Run/Walk or 500 yard swim Curl-Ups Push-Ups Sit and Reach Body Fat by Tape	3–Mile Run Ab Crunch Push-Ups (Male) Flexed Arm Hang (Female) Body Fat by Tape

Table 1. Military Service Comparison of Physical Fitness Requirements (After: Constable & Palmer, 2000)

Powers and Howely (2004) conducted a study of physical and physiological differences between males and females and determined that, when absolute strength (e.g., the total amount of force applied) is compared between untrained males and females, males had 50% more upper body strength than females. Foland and Williams (2007) conducted a study on adaptation of strength training and observed that the skeletal muscle of females is about 60–80% of the strength of males. Hormonal differences such as testosterone and estrogen production in males and females respectively are another factor to consider. Testosterone, which produces anabolic steroids, promotes tissue building.

Estrogen, which has similar physiological effects, stimulates female fat deposition and other secondary sex characteristics (Powers & Howley, 2004) with females having lower testosterone levels than males (Lippa, 2005).

Currently, the services are revisiting their respective physical fitness test (PFT) programs and are effecting changes to better suit their needs for supporting performance, safety and health (Schloesser, 2011; Powers & Howley, 2004). For example, the Marine Corps physical fitness assessment changed from a semi-annual PFT, to an annual PFT and a Combat Fitness Test (CFT) (DoN, 2008a). The CFT events are related to the functional requirements of Marines in combat–related tasks, whereas the PFT events are components of the service's physical fitness requirements. Further, the Army Training and Doctrine Command's deputy commanding general for Initial Military Training observed that the Army Physical Fitness Test (APFT) does not sufficiently measure physical fitness components. It has a low correlation with occupational requirements and performance and does not predict physical performance in high-tempo operations (Schloesser, 2011). The Marine Corps like the Army, has recognized the need for change and has updated its physical fitness program to improve combat readiness of Marines. The Army is considering adjusting its physical fitness test to incorporate functional tests related to combat tasks.

C. HUMAN SYSTEMS INTEGRATION

Human Systems Integration (HSI) is an application of systems engineering techniques to integrate the domains of manpower, personnel, training, human factors engineering, environmental safety and occupational health, habitability and personnel survivability into systems (DoN, 2009). HSI domains characterize how human interactions with system components impact overall system performance. Additionally, HSI analyses can help depict how a system can impact human performance and what mental and physical demands are place on personnel. Specifically for physical abilities, key HSI issues include aerobic capacity, physical strength and anthropometric characteristics. The following HSI domain definitions derived from the Department of the Army (DoA) MANPRINT program apply to this research:

Manpower: The number of military personnel required to operate, maintain, sustain and provide training for systems (DoA, 2001). For example, force structure can be affected by the administrative separation of personnel due to Physical Fitness Assessment (PFA) failure or medical discharge from an unrecoverable acute of chronic musculoskeletal injury.

Personnel: The cognitive and physical capabilities required to be able to train to operate, maintain and sustain material and information systems (DoA, 2001). For example, personnel selection and retention is affected in the recruitment of sailors to perform the minimum standards for military entry.

Training: The instruction, education, on-the-job, or unit training that provides personnel their essential job skills, knowledge and attitudes (DoA, 2001). For example, training to demonstrate proper form in physical movements may place personnel at risk for musculoskeletal injury due to improper movement execution.

Safety: The design features and operating characteristics of a system that serves to minimize the potential for human or machine errors, or failure that causes injurious accidents (DoA, 2001). For example, prolonged physical exertion of personnel during emergency procedures increases the risk of injury.

Human Factors: The integration of human characteristics into system definition, design, development and evaluation to optimize human-machine performance under operational conditions (DoA, 2001). For example, in recruitment anthropometry, measures should be considered in job placement to mitigate the risk of injury if job demands exceed their physical statue.

D. OBJECTIVE

The purpose of this study is to examine the military recruitment process to consider if job–related physical ability testing should be considered in job placement. Services use physical readiness assessments to ensure that military personnel meet universal minimum standards (DoD, 2002), but it is contended by the author that such assessments should be tied to valid job demands and placement should be contingent upon meeting those demands.

E. PROBLEM STATEMENT

Physical readiness assessments in the DoD (2002) are used to evaluate aerobic capacity (e.g., timed run) and muscular strength and endurance (e.g., push-ups and sit-ups). They are not considered in recruitment processes for job placement and are not commensurate with the performance of physical activities, such as routine tasks (e.g.,

daily maintenance), sustained operations (e.g., replenishment), or emergency operations (e.g., damage control). In a period of DoD spending reductions it is imperative that personnel are evaluated to ensure they possess the physical ability to fulfill their operational commitments (Bilzon, J. L., Scarpello, Bilzon, E., & Allsopp, 2002). Personnel are susceptible to acute and chronic musculoskeletal injuries when they are placed in a physically demanding job that is beyond their individual capability. The same is also true in succumbing to illnesses due to environmental factors (e.g., heat exhaustion), or exceeding physiological capacity, for example maximal oxygen consumption (VO_2max) due to a lack of physical conditioning. A concern in the recruitment process is to determine whether personnel should be excluded from being placed in some jobs based on their physical inability to perform assigned tasks (Harman & Frykman, 1992).

Physical standards are generally in place to provide for the well-being and safety of personnel in the performance of their duties. Yet, most attention is given to enforcing these standards in the name of readiness while they do not necessarily relate to job demands in routine, sustained, or emergency operations. Therefore, the intent of this study is to assess if current physical fitness requirements reflect job requirements, if requirements can be associated with job performance, if the screening process can be simplified to ensure efficient person-job fit and if a continuous assessment process to track physical standards of personnel throughout their career should be developed.

F. RESEARCH QUESTIONS

The research investigated the following questions to address the statement of the problem and attain the study's overall objective:

1. Is there a correlation between personnel evaluation trait averages and Physical Readiness Test (PRT) scores?
2. Are PRT scores and BCA components predictive of personnel self–reported evaluation trait averages?
3. Should the selection process consider physical ability testing for job placement?
4. How can a continuous physical standards assessment process assist the DoD?

G. OPERATIONAL DEFINITIONS

This study uses the following operational definitions:

Aerobic Capacity: The functional capacity of the heart, lungs and blood vessels to deliver oxygen to the working muscles and its utilization by the muscles to oxidize energy sources to generate energy over sustained periods of time (DoD, 2002).

Muscular Endurance: The ability of a skeletal muscle or group of muscles to perform repeated contractions for an extended period of time (DoD, 2002).

Muscular Strength: The maximal force that can be exerted in a single voluntary contraction of a skeletal muscle or skeletal muscle group (DoD, 2002).

Physical Ability: The ability to perform a physical act (Schmitt & Chan, 1998).

Physical Ability Test: A test where an individual performs a job-related task requiring manual labor or physical skill. The tasks measure physical ability regarding strength, muscular flexibility and stamina (U.S. Office of Personnel Management [OPM], 2012a).

Physical Fitness: The capacity to perform physical exercise, consisting of the components of aerobic capacity, muscular strength and muscular endurance in conjunction with body fat content within an optimal range (DoD, 2002).

Physical Readiness: The overall capacity to perform the physical duty of military service and combat, consisting of the components of physical fitness, health and motivation (DoD, 2002).

H. SCOPE, ASSUMPTIONS AND LIMITATIONS

This study examined the concept of physical ability testing for active duty personnel onboard Navy surface ships in two enlisted rates. The focus of this study was to examine physical ability testing in regards to job performance, with the assumption that the basic findings will generalize to other personnel ratings. Even though the research reached its objectives, there were some limitations. The survey was administered to a relatively small sample of the Navy's ship population in the San Diego

Fleet Concentration Area (FCA). In addition, five ships that participated were forward deployed or underway and may have been affected by a higher operational tempo and limited internet connectivity.

I. THESIS ORGANIZATION

Chapter I provided an overview and background on physical ability testing in the military. Chapter II provides a review of the literature to showcase of the use of physical ability testing in the military, private and public sector selection process. Chapter III covers the research methodology used and discusses the participants, their job description and the relevance to physical ability for job performance. Chapter IV considers the data collected and the results of its analyses performed. Finally, Chapter V summarizes and discusses the findings, draws conclusions and makes recommendations.

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II. LITERATURE REVIEW

A. OVERVIEW

This chapter provides a framework for understanding the recruitment process including placement of candidates for military service and physical ability testing and its relevance in meeting job demands. Physical ability testing is used across all military services and in public and private sector jobs. A review of the military selection process and military fitness standards of the Navy, Marine Corps, Army and the Air Force is provided. Next, a review of person-job fit, the selection and placement process and the use of physical ability testing in the private (e.g., coal miners) and public (e.g., fire–fighters) sectors are explored. Finally, an in-depth review of the Navy's physical readiness program and its potential impact in terms of enhanced job performance, reduced health-care costs, or ability to meet minimum standards for general military duties is presented.

B. MILITARY SELECTION PROCESS

After initial contact, potential recruits go through a series of sequential and sometimes parallel steps prior to entering military service (Figure 1). The time required to go through the process is dependent on the potential recruit's knowledge, skills and abilities, the career field in which he or she is interested and the need of the interested service. A potential candidate may be dismissed from the recruitment process at any time (AT1 Steven King, USN & SSgt Kelvin McMillan, USMC, personal communication, January 3, 2012).

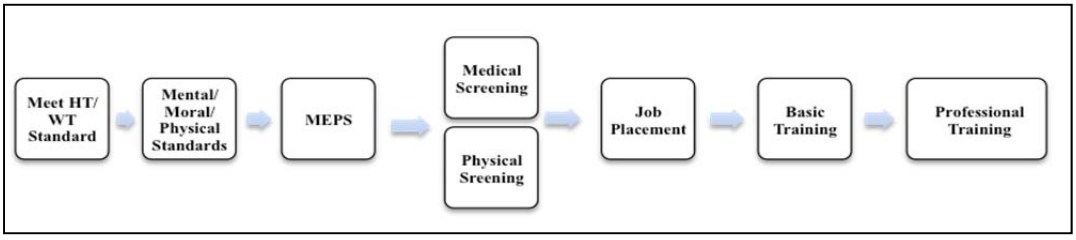

Figure 1. Military Selection Process Model (From: AT1 Steven King, USN & SSgt Kelvin McMillan, USMC, 2012)

The military services attempt to ensure that the health and safety of personnel are handled properly throughout their military service. This process begins with an interaction between potential recruit and a military recruiter. First, an initial evaluation is conducted in which a height and weight measurement is taken and compared to a height and weight table indicating if the person is within standards. According to the U.S. Navy's Physical Readiness Program, a potential Sailor must fall under the maximum weight for their respective height given in Table 1 (DoN, 2011b) during all aspects of the selection process. However, the Marine Corps takes a different approach for height and weight standards than the Navy. Potential Marines can fall under a less restrictive weight standard in the pre-recruitment process, as seen in Table 2. They are allowed a higher weight during their contracting period, with the intent to lose weight prior to shipping to basic training. Furthermore, if a potential Marine is not under his or her respective weight standard, a waiver may be granted. Shipping is authorized at the consent of the district commanding officer or commanding general of the region based on the deviation from the maximum weight (DoN, 2008a). Additionally, throughout the screening process the Marines also considers a minimum weight for potential recruits where the Navy does not.

TABLE 1
PHYSICAL FITNESS ASSESSMENT (PFA) TABLES

MAXIMUM WEIGHT FOR HEIGHT SCREENING TABLE

Men Maximum Weight (pounds)	Member's Height (inches with fractions rounded up to nearest whole inch)	Women Maximum Weight (pounds)
127	57	127
131	58	131
136	59	136
141	60	141
145	61	145
150	62	149
155	63	152
160	64	156
165	65	160
170	66	163
175	67	167
181	68	170
186	69	174
191	70	177
196	71	181
201	72	185
206	73	189
211	74	194
216	75	200
221	76	205
226	77	211
231	78	216
236	79	222
241	80	227

TABLE 3-8

WEIGHT STANDARDS FOR MALE APPLICANTS WHO REQUIRE RECRUIT TRAINING

		CONTRACTING WEIGHTS (Note 1)			MALE SHIPPING (RETENTION WEIGHTS)	SHIPPING WEIGHTS (Notes 2 & 3) Retention Weight Waivers				
		AGE	AGE	AGE		5% or less		6-10%		11% +
HT	MIN	17-20	21-30	31-35	ALL AGES	No Waiver Required		CO DIST WAIVER		CG REGION
58	91	148	153	152	131	138	MAX	144	MAX	145+
59	94	153	158	157	136	143	MAX	150	MAX	151+
60	97	158	163	162	141	148	MAX	155	MAX	156+
61	100	163	168	167	145	152	MAX	160	MAX	161+
62	104	168	174	173	150	158	MAX	165	MAX	166+
63	107	174	180	178	155	163	MAX	171	MAX	172+
64	110	179	185	184	160	168	MAX	176	MAX	177+
65	114	185	191	190	165	173	MAX	182	MAX	183+
66	117	191	197	196	170	180	MAX	187	MAX	188+
67	121	197	203	202	175	184	MAX	193	MAX	194+
68	125	203	209	208	180	189	MAX	198	MAX	199+
69	128	209	215	214	186	195	MAX	205	MAX	206+
70	132	215	222	220	191	201	MAX	210	MAX	211+
71	136	221	228	227	197	207	MAX	217	MAX	218+
72	140	227	234	233	202	212	MAX	222	MAX	223+
73	144	233	241	240	208	219	MAX	229	MAX	230+
74	148	240	248	246	214	225	MAX	235	MAX	236+
75	152	246	254	253	220	231	MAX	242	MAX	243+
76	156	253	261	260	225	236	MAX	248	MAX	249+
77	160	260	268	266	231	243	MAX	254	MAX	255+
78	164	267	275	273	237	249	MAX	261	MAX	262+
79	168	274	282	278	244	256	MAX	268	MAX	269+
80	173	281	288	285	250	263	MAX	275	MAX	276+

NOTE 1: Exceeding contracting weight standards requires a CG MCRC Weight Waiver. Height measurements of one-half inch or more will be rounded to next higher inch. (exception: heights below 58 inches or over 80 inches will be exact measurements for height waiver considerations (i.e. 57 1/2" or 80. 1/2"). CG region height waivers are limited to minimum 56" or maximum 82" (exact measurements, no rounding). See paragraph 3273.6 page 3-79.

NOTE 2: Exceeding shipping weight standards waiver refer to Table 3-11. Height measurements of one-half inch or more will be rounded to next higher inch.

NOTE 3: Exceeding weight standards and body fat percentages requires a CG MCRC Exception to Policy Waiver.

Table 2. Navy and Marine Corps Recruit Height and Weight Standards (From: DoN, 2011b, 2011c)

Following the height and weight measurements, a potential recruit undergoes several steps. A verification process is conducted where a potential recruit is evaluated in the following aspects: mentally, morally and physically. The Armed Services Vocational Aptitude Battery (ASVAB) tests the mental capacity of a recruit, which will determine the qualification for a rate or Military Occupation Specialty (MOS). For example, the Navy requires an ASVAB sub-test score of VE+MC+AS equal or greater than 158 for assignment to the rate of Damage Controlman (DC) (Military Advantage, 2012). Task demands required for this rate include: maintenance of the operational capabilities of vital systems; prevention, isolation, combat, extinction and removal of the effects of fire and explosion; and rapid repairs to correct structural and equipment damage (DoN, 2003). A background investigation is conducted which will determine if potential recruits are morally acceptable. Finally, an initial strength test is administered to confirm that recruits have the potential to meet physical readiness standards. After completion of these criteria, the potential recruit goes into the next point of the selection process (AT1 Steven King, USN & SSgt Kelvin McMillan, USMC, personal communication, 2012).

The military entrance process station (MEPS) is the next step for a potential recruit; there a medical and physical evaluation is conducted. Th recruit undergoes a series of examinations that includes blood work, anthropometric measurements, vision and auditory exams, personality tests and a self-reporting medical history review. Following the medical and physical screening process is job placement: potential recruits are provided with choices of what rate or MOS they qualify to enter, based on their ASVAB score. Navy personnel have three options: be designated a rate in which they qualify, then attend an “A” school; attend an “A” school and a “C” school, or be undesignated and attend an apprenticeship course after basic training. Marines differ by designating a MOS to all potential Marines. Upon the successful completion of these steps, a potential recruit is then eligible to take the oath of enlistment for entrance into military service (AT1 Steven King, USN & SSgt Kelvin McMillan, USMC, personal communication, 2012).

Basic training consists of conditioning work, swimming qualifications, marching, formation drilling, attending educational classes and training for the use and handling of small-arm weaponry (DoN, 2012a). The majority of training consists of physical activities and conditioning. Following completion of basic training, personnel who have been assigned an "A" school will travel to various locations for their professional training. In an "A" school personnel receive advanced training where they are educated on the basic skill needed to accomplish their job. The goal is to successfully educate personnel, with little emphasis placed on physical training. A "C" school is a more advanced school where personnel receive specialized training on particular systems. Again, emphasis is placed on educational requirements with little focus on physical training other than meeting the minimum standard. Apprenticeship training consists of basic skills required to become an airman (AN), seaman (SN), or fireman (FN) with little importance placed on physical training for successful completion (AT1 Steven King, USN & SSgt Kelvin McMillan, USMC, personal communication, 2012).

C. PHYSICAL ABILITY TESTING

Physical ability tests are administered to determine an invidual's ability to perform job-related tasks requiring manual labor or physical skill (OPM, 2012a). The tests measure components such as aerobic capacity and muscular endurance. The tests are developed by conducting a job-analysis. A job-analysis identifies the skills directly related to performance on the job and it demonstrates that there is a clear relationship between the tasks performed on the job and the skills required to perform the tasks. (OPM, 2012b). To ensure that the physical ability test is associated to the test measures, the test must have proof of validity, such as criterion-related validity (e.g., task predicts job performance). Attention must be paid to ensure that the testing tools justify the test and do not violate federal anti–discrimination laws that would prevent potential employees from being hired (U.S. Equal Employment Opprotunity Commission, 2012). To protect employees, Title VII of the Civil Rights Act of 1964, the American with Disabilities Act of 1990 and the Age Discrimination in Employment Act of 1967, prohibit the use of discriminatory employment tests.

Physical ability tests are used both in the military and public and private sector. The military services use physical ability tests to verify that sailors are within established standards with a purpose of contributing to overall force protection and readiness by reducing injuries due to poor physical fitness (DoD, 2002). The public and private sectors mainly use physical ability tests during the selection process to ensure that potential employees are physically capable of performing the job prior to job placement (Mathis & Jackson, 2008). The following sections review physical ability testing in the military and public and private sectors.

1. Military Physical Ability Testing

According to DoDI 1308.3 (2002), the services shall expand their respective physical fitness programs to incorporate "occupational-specific physical fitness requirements for those career fields where it is deemed necessary to ensure adequate skill, performance, and safety." In the military entrance process, there were no requirements in the job placement phase to meet specific physical capabilities needed for an occupational specialty. For example, the physical capability required for successful completion at Basic Underwater Demolition/SEAL (BUD/S) School differs greatly from that for successful completion at basic training for Navy personnel (DoN, 2012b).

a. Navy

The policy for physical ability testing in the United States Navy (USN) is to ensure that sailors maintain a level of physical fitness necessary to support overall mission readiness (DoD, 2002). According to OPNAV Instruction 6110.1J, all personnel shall meet the minimum physical fitness standards throughout their service. The commanding officer (CO) is responsible and accountable to establish a physical readiness program to promote a program that allows meeting mission readiness standards within a command. Meeting these standards is accomplished by devoting time of up to two and a half hours per week and performing strength training exercises at least twice per week (DoN, 2011b).

As of 2011, the Navy's Physical Fitness Assessment is a semi-annual event consisting of a medical screening, a body composition assessment (BCA) and the PRT (DoN, 2011b). The medical screening includes a physical health assessment (PHA), which is composed of a physical activity risk factor questionnaire (PARFQ) and pre-physical activity questions. The BCA is composed of height and weight measurements and, when required, body circumference measurements. The PRT consists of curl-ups, push-ups and a cardio-respiratory event: run or walk, swim, or elliptical trainer or stationary bike (DoN, 2011b). There are eleven age brackets for males and females.

Sailors' performances are scored in five different performance levels. For example, Table 3 shows part of the numbers of points awarded, by age and gender, for varying performance on the different constituents of the PRT. The number of repetitions is proportional to the level, but there are scoring differences between males and females in the test items of push-ups and the cardio-respiratory events. Fewer repetitions are required by a female to obtain the same score as a male. However, the differences, in regards to overall strength capacity, are not to imply that females are weaker than males as a female's muscle is capable of generating the same amount of force per unit of its cross-sectional area (McArdle, Katch, F. I., Katch, & V. L., 2010). The more muscle an individual has the more force that can be generated. Age is also a factor for the number of repetitions required for each test item. In terms of physical strength, maximum strength is reached between the ages of 25–30 years (Coates & Kirby, 1982). This accounts for the reduction in the number of repetitions required for an older sailor to achieve the same score as someone in a younger age bracket.

Performance Level	Points	Males: Age 17-19 years				
		Curl-ups	Push-ups	1.5-mile run	500-yd swim	450-m swim
"Maximum"	100	109	92	8:15	6:30	6:20
Outstanding	90	102	86	9:00	7:15	7:05
Excellent	75	90	76	9:45	8:30	8:20
Good	60	62	51	11:00	11:15	11:05
Satisfactory	45	50	42	12:30	12:45	12:35
Failure	<45	<50	<42	>12:30	>12:45	>12:35
		Males: Age 20-24 years				
"Maximum"	100	105	87	8:30	6:30	6:20
Outstanding	90	98	81	9:15	7:30	7:20
Excellent	75	87	71	10:30	8:45	8:35
Good	60	58	47	12:00	11:30	11:20
Satisfactory	45	46	37	13:30	13:00	12:50
Failure	<45	<46	<37	>13:30	>13:00	>12:50

Performance Level	Points	Females: Age 17-19 years				
		Curl-ups	Push-ups	1.5-mile run	500-yd swim	450-m swim
"Maximum"	100	109	51	9:29	6:45	6:35
Outstanding	90	102	47	11:30	8:30	8:20
Excellent	75	90	42	12:30	9:45	9:35
Good	60	62	24	13:30	13:00	12:50
Satisfactory	45	50	19	15:00	14:15	14:05
Failure	<45	<50	<19	>15:00	>14:15	>14:05
		Females: Age 20-24 years				
"Maximum"	100	105	48	9:47	7:15	7:05
Outstanding	90	98	44	11:30	8:45	8:35
Excellent	75	87	39	13:15	10:00	9:50
Good	60	58	21	14:15	13:15	13:05
Satisfactory	45	46	16	15:30	14:30	14:20
Failure	<45	<46	<16	>15:30	>14:30	>14:20

Table 3. Excerpt of Navy Male/Female Performance Standards by Age (From: DoN, 2011b)

The standard for maximum point requirements decreases as personnel enter higher age brackets for both male and female sailors (DoN, 2011b). This decrease may be because as personnel age, their body composition changes, which typically includes increases in weight (Harman & Frykman, 1992). Personnel who do not meet these standards are placed in a remedial program to improve their performance; failure to meet standards may result in an administrative separation (DoN, 2011b; DoD, 2002).

b. Marine Corps

Policy for physical ability testing in the United States Marine Corps (USMC) falls in accordance with DoDI 1308.3 (2002). According to Marine Corps Order 6100.13 (DoN, 2008a), "every marine must be physically fit, regardless of age, grade, or duty assignment." The CO or Officer in Charge (OIC) is responsible for the combat readiness of his or her command. To accomplish this, commanders ensure Marines perform at least five, thirty–minute combat conditioning sessions per week.

Recently, a change was made to the Marine Corps Physical Fitness Program (MCFFP) that adds the Combat Fitness Test (CFT) (DoN, 2008a), with the intent to ensure Marines are ready for the increasing physical rigors of modern combat operations (DoN, 2008b). Implementation of the Combat Conditioning Program (CCP), a semi-annual event for all Marines, ensures that they are combat ready. A body composition evaluation ensures individuals are within height and weight standards. When an individual is not within standards, a body circumference measurement is administered. The CCP consists of the Physical Fitness Test (PFT), the CFT and the Remedial Conditioning Program (RCP). The PFT consists of three events: male Marines perform dead-hang pull-ups, abdominal crunches and a three mile run; female Marines perform a flexed-arm hang, abdominal crunches and a three-mile run (DoN, 2002). Table 4 illustrates the scales of performance for male and female Marines.

AGE	PULL-UPS/ FLEXED-ARM	ABDOMINAL CRUNCHES	3.0 MILE RUN (MIN)	TOTAL POINTS	MIN SCORE	ADDNTL' POINTS NEEDED
17-26	3/15(SEC)	50	28(m) 31(f)	105	135	30
27-39	3/15	45	29(m) 32(f)	94	110	16
40-45	3/15	45	30(m) 33(f)	88	88	0
46+	3/15	40	33(m) 36(f)	65	65	0

Table 4. Marine Male/Female Minimum Performance Standards by Age (From: DoN, 2002)

The CFT is a three part pass/fail event that consists of combat–related tasks and measures the functional elements of combat fitness through execution of a series of events that represent every Marine's possible combat experience (DoN, 2008b). It is composed of the following events: movement to contact (MTC), ammunition lift (AL) and maneuver under fire (MANUF) (DoN, 2008a). The MTC is an 880 yard sprint (DoN, 2008a). Figure 2 illustrates the layout of MANUF. The AL is a continuous timed lift of a 30 pound ammunition can from shoulder level to above the Marine's head. The MANUF consists of a 300–yard shuttle run that includes an arrange of combat-related tasks such as high crawling, conducting a "buddy" drag and carry, carrying ammunition

cans for resupply, a grenade toss and an agility run. CFT passing criteria were derived from testing a sample population of Marines comprised of the Marine Corps Total Force structure. Consequently no differences or separate events are based on gender or age (DoN, 2008a). However, the requirements do decrease as Marines move through the later age brackets. Personnel who do not meet the standards in the PFT or CFT are placed in a remedial physical conditioning program; failure to meet standards may result in administrative separation. Table 5 shows the minimum requirements.

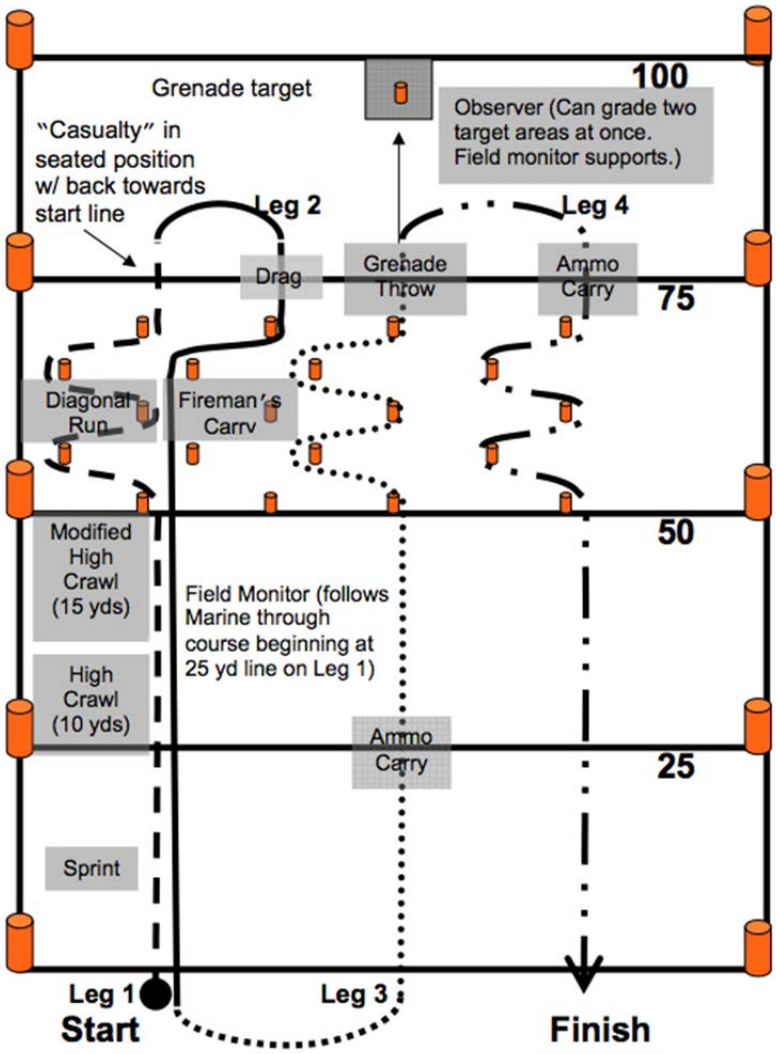

Figure 2. A Layout of the MANUF Component of Marine CFT (From: DoN, 2008a)

CFT Pass/Fail Requirements				
Male				
	17-26	27-39	40-45	46+
MTC	3:48	4:00	4:19	4:21
AL	45	45	44	43
MANUF	3:29	3:55	3:57	4:28
Female				
	17-26	27-39	40-45	46+
MTC	4:34	4:40	5:09	5:20
AL	20	21	17	15
MANUF	4:57	5:27	6:07	6:30

Table 5. Marine CFT Minimum Requirements (From: DoN, 2008a)

c. Army

Policy for physical fitness training in the United States Army (USA) is in accordance with DoDI 1308.3. According to Army Regulation 350-1, Army Training and Leader Development, the intent of physical fitness training is to increase combat readiness and leadership effectiveness by building up and maintaining high levels of physical fitness. Commanders are responsible for establishing a physical fitness training program consistent with their respective unit's mission (DoA, 2009). This fitness program should include from three to five workouts per week (DoA, 1992).

Recently, a change to the Army's Physical Fitness Test (APFT) was proposed to adjust the events that measure the physical components to ensure that soldiers have the muscular strength, endurance and mobility for modern combat operations (Schloesser, 2011). Two physical tests were proposed to replace the APFT: the Army Physical Readiness Test (APRT) and the Army Combat Readiness Test (ACRT) (DoA, 2011a). The APRT is comprised of five events assessing the physical components of strength, endurance and mobility. The ACRT is also comprised of five events assessing the same physical components of the APRT. Figure 3 illustrates the proposed ACRT course. The ACRT course and components are similar to the Marine's current CFT. Until the proposed physical fitness tests are changed, soldiers will continue to be assessed by participating in the APFT. The current APFT is comprised of three events: push-ups, sit-ups and a two–mile run (DoA, 1992).

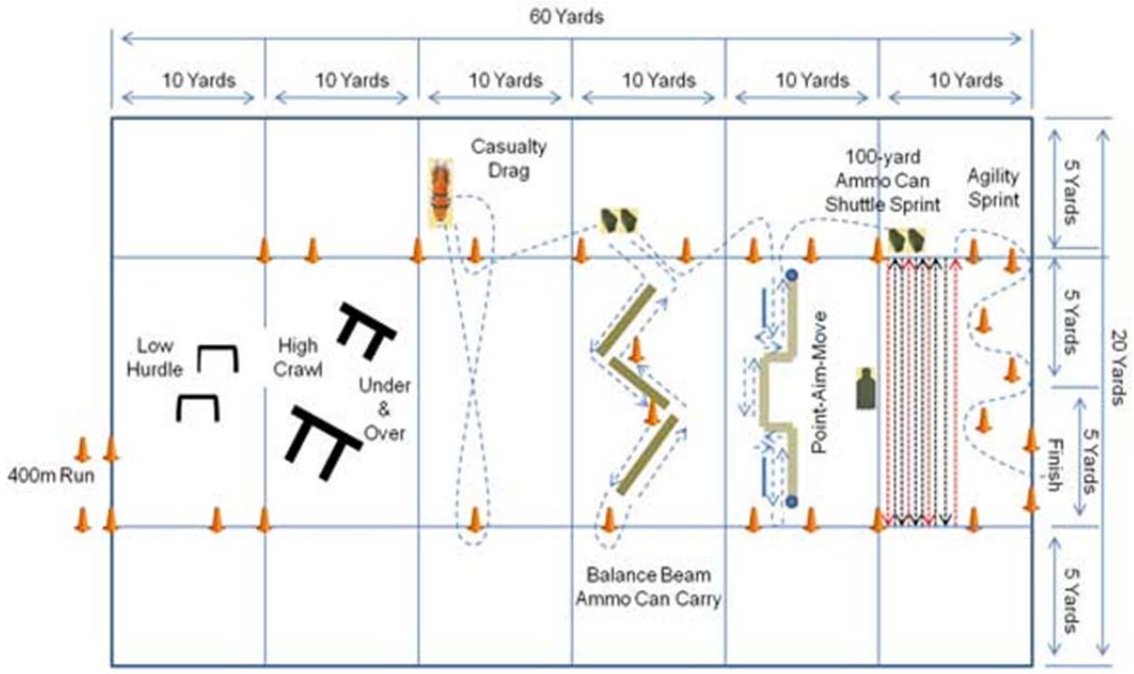

Figure 3. Army Combat Readiness Test Course Diagram (From: Schloesser, 2011)

d. Air Force

Policy for physical ability testing in the United States Air Force (USAF) is in accordance with DoDI 1308.3. According to Air Force Instruction 36-2905_AFGM3 (Air Force Reserve Officer Training Corps [AFROTC], 2012), it is the responsibility of every airman to maintain physical standards and to be physically fit to support the mission. Unit or squadron commanders (CC) are responsible to implement a unit/squadron physical training program, which should allow for participation up to 90 minutes, three to five times per week. To ensure that Airmen are measured within standards, they participate in a Fitness Assessment (FA).

The FA consists of a body composition assessment with the components of height, weight and abdominal circumference; push-ups; sit-ups; and a 1.5-mile run or an alternative aerobic test of a one–mile walk. As of January 2012, airmen who score an "excellent" or above in all four components of the FA are only required to test once a year, with a retest within 12 calendar months from the previous test date. Airmen who score below "excellent" are required to test semiannually (AFROTC, 2012). Table 6

illustrates one age group of USAF performance standards for males less than age 30. To receive an "excellent" score, airmen must have a cumulative composite score equal to or greater than 90 points. Failure to meet standards may lead to administrative separation.

Additionally, the Air Force considers "health risk" as a category and contends that health risk levels (e.g., risk of cardiovascular disease) are directly related to the overall fitness levels of airmen (AFROTC, 2012). There are three levels in the health risk category: low, moderate and high. A health risk assessment provides a tool to identify potential health problems so that wellness programs can be implemented to reduce risk of injuries, furthermore reducing the impact for potential long-term health care expenditures associated with injury or disease (Goetzel, Anderson, Whitmer & Ozminkowski, 1998).

USAF Fitness Test Scoring /Males < 30 years of age

Cardiorespiratory Endurance			Body Composition			Muscle Fitness			
Run Time (mins:secs)	Health Risk Category	Points	AC (inches)	Health Risk Category	Points	Push-ups (reps/min)	Points	Sit-ups (reps/min)	Points
≤ 9:12	Low-Risk	60.0	≤ 32.5	Low-Risk	20.0	≥ 67	10.0	≥ 58	10.0
9:13 - 9:34	Low-Risk	59.7	33.0	Low-Risk	20.0	62	9.5	55	9.5
9:35 - 9:45	Low-Risk	59.3	33.5	Low-Risk	20.0	61	9.4	54	9.4
9:46 - 9:58	Low-Risk	58.9	34.0	Low-Risk	20.0	60	9.3	53	9.2
9:59 - 10:10	Low-Risk	58.5	34.5	Low-Risk	20.0	59	9.2	52	9.0
10:11 - 10:23	Low-Risk	57.9	35.0	Low-Risk	20.0	58	9.1	51	8.8
10:24 - 10:37	Low-Risk	57.3	35.5	Moderate Risk	17.6	57	9.0	50	8.7
10:38 - 10:51	Low-Risk	56.6	36.0	Moderate Risk	17.0	56	8.9	49	8.5
10:52 - 11:06	Low-Risk	55.7	36.5	Moderate Risk	16.4	55	8.8	48	8.3
11:07 - 11:22	Low-Risk	54.8	37.0	Moderate Risk	15.8	54	8.8	47	8.0
11:23 - 11:38	Low-Risk	53.7	37.5 #	Moderate Risk	15.1	53	8.7	46 #	7.5
11:39 - 11:56	Low-Risk	52.4	38.0	Moderate Risk	14.4	52	8.6	45	7.0
11:57 - 12:14	Low-Risk	50.9	38.5	Moderate Risk	13.5	51	8.5	44	6.5
12:15 - 12:33	Low-Risk	49.2	39.0 *	Moderate Risk	12.6	50	8.4	43	6.3
12:34 - 12:53	Moderate Risk	47.2	39.5	High Risk	0	49	8.3	42 *	6.0
12:54 - 13:14 #	Moderate Risk	44.9	40.0	High Risk	0	48	8.1	41	0
13:15 - 13:36 *	Moderate Risk	42.3	40.5	High Risk	0	47	8.0	40	0
13:37 - 14:00	High Risk	0	41.0	High Risk	0	46	7.8	39	0
14:01 - 14:25	High Risk	0	41.5	High Risk	0	45	7.7	38	0
14:26 - 14:52	High Risk	0	42.0	High Risk	0	44 #	7.5	37	0
14:53 - 15:20	High Risk	0	42.5	High Risk	0	43	7.3	36	0
15:21 - 15:50	High Risk	0	43.0	High Risk	0	42	7.2	35	0
15:51 - 16:22	High Risk	0	≥ 43.5	High Risk	0	41	7.0	34	0
16:23 - 16:57	High Risk	0				40	6.8	33	0
≥ 16:58	High Risk	0				39	6.5	32	0
						38	6.3	31	0
NOTES:						37	6.0	30	0
Health Risk Category = low, moderate or high risk for current and future						36	5.8	≤ 29	0
cardiovascular disease, diabetes, certain cancers, and other health problems						35	5.5		
						34	5.3		
Passing Requirements - member ***must***: 1) meet minimum value in each of						33 *	5.0		
the four components, ***and*** 2) achieve a composite point total ≥ 75 points						32	0		
						31	0		
* Minimum Component Values						30	0		
Run time ≤ 13:36 mins:secs / Abd Circ ≤ 39.0 inches						29	0		
Push-ups ≥ 33 repetitions/one minute / Sit-ups ≥ 42 repetitions/one minute						28	0		
						27	0		
# Target Component Values						26	0		
Member should attain or surpass these to achieve ≥ 75.0 composite score						25	0		
						24	0		
Composite Score Categories						23	0		
Excellent ≥ 90.0 pts / Satisfactory = 75.0 - 89.9 / Unsatisfactory < 75.0						22	0		
						21	0		
						20	0		
						19	0		
						18	0		
						≤ 17	0		

Table 6. Air Force Male Performance Standards for Ages 30 and Under (From: AFROTC, 2012)

2. Public and Private Sector Physical Ability Testing

The selection process in the public and private sector include testing procedures similar to those in the military. The selection process entails reception of the applicant, an initial screening, testing and background checks, physical examinations and interviews (Mathis & Jackson, 2008) as seen in Figure 4. Job placement occurs upon a satisfactory screening process. Conventional hiring practice is accomplished through a human resources department. Job postings are listed that provide information on available positions. Potential employees fill out an application on paper or online. Upon meeting the initial qualifications interviews, testing follows. A background check is conducted, followed by a job offer and upon passing the medical and drug screening, a potential employee is placed in a job (T. L. Phillips, personal communication, May 20, 2012).

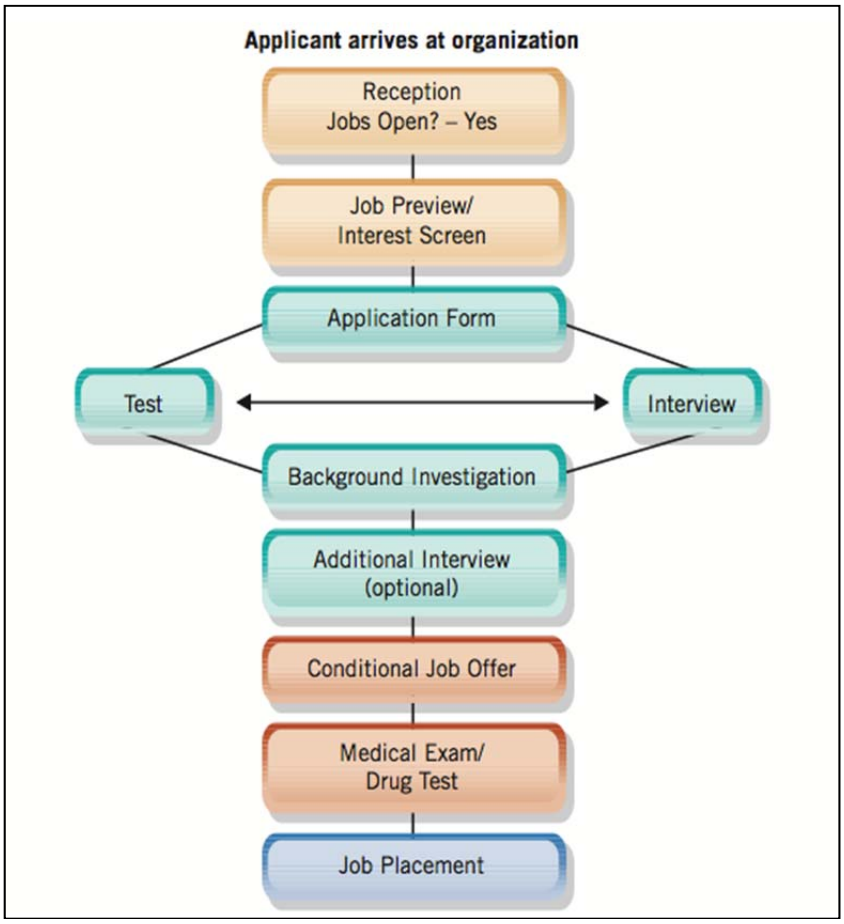

Figure 4. Organization Selection Process Model (From: Mathis & Jackson, 2008)

Some selection practices consider a potential employee's knowledge, skills and abilities (KSA) that provide the best fit with clearly specified job requirements (Bowen, Ledford & Nathan, 1991). Within the job's task-based requirements, organizations consider the potential employee's physical ability and what is required to perform the job to ensure a proper person-job fit (Mathis & Jackson, 2008). Physical ability testing for public and private service employees is conducted to ensure that employees have the physical capacity to perform their job in terms of strength, stamina and endurance. Testing components are job related and are valid measurements to predict whether employees can perform the job (Hollar, 2000). These tests can be an effective means to ensure employees are able to perform the essential physical functions of the job (Bunch, 2012). There are numerous jobs in public and private industry whose tasks are physically demanding. Employees are placed under a great deal of physiological stress working in a rigorous, dangerous and potentially life-threatening environment. To provide a basis for comparison, two occupations whose duties and tasks are physically demanding in the public sector are police officers and fire fighters; in the private sector, two examples are coal miners and offshore oil rig workers. The following sections describe job dimensions, duties and demands of these respective occupations.

a. Police Officer

The physical demands required of police officers are higher than for a job that is sedentary. As in any job, the daily routine can vary, from patrolling in a vehicle to a critical situation that demands the physical capacity to apprehend a fleeing suspect. It is imperative that a physical ability test be included in the personnel selection process to ensure that a candidate is able to perform the duties of a police officer. Anderson, Plecas and Segger (2001) conducted a study to revalidate a physical abilities test used in the police officer selection process. Core physical tasks that are required to perform general police duties were identified and are seen in Table 7. It was determined that these competencies can be tested with a well-designed physical ability test which simulates the tasks required for pre-employment screening. Further demonstration of these physical abilities test components varies with each agency post-employment.

A study conducted by Allen (2005) focused on the need for annual physical fitness testing in law enforcement agencies because of the rising cost of health compensation claims. A duty of law enforcement officers requires them to possibly become engaged in a physical act to ensure compliance with lawful commands or for self-defense, which exemplifies the need for police officers to be physically capable of performing their tasks. Physical ability testing is conducted in the personnel selection process, but few law enforcement agencies employ a standard to maintain a level of fitness after initial training.

Fitness areas that are predictive of performing physical tasks

Job tasks	**Fitness areas**
Short pursuits	anaerobic power, leg power, agility
Sustained pursuit	aerobic power, agility, muscular endurance
Lifting/carrying	upper body strength, muscular endurance, agility, leg power
Jumping/vaulting	leg power, anaerobic power
Climbing	anaerobic power, aerobic power, muscular endurance, agility, upper body strength
Dragging/pulling	upper body strength, leg power
Pushing	upper body strength, muscular endurance, leg power
Dodging	agility, anaerobic power
Use of force < 2 minutes	anaerobic power, upper body strength, agility, muscular endurance
Use of force > 2 minutes	aerobic power, upper body strength, agility, muscular endurance
Bending/reaching	flexibility

Table 7. Fitness Areas Associated in Police Officer Job Tasks (From: FitForce, 2007)

b. Fire Fighter

The physical demands required of fire fighters are comparable to those of police officers. Fire fighters respond to frequent calls for fire suppression duties as well as providing care in medical emergencies (Garver, Jankovitz, Danks, Fittz, Smith & Davis, 2005). The job tasks of fire fighters are also similar those to of police officers, but there are some differences; as in their uniforms for example. When suppressing a fire, fire fighters must wear up to an additional 50 pounds of personal protective equipment which includes a self-contained breathing apparatus (SCBA) (Michaelides, Parpa, Thompson & Brown, 2008). Rhyan (2006) conducted a study of the different types of physical training needed to pass a Firefighter Physical Ability Test (PAT). As with police officers, fire fighters are required to complete a physical ability test. The test includes both anaerobic and aerobic exercises; components include dragging charged and uncharged fire hoses a set distance, ladder manipulation and movement, and a simulated casualty drag with a 150 pound dummy. Additionally, they wear a SCBA or a facsimile weighing up to 40 pounds.

A study conducted by Baur, Christophi, Cook and Kales (1999) discovered that long-serving fire fighters' health and wellness declines over time, which directly impacts their capability to perform their duties. A survey conducted by the National Fire Protection Association in 2012 determined that, 54.5% of fire fighters suffered from strain, sprain, or muscular pain (Karter, 2012). The risk of experiencing a musculoskeletal injury is high for all fire fighters. As with police agencies, fire fighters must pass an initial physical ability test prior to starting their job. A continuous physical assessment of incumbent fire fighters is, as with police officers, agency dependent.

c. Coal Miner

The physical demands required of coal miners are extremely rigorous. For example, a roof bolter operates machinery to install support bolts in underground mines such as in a longwall mine. They may be asked to perform physical activities such as: climbing, lifting, balancing and handling odd-shaped heavy equipment in a close-quartered space (National Center for O*NET Development, 2012). Additionally, the

working environment is not conducive to health or the well-being of employees in mines that have low ceilings, for example, in a low coal mine. Morriessey, Burford, Caddel, and Ayoub (1980) conducted a study of male and female low coal miners and determined that the working environment miners were exposed to in cramped working conditions were associated with significantly lower back strength. Anthropometric measures should be considered prior to placing individuals who exceed the occupation's environmental dimensions.

Coal miners undergo physical ability tests prior to entering work in either surface or underground mines. Their physical ability tests can be attributed to the work of Laughery, Jackson and Fontenelle (1988), who determined that isometric tests could serve to predict job performance. As in the public sector, maintenance of physical ability for employees is not required after job placement. As incumbent coal miners continue to endure the extreme working conditions, they become more susceptible to musculoskeletal injuries. In 2009, the West Virginia Office of Miners' Health Safety and Training report released injury totals from activity that included: "reaching, lifting, pushing, bending, (and) pulling," which accounted for 77% of lost time. (West Virginia Office of Miners' Health Safety and Training, 2010).

d. Offshore Oil Rig Laborer

The physical demands of offshore oil rig laborers are comparable to those of coal miners. The selection process is similar to that of any private sector job; however, physical ability testing in this industry varies with each company. There are minimum qualifications that an individual must have (e.g., pass drug screening and possess a valid driver's license); in regards to physical ability testing, the requirements are that the person is "physically in good condition" and "(has) stamina and flexibility to work outdoors" (Petroleum Human Resources Council of Canada, 2012). A different company requires individuals to lift a 50 pound box from the ground and above their head (Smith, personal communication, June 21, 2012). No further physical ability testing is required.

It is unclear why additional testing is not conducted in this occupation. There are numerous studies that have identified test batteries that employers could

administer to potential offshore oil rig employees. Laughery and Jackson (1982) conducted a task analysis and identified the most frequently occurring tasks of a roughneck oil rig worker and developed a pre-employment test in which the test battery is comprised of simulated tasks based on the analysis. An isometric strength test was used to predict the performance of the physically demanding pipe transport task for oil rig roustabouts (Jackson, Osburn & Laughery, 1984). Similar to coal miners, oil rig workers are not tested post-employment to ensure they are physically qualified for job accomplishment. A survey of occupational injuries and illnesses conducted in 2007 showed that over–exertion was the third leading reason for days lost from work, preceded by "struck by object" and "caught in object, equipment, (or) material" (Department of Labor, 2010).

D. NAVY PHYSICAL READINESS PROGRAM

The Chief of Naval Operations established the policy and requirements for the U.S. Navy's Physical Readiness Program. Guidance for both active and reserve component personnel is found in the OPNAVINST 61101.J, Physical Readiness Program, which ensures that all sailors maintain a level of physical fitness that is conducive to mission accomplishment. Further guidance for Navy Physical Readiness is provided through the Navy Personnel Command's website. Their mission, according to their webpage, is to "set the foundation to instill a Culture of Fitness that assists sailors in developing their ability to complete tasks that supports the command mission and Navy operational readiness" (DoN, 2012d). Commands, activities and personnel can find supplemental guidance to the Physical Readiness Program in the Physical Readiness Program Operating Guide (OPGUIDE).

The components of the OPGUIDE are the Physical Readiness Program "How To" Guide, the Command Fitness Guide and the Nutrition Resource Guide. It is tailored for the use of the Command Fitness Leader (CFL) as a resource to aid them in managing their command's Physical Readiness Program. However, the same resources and tools can be used by all sailors to give guidance on exercise and nutrition so they can achieve a healthy lifestyle. The "How To" guide provides guidance to the CFL on all PFA matters.

It also provides direction on the administration separation process, as well how to administer procedures for Individual Augment (IA), Personnel Exchange Program (PEP) and for mobilized reservists. The command fitness guide provides assistance to CFLs to effectively manage their command's physical training sessions and ensures that the assigned sailors to the Fitness Enhancement Program (FEP) are provided the training routine needed to bring them into their respective PRT or BCA standard. Finally, the nutrition resource guide provides resources and tools such as informational websites that contain educational material on nutrition or weight management.

Job performance is affected by many factors. One factor is the constant service in high OPTEMPO operations that include continuous days at sea conducting proficiency training or conducting joint exercises. The relentless operations have made a significant impact on the overall readiness of the Navy. In 2011, the Chair of the Joint Chiefs of Staff released an instruction, *Chairman's Total Force Fitness Framework*, which provided the "methodology for understanding, assessing, and maintaining Service member's well-being and sustaining their ability to carry out missions" (Chairman of the Joint Chiefs of Staff, 2011). Physical fitness is an underlying element of job performance and readiness. The relationship between levels of physical fitness and job performance has been investigated. Harman and Frykman (1992) explored the relationship of body size and composition in the performance of physically demanding tasks and discovered evidence that there is a positive relationship between high lean body mass and lifting ability.

Sailors who demonstrate behaviors that are not conducive to promoting a healthy lifestyle run the risk of developing an illness or disease. Physical inactivity has been shown to lead to obesity and Type 2 diabetes. Maintaining a physical fitness program can assist an individual in controlling weight, strengthening bones and muscles, and may reduce the risk of heart disease (Centers for Disease Control and Prevention, 2012). Pronk, Tan and O'Connor (1999) conducted a survey and determined that a high body mass index (BMI) and low physical fitness levels are directly and significantly associated with higher health care costs. Time spent in medical facilities, physical conditioning remediation and skills lost due to administrative separation directly impacts mission

readiness. These factors also affect manpower levels and remove a skill required to complete daily tasks. Additionally, time spent in medical facilities impacts mission readiness and places an increased strain for other sailors to compensate for the missing individual.

E. SUMMARY

In this literature review it was observed that the military selection process does not consider physical ability testing in the recruiting process for job placement. However, physical ability tests are used in the military to ensure that personnel maintain physical standards. Conversely, in the public and private sectors, physical ability tests are used in the selection process for job placement, but maintenance testing is organization–dependent. The Navy established standards for sailors to maintain optimal health, physical and mental stamina in the Physical Readiness Program. Taking note of the use of physical ability testing from the public and private sectors for job placement, the Navy can enhance its recruiting process and therefore provide for a more productive military workforce.

After discussions with DoD recruiters, Subject Matter Experts (SMEs) and a careful review of literature, it was observed that in the military selection process, there is clearly an established military recruiting process for enlisting people into military service. Yet, there are factors that should be considered to enhance the efficiency and effectiveness in meeting military job demands. The most notable is the omission of a physical ability test in the military recruiting process. A physical ability test, when used in conjunction with a cognitive test, verifies whether a person has both the mental and physical capabilities to perform their job. Consequently, it is necessary to place an additional requirement into the military recruiting process: a physical ability test. It is believed this new requirement would reduce personnel musculoskeletal acute and chronic injury, reduce the associated health care costs and provide for a more productive military workforce.

The following research questions have been designed:

1. Is there a correlation between personnel evaluation trait averages and PRT scores?
2. Are PRT scores and BCA components predictive of personnel self–reported evaluation trait averages?
3. Should the selection process consider physical ability testing for job placement?
4. How can a continuous physical standards assessment process assist the DoD?

To answer these questions a data collection was needed from the two participant groups. Their first–hand experience involving physically demanding tasks provided the means to answer the stated research questions.

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III. METHOD

A. OVERVIEW

The present study entails two major thrusts:

1. Explore the relationship among recorded individual evaluation performance ratings averages, BCA and PRT scores.
2. Conduct a survey to explore the relationship among self-reported EVAL ratings, BCA and PRT scores with individual sense of well being and perceptions of fitness assisting in critical aspects of their job performance.

The specific research questions raised were:

1. Is there a correlation between personnel evaluation trait averages and Physical Readiness Test (PRT) scores?
2. Are PRT scores and BCA components predictive of personnel self–reported evaluation trait averages?
3. Should the selection process consider physical ability testing for job placement?
4. How can a continuous physical standards assessment process assist the DoD?

The researcher developed a survey that was validated by subject matter experts (SME). The online survey was used to distribute and administer the surveys to participants and collect responses the survey instrument is presented in Appendix A. All necessary steps were taken to ensure the safe and ethical treatment of participants in accordance with NPS IRB and DoD policies.

B. PARTICIPANTS

Two sea-going rates of the surface war fighting community were selected for the study: Boatswain's Mate (BM) and Damage Controlman (DC). These rates were selected based on their frequency of participation in all capacities of shipboard operations to including: the daily occurrence of physically demanding job requirements, sustained flight and well deck operations and their pivotal roles in emergency and damage control scenarios. BMs train, direct and supervise personnel in ship's maintenance duties in all activities relating to marlinspikes, decks, boat seamanship, painting, upkeep of ship's external structure, rigging, deck equipment and life boats (DoN, 2012c). DCs perform

organizational and intermediate level maintenance and repair damage control equipment and systems. They plan, supervise and perform tasks necessary for damage control, ship stability, preservation of watertight integrity, fire fighting and Chemical, Biological, Radiological and Nuclear Explosive (CBRNE) defense (DoN, 2012c).

Support was solicited from four operational commands (OPCON): COMDESRON Two One, COMDESRON Two Three, COMPHIBRON One and COMPHIBRON Five, in the fleet concentrated area of San Diego, California. The researcher requested support and permission to administer the survey from the Commodore at each OPCON. See Appendix B for the request letter to Commodores. The Chief of Staff, or a senior officer, contacted ships under his or her command to vet whether the survey would hinder their operational schedules, and provided information about the study including the purpose, objectives and what would be required of their ships. Upon ship command approval, participants' contact information was sent to the author by a command–designated representative. Then a request for participation was sent to all participants (Appendix C).

A total of eight surface ships elected to participate. Five of them were forward deployed or conducting underway operations in the Southern California operating area. A total of 151 enlisted sailors were eligible to participate in the study. Eligible BM and DC participants were asked to take the survey voluntarily and the informed consent was question 1 of the survey. Sixty-two sailors completed the survey, 30 DC and 32 BMs, yielding a 41% response rate. Three opted out of participation and the other 86 did not respond. Limited Internet connectivity and bandwidth proved to slow and limit response rates from those underway. Furthermore, due to the population's nature of work, administrative duties and responsibilities are not always a priority.

C. SUBJECT-MATTER EXPERTS

SMEs from NRD San Francisco assisted in the task-analysis by validating physical tasks performed by the participants. Their ship experience includes service onboard Navy aircraft carriers, amphibious assault ships, frigates and destroyers. Their average time in service was 15 years. The researcher developed a preliminary list of

tasks based on former experience as a deck division officer, a training officer and by referencing the *Navy Enlisted Occupational Standard* manual. Two exerpts from the task list are seen in Table 8 and Table 9.

Amphibious Operations				
Task Number	**Task Statement**	**Frequency**	**Task Difficulty**	**Criticality**
BM-1	Launch amphibious craft			
BM-2	Load amphibious vehicles			
BM-3	Operate well deck equipment			
BM-4	Recover amphibious craft			
BM-5	Recover amphibious vehicles			
BM-6	Repair well deck equipment			
BM-7	Secure amphibious vehicles			
BM-8	Unload amphibious vehicles			

Table 8. BM Task List

Damage Control				
Task Number	**Task Statement**	**Frequency**	**Task Difficulty**	**Criticality**
DC-1	Dewater spaces using installed educators			
DC-2	Doff Fire Fighting Ensembles (FFE)			
DC-3	Don Fire Fighting Ensembles (FFE)			
DC-4	Doff Self-Contained Breathing Apparatus (SCBA)			
DC-5	Don Self-Contained Breathing Apparatus (SCBA)			
DC-6	Install emergency pipe patches			
DC-7	Install hull patches			

Table 9. DC Task List

From these observations, the author formulated survey questions in terms of their physical demands, frequency of performance and job criticality. It was the author's intent to formulate modern and familiar questions the participants would recognize. At the completion of the assessment, survey items were developed supporting the underlying series of research questions.

D. INSTRUMENT

The principal purpose of this survey was to examine the relationship between enlisted evaluation performance trait average and PRT scores. The secondary purpose was to identify the top three tasks performed and how they relate to the criteria set forth in the job-analysis: physical demands, frequency of performance and job criticality. The intent was to propose candidate physical ability tests to be used in the selection process prior to job placement. The survey included 71 close-ended questions and took approximately 10–20 minutes to complete. Survey questions regarding job dimensions and job duties contained survey skip logic. Answers could only be given if the participant performed those events. The questions were designed to provide data to support the research questions and rating scales were included as an attempt to quantify the importance of physical ability for job accomplishment. Survey questions can be seen in Appendix A.

E. PROCEDURE

The Naval Postgraduate School (NPS) Institutional Review Board (IRB) approved this study. The survey was conducted through an internet program called SurveyMonkey (2012). A pilot study was conducted with rated BM and DC personnel to verify that survey questions were relevant, verify receipt of e-mail and provide an estimate of time for survey duration. Command leadership provided approval and solicited interest for participation. Participants' last name, rank and ship's email address was sent to the author. E-mails were sent to all known participants. Reminder and survey partial completion e-mails were sent when required.

F. DATA ANALYSIS

The analysis consists of descriptive statistics to characterize the sample size and demographic data including gender. It was also used to illustrate the top three tasks performed and how they relate to the criteria set forth in the job-analysis: physical demands, frequency of performance and job criticality. Correlation was used to determine if relationships existed between the variables. PRT scores are organized by category (e.g., outstanding and excellent): therefore, to utilize the data it was converted into ordinal data. An ordinal Likert scale was used to scale participant responses for job accomplishment. Therefore, a non-parametric statistic, Spearman's rank correlation coefficient, was used to examine the relationship between PRT scores and evaluation performance trait averages and between PRT scores and job accomplishment. A logistic regression model was used to predict job performance based on the criterion of both PRT components and personnel evaluation trait average. A chi-square test of independence was used to determine if physical demands are different during different modes of operational tempo. Additionally, a chi-square goodness-of-fit test was used to determine if a physical ability test should be used in the selection process for job placement. Findings from research questions one through three were used to answer research question four.

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IV. RESULTS

A. OVERVIEW

This chapter focuses on the analysis of survey data received from the participants as they relate to the four primary research questions:

1. Is there a correlation between personnel evaluation trait averages and PRT scores?
2. Are PRT scores and BCA components predictive of personnel self–reported evaluation trait averages?
3. Should the selection process consider physical ability testing for job placement?
4. How can a continuous assessment process of physical standards assist the DoD?

Participants were asked to provide self-reported PRT scores and performance evaluation trait averages. The following sections provide descriptive statistics including demographic and anthropometric information and correlation statistics to determine if relationships exist between organized datasets. Data were organized and analyzed using Microsoft Excel for Mac 2008 and JMP Pro 10.0.0.

B. DESCRIPTIVE STATISTICS

An analysis was conducted on survey data to describe the participants in this thesis. The following sections provide demographic and anthropometric information.

1. Demographics

There were 66 BM and DC sailors who responded to the survey. As shown in Table 10, 63 actively participated in the survey. Thirty-nine sailors received professional training at a BM or DC "A" school respectively and 19 received follow-on specialty training for their rate. It included 41 males and 12 females as seen in Table 10. Three participants voluntarily opted out of participating.

	Agreed to Participate	Gender		Attended "A" School	Possess a NEC
		M	F		
BM	33	20	7	11	5
DC	30	21	5	28	14
Totals	63	41	12	39	19

Table 10. Demographics of Survey Participants

Table totals for follow-on tables may not sum up to the respective participant total number as seen from Table 10. The purpose of the tables is to illustrate demographic information, and was not needed in the analysis to answer the research questions. To keep within the confines in age categories of PRT standards in the Physical Readiness Program (DoN, 2011b) instruction for males and females, participants were asked to select their age from a list of given ranges. Most participants were in their twenties or early thirties. To capture the experience level of the participants, the following elements were identified: Time in Service (TIS) and Time in Rate (TIR) as seen in Table 11 and Table 12. Along with attending professional training, on-the-job training (OJT) is an opportunity for sailors to become proficient in peforming their tasks. A majority of participants fall under the 0–4 range for TIS and TIR.

	Age (years)					
	17-19	20-24	25-29	30-34	35-39	40-44
BM	1	7	6	6	5	1
DC	1	8	5	6	2	1

Table 11. Demographic of Survey Participants – Age

		Service (years)				
		0-4	5-9	10-14	15-19	20-24
BM	**TIS**	9	6	6	4	1
	TIR	13	7	4	1	0
DC	**TIS**	11	3	7	3	2
	TIR	11	6	4	2	1

Table 12. Demographic of Survey Participants – TIS/TIR

To further capture the participants' job experience, the following elements were identified: surface ship service, number of deployments and total sea-duty service. Table 13 provides information regarding the different types of ships served on by the

participants and the number of deployments endured by the participants on that respective ship. Table 14 provides information regarding the years of sea-duty for the participants with the BMs showing more participants sailing with fewer years of experience compared to the DCs who have equal representation among the different year groups.

		Ships									
		CV/ CVN	LHA/ LHD	LCC	LPD	LSD	CG	DDG	FFG	LCS	MCS/ MCM
BM	**Ship Service**	3	6	0	7	5	4	13	3	0	0
	Deployments	5	9	0	11	9	9	14	6	0	0
DC	**Ship Service**	3	6	0	4	6	4	14	1	0	0
	Deployments	14	10	0	3	12	7	24	9	0	0

Table 13. Demographic of Survey Participants – Ship Service & Deployment History

	Sea-Duty Service (in years)				
	0-3	4-7	8-11	12-15	16-20
BM	7	7	4	1	1
DC	9	4	6	9	0

Table 14. Demographic of Survey Participants – Sea-Duty Service

2. Anthropometrics

The participants were asked to provide height and weight data. To illustrate a comparison of height and weight differences between Navy and Army personnel, data were obtained from the from the Army's Antropometric Survey (ANSUR) II (2008). Table 15 provides combined information regarding the height of the participants and shows a moderate amount of variation in height in both male and female participants. Table 16 provides ANSUR II height information. Male participants were slightly taller and females participants were slightly shorter than those individuals from the Army. Table 17 illustrates the participants combined weight in pounds and shows a significant amount of range among both male and female participants. Table 18 provides ANSUR II weight information. Males participants were slightly heavier and female participants were slightly lighter than those individuals from the Army. Height and weight measurements are required for the BCA. This component of the PFA verifies a sailor is within the

established maximum weight for height. A measurement of body circumference is taken when sailors fall outside their respective limit and a body fat percentage is calculated (DoN, 2011b).

	Mean	SD	Min	Max
Male	70.6	3.2	64	77
Female	63.8	2.7	59	68

Table 15. Participant Height in Inches – Anthropometrics

	Mean	SD	Min	Max
Male	69.1	2.8	61	81

Table 16. ANSUR Survey Height in Inches (After: Paquette, Gordon, & Bradtmiller, 2008)

	Mean	SD	Min	Max
Male	196.4	27.6	150	250
Female	146.9	17.8	110	177

Table 17. Participant Weight in Pounds – Anthropometrics

	Mean	SD	Min	Max
Male	187.8	30.9	108	317
Female	151.9	27.2	95	249

Table 18. ANSUR Survey Weight in Pounds (After: Paquette, Gordon, & Bradtmiller, 2008)

3. Top Three Tasks Performed

Participants were presented with list of tasks for different types of operations. They were asked to select the top three tasks in each of the criteria set forth in the job-analysis: physical demands, frequency of performance and job criticality. The results are shown for each participant group in the following sections.

a. Boatswain's Mate

Table 19 provides a breakdown for each operation. For amphibious operations, load amphibious craft and recover amphibious craft were identified in each criteria. Handling mooring lines was identified in each criteria for anchoring, mooring and towing. For deck seamanship, rig ship's accommodation ladder and tend lines for

deck seamanship evolutions were identified in each criteria. Rig fueling replenishment stations and rig cargo replenishment stations were identified in each criteria.

	Physical Demands	**Frequency**	**Criticality**
Ampibious Operations	Recover Ampibious Craft	Load Amphibious Craft	Recover Ampibious Craft
	Load Ampibious Craft	Recover Ampibious Craft	Perform PMS on Well-Deck Equip.
	Recover Ampibious Craft	Launch Ampibious Craft	Load Ampibious Craft
Anchoring, Mooring, Towing	Mooring to a Buoy	Prepare Lines for Mooring and Getting Underway	Rig for Tow
	Rig for Tow	Handling Mooring Lines	Mooring to a Buoy
	Handling Mooring Lines	Secure Mooring Lines after getting underway	Handling Mooring Lines
Deck Seamanship	Rig Ship's Accommodation Ladder	Tend Lines for Deck Seamanship Evolutions	Rig Ship's Accommodation Ladder
	Unrig Ship's Accommodation Ladder	Rig Pilot's Ladder	Unrig Ship's Accommodation Ladder
	Tend Lines for Deck Seamanship Evolutions	Rig Ship's Accommodation Ladder	Tend Lines for Deck Seamanship Evolutions
Replenishment At Sea	Rig Fueling Replenishment Stations	Rig Fueling Replenishment Stations	Fuel/Cargo Rig Line Handler
	Rig Cargo Replenishment Stations	Rig Cargo Replenishment Stations	Rig Fueling Replenishment Stations
	Fuel/Cargo Rig Line Handler	Unrig Fueling Replenishment Stations	Rig Cargo Replenishment Stations

Table 19. Top Three Task List – Boatswain's Mate

b. Damage Controlman

Table 20 provides a breakdown for each operation. For CBRNE, perform CBRNE decontamination operations on ship and on DECON stations were identified in each of the criteria. For damage control operations, don FFE was identified for each criteria. Replace and weigh CO2/Halon bottles and perform maintenance on P-100 pumps were identified in each criteria.

	Physical Demands	**Frequency**	**Criticality**
CBRNE	Perform CBRNE Decontamination Operations on Ship	Perform CBRNE Decontamination Operations on Ship	Perform CBRNE Decontamination Operations on Ship
	Perform CBRNE Decontamination Operations on Individual	Perform CBRNE Decontamination Operations on DECON Stations	Perform CBRNE Decontamination Operations on Individual
	Perform CBRNE Decontamination Operations on DECON Stations	Don Chemical Protective Ensembles	Don Chemical Protective Ensembles
Damage Control	Install K-type Shoring	Don SCBA	Don FFE
	Install a Hull Patch	Don FFE	Install K-type Shoring
	Don FFE	Doff SCBA	Install a Hull Patch
Equipment Maintenance	Replace and Weigh CO2/Halon Bottles	Inspect DCRS Equipment	Replace and Weigh CO2/Halon Bottles
	Perform PMS on P-100 Pump	Replace and Weigh CO2/Halon Bottles	Perform PMS on P-100 Pump
	Maintain Electrical Submersible Pump	Perform PMS on P-100 Pump	Maintain Electrical Submersible Pump

Table 20. Top Three Task List – Damage Controlman

C. SPEARMAN'S RANK CORRELATION COEFFICENT

Components of the PRT are scored in numerical terms (e.g., 83 and 10:02). The overall PRT score is expressed in terms of ordinal categories (e.g., outstanding and excellent). A non-parametric analysis was conducted to determine the strength of

relationship between overall PRT scores and personnel evaluation trait averages. The data set of 62 BMs and DCs participants was filtered and split into two groups for anlaysis, BMs (n=32) and DCs (n=30).

1. Boatswain's Mate

In order to determine a relationship, both self-reported factors of PRT score and trait average were required. For the 21 of the 32 BMs who provided input for both factors, the Spearman's Rank Correlation Coefficient $r_s=0.84$, suggests there is a significant positive correlation exists between PRT score and trait average for BMs.

2. Damage Controlman

Only 22 of the 30 DCs provided input for both factors. Once again, the Spearman's Rank Correlation Coefficient $r_s=0.88$, suggests there is a significant positive correlation between PRT scores and trait average for DCs.

D. LOGISTIC REGRESSION

For the second research question, logistic regression was used to determine if the components of the PRT and BCA that include push-ups, sit-ups, 1.5 mile run time, height and weight, can predict evaluation scores. Because of the survey design, personnel evaluation trait averages were provided in a given range (e.g., 3.0–3.9). Of the data collected, all averages fell under either the 3.0–3.9 or the 4.0–4.9 range. Therefore, to peform the logistic regression the averages were changed to 3 and 4, respectivey. First, an individual logistic model was developed for each factor, followed by another logisitic regression of all factors. The results are shown for each participant group in the following sections.

1. Boatswain's Mate

For this portion of the research, there were 28 observations, 16 of which had all factors accounted for, 10 with one factor missing, 1 with two factors missing and 1 with three factors missing (Table 21). For the overall model, no factors achieved significance.

All p–values listed under the "Prob(ChiSq)," column were significantly larger than the chosen level of significance of 0.05.

Parameter Estimates				
Term	**Estimate**	**Std Error**	**ChiSquare(16)**	**Prob(ChiSq)**
Intercept	19.75	34.17	0.33	0.56
Weight	0.06	0.07	0.79	0.38
Height	-0.57	0.41	1.94	0.16
1.5 mi run (sec)	0.00	0.02	0.03	0.87
P/U	0.05	0.05	0.90	0.34
S/U	0.03	0.09	0.07	0.79

Table 21. PRT Score and Evaluation Trait Average Logistic Regression – Boatswain's Mate

2. Damage Controlman

For this portion of the research, there were 27 observations, of which, 17 had all factors accounted for, 9 with one factor missing and 1 with two factors missing (Table 22). For the overall model, no factors achieved the .05 level of significance. All p–values listed under the "Prob(ChiSq)," column were significantly larger than the chosen level of significance of 0.05.

Parameter Estimates				
Term	**Estimate**	**Std Error**	**ChiSq(16)**	**Prob(ChiSq)**
Intercept	–4.365	12.889	0.11	0.735
Weight	–0.012	0.028	0.19	0.666
Height	0.059	0.239	0.06	0.805
1.5 mi run (sec)	0.008	0.007	1.46	0.227
P/U	–0.018	0.379	0.23	0.634
S/U	–0.030	0.058	0.27	0.606

Table 22. PRT Score and Evaluation Trait Average Logistic Regression – Damage Controlman

E. CHI-SQUARE TEST

The third research question about whether physical fitness matters in traditional modes of operations was addressed with subjective responses to three questions using a Likert rating scale. The questions concerned the level of physical demands placed on the participant under three differenct modes of operational tempo: normal underway operations, sustained operations and emergency operations–actual or simulated. For all questions there were five intervals in the rating scale, ranging from not physically demanding to very physically demanding. The null hypothesis is that there are no differences in the levels of physical demand required for job performance across modes of operations, with the althernative hypothesis that there is a difference. Additionally, the research question was addressed with a specific question: "Should physical ability testing be included in the selection process for job placement?" The results are shown for each group of participants in the following sections.

1. Boatswain's Mate

A chi-square test for independence was conducted to determine if participants' answers to the question regarding the physical demands during underway operations vary

across the three modes of operations. Table 24 shows the observed counts and summarizes the test. The observed $\chi^2_{(4)}=12.69$, $p<0.05$ reveals that the responses are not independent. The participants indicated that there is a difference in physical demands between the modes of operations. The scale was anchored with "Not Very Physically Demanding" categorized with a response of 1 through "Very Physically Demanding" categorized with a response of 5. Many more participants indicated that the physical demands required for the mode of operation of "Sustained" are more demanding than for the other two modes of operation. Most of the participants indicated that they believe that physical ability testing should be used in the selection process.

Mode of Operation/Scale of Physical Demand	1–3	4	5	Total	ChiSquare	df	Prob.
Normal	9	12	6	27	12.69	4	0.01
Sustained	3	6	18	27			
Emergency	7	5	15	27			
Totals	19	23	39	81			

Table 23. Chi-Square Test for Independence Modes of Operations – Boatswain's Mate

2. Damage Controlman

A chi-square test for independence was conducted to determine if participants' answers to the question regarding the physical demands during underway operations vary across the three modes of operations. Table 24 shows the observed counts and summarizes the test. The observed $\chi^2_{(4)}=22.96$, $p<0.05$ reveals that the responses are not independent. The participants indicated that there is a difference in physical demands between the modes of operations. The scale was anchored with "Not Very Physically Demanding" categorized with a response of 1 through "Very Physically Demanding" categorized with a response of 5. Many more participants indicated that the physical demands required for the mode of operation of "Emergency" are more demanding than for the other two modes of operation. Most of the participants indicated that they believe that physical ability testing should be used in the selection process.

Mode of Operation/Scale of Physical Demand	1–3	4	5	Total	ChiSquare	Prob.
Normal	13	7	6	26	22.959	0.0002
Sustained	11	11	4	26		
Emergency	2	6	18	26		
Totals	26	24	28	78		

Table 24. Chi-Square Test for Independence Modes of Operations – Damage Controlmen

F. SUMMARY

The author concluded in this analysis that the participants' level of experience, training and physical characteristics were adequate to accomplish their tasks. The participants' input for the top three tasks performed provided a basis for the development of a candidate physical ability test. For both groups, a significant positive correlation existed between the participants' PRT scores and their evaluation trait averages. However, the analysis did not find any PRT or BCA components to be predictors of evaluation trait averages for either group. It was revealed that both Boatswain's Mates and Damage Controlmen believe that a physical ability test should be included during the selection process for job placement. Regarding physical demands between the modes of operations, DC participants indicated that the physical demands required for "Emergency" operations were highly demanding, while BM participants indicated that the physical demands required for "Sustained" operations were highly demanding

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V. DISCUSSION AND RECOMMENDATIONS

A. OVERVIEW

This research explored the relationships of PRT scores and enlisted personnel evaluation trait averages. It also explored the predictive ability of the PRT components with respect to evaluation trait averages. Additionally, tasks were evaluated in regards to physical ability of three separate criteria. Three analyses were conducted: first, to determine the correlation between PRT scores and evaluation trait averages; second, to determine how well the PRT components could predict success for evaluation trait averages; and third, to assess the degree of similarity between the observed and expected observations for different mode of operational tempos experienced by both groups of participants. The following sections address the findings for three of the research questions. To address research question four, how a continuous assessment of physical standards assists the DoD, a conclusion was drawn based on the findings for the first three research questions and from a task list based on three levels of criteria of physical ability.

B. RELATIONSHIP BETWEEN PRT SCORE AND EVALUATION

Military personnel are periodically evaluated on job performance and physical readiness. This research explored the relationship among personnel evaluation trait averages and PRT scores. Research question one was addressed by determining the strength of the relationship between these two variables.

A significant positive correlation was founcd to exist between PRT scores and trait averages for both BMs and DCs. However, the data was obtained from a relatively small sample size, n=21 and n=22 respectively. Although the response rate was reasonable, more research is required to produce a larger sample size. This will allow for a more diverse distribution among questions, with the potential to alter the statistical significance and decrease the likelihood of confounding variables within the results.

C. JOB PERFORMANCE PREDICTION FROM PFA COMPONENTS

The job description for these two groups of participants includes high levels of physically demanding effort to accomplish certain tasks. This thesis tested the hypothesis that an assumption could be made that having a high level of physical ability can help accomplish these tasks. Research question two was addressed by exploring if the components of the PFA are predicitive of job performance based on personnel evaluation trait averages. It was found that no components of the PFA were significant predictors of job performance for both BMs and DCs. There was missing data for both groups, which may have influenced the significance, if any, of the factors.

D. PHYSICAL ABILITY TESTING FOR JOB PLACEMENT

In the current selection process, physical ability testing is conducted to verify whether applicants meet minimum physical readiness standards prior to entering military service. Job placment is based solely on aptitiude level as dervived from a cognitive test with no consideration given to physical ability. Given the nature of the participants' daily job demands, this research explored the need to include a physical ability test in the selection process. Participants were asked to rate the physical demand of their job for three different operation tempos with the intent to determine if physical ability is a relevant measure for job placement. To further examine this question, the participants were asked a specific survey question: "Should physical ability testing be included in the selection process for job placment?"

The findings reveal that in every mode of operation for DCs, physical ability should be considered for job placement. Conversly, for BMs, the findings reveal that there were no differences in the physical demands for each tempo of operations. Additionally, findings from both groups show that physical ability should be included in the selection process for job placement. Further research with a larger sample size is recommended to confirm these findings.

E. CONTINUOUS ASSESSMENT PROCESS OF PHYSICAL STANDARDS

Physical ability testing can serve the military in several ways. It already serves as a test to verify whether personnel meet physical readiness standards. However, there are several other uses for testing. In the selection process, it can be used to verify if personnel can perform the duties associated with the job, as done in the public and private sectors. It can also be used as a post-job placement assessment to ensure that personnel are still capable to perform job duties, as done by select police agencies. This assessment could also be used as a tool to retain personnel for duty, or, if they are no longer fit, to release personnel from duty. Furthermore, testing can be used as a tool to verify if a person meets the physical capabilities for a new job. Utlimately, physical ability testing can be used to track physical standards and to ensure the maintenance of job fit.

F. RECOMMENDATIONS

Tasks identified as most frequently accomplished, most physically demanding and most critical for job performance can serve as a candidate list of tasks that could be used as a job sample task. These are the tasks that should be emulated in a physical ability test. Incumbent BMs and DCs can perform the tasks and both physical and physiological dimensions can be measured to set the criteria. These criteria will be used in a physical ability test and be used to correlate with the PRT components. Furthermore, these physical ability tests can be tailored for use in the selection process.

For personnel who do not meet the physical standards set in these tests, a remediation program should be developed to ensure that the recruit has the necessary tools to self-remediate to pass the criteria for job placement. Like the current remediation program in the Navy's Physical Readiness Program, a maintenance program should be developed to ensure that personnel maintain physical requirements to remain in their respective job, or be used as a tool for cross-rating if a person no longer meets the physical requirements. Further research should be conducted to test the criteria of the identified tasks and to verify that the candidate list is appropriate for the physical ability test for any given rate.

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APPENDIX A: ONLINE SURVEY

An Examination of Physical Ability Testing

Consent to Participate in Study

Introduction. You are invited to participate in a research study entitled "An Examination of Physical Ability Testing and the Relationship Between Enlisted Evaluation Performance Trait Average and Physical Readiness Test Score." The purpose of this research is to examine the military recruitment process to consider if job related physical ability testing should be considered in job placement. Services use physical readiness assessments to ensure military personnel meet universal minimum standards, but it is contended such assessments should be tied to valid job demands.

Procedures. The researcher will conduct an online survey with you regarding physical ability in the performance of your job. The online survey will take approximately 20 minutes. There will be approximately 50 Sailors participating in this study. The researcher will ask you to self-report to the best of your knowledge questions that involve your daily tasks and physical readiness condition.

Location. The survey will take place onboard your ship.

Cost. There is no cost to participate in this research study.

Voluntary Nature of the Study. Your participation in this study is strictly voluntary. If you choose to participate you can change your mind at any time and withdraw from the study. You will not be penalized in any way or lose any benefits to which you would otherwise be entitled if you choose not to participate in this study or to withdraw. The alternative to participating in the research is to not participate in the research.

Potential Risks and Discomforts. The potential risks of participating in this study a breach of confidentiality.

Anticipated Benefits. There is no direct benefit to you for participating in this research.

Compensation for Participation. No tangible compensation will be given.

Confidentiality & Privacy Act. Any information that is obtained during this study will be kept confidential to the full extent permitted by law. All efforts, within reason, will be made to keep your personal information in your research record confidential but total confidentiality cannot be guaranteed. All survey results will be kept electronically on the NPS secure computer server. After survey data is collected, your email address will be deleted from the data set.

Points of Contact. If you have any questions or comments about the research, or you experience an injury or have questions about any discomforts that you experience while taking part in this study please contact the Principal Investigator, CAPT John Schmidt, MSC, USN, 831-656-3864, jkschmid@nps.edu. Questions about your rights as a research subject or any other concerns may be addressed to the Navy Postgraduate School IRB Vice Chair, Dr. Maiah Jaskoski, 831-656-3167, majaskos@nps.edu. .

Statement of Consent. I have read the information provided above. I have been given the opportunity to ask questions and all the questions have been answered to my satisfaction. I have been provided a copy of this form for my records and I agree to participate in this study. I understand that by agreeing to participate in this research and selecting "Yes," on this form, I do not waive any of my legal rights.

***1. Do you agree to participate in this study?**

◯ Yes

◯ No

Job Characteristics

The following questions will assist in identifying characteristics of the job you perform, and the level of experience and training you bring to the job. These questions are not meant to identify you as a person.

An Examination of Physical Ability Testing

***2. Select your rate.**

- ◯ BM
- ◯ DC

Boatswain's Mate

***3. Did you attend BM "A" school?**

- ◯ Yes
- ◯ No
- ◯ Don't Know

***4. Do you have a Navy Enlisted Classification (NEC) for this rate? (e.g., 0171 – Landing Craft Utility Craftmaster; 0161 – Tugmaster; 0164 – Assault Boat Coxswain)**

- ◯ Yes
- ◯ No
- ◯ Don't Know

Damage Control

***5. Did you attend DC "A" school?**

- ◯ Yes
- ◯ No
- ◯ Don't Know

***6. Do you have a Navy Enlisted Classification (NEC) for this rate? (e.g., 4805 – Shipboard Chemical, Biological and Radiological Defense (CBRD) Operations and Training Specialist; 4812 – NAMTS Watertight Closure Maintenance Technician)**

- ◯ Yes
- ◯ No
- ◯ Don't Know

Boatswain's Mate Job Dimensions and Job Duties

The upcoming questions will assist in identifying job dimensions for the BM rating to include: frequency of occurrence of the job, physical effort required to perform a job, and importance of physical ability for successful job completion. Job duties include performing handling mooring lines, etc..

An Examination of Physical Ability Testing

***7. The following questions relate to conducting Amphibious Operations. Have you actively participated in Amphibious Operations (e.g., LCAC, AAV, LCU, MEU onload/offload)?**

- ◯ Yes
- ◯ No
- ◯ Don't Know

Amphibious Operations - Frequency

The following question relates to how often you perform these tasks either in training or in actual operations.

8. Choose the top 3 tasks you most often perform.

- ☐ Perform preventative maintenance on well-deck equipment
- ☐ Load amphibious craft
- ☐ Unload amphibious craft
- ☐ Recover amphibious craft
- ☐ Recover amphibious vehicle
- ☐ Launch amphibious craft
- ☐ Launch amphibious vehicle

Amphibious Operations - Physically Demanding

The following question relates to how physically demanding these tasks are to perform either in training or in actual operations.

9. Choose the top 3 tasks that are the most physically demanding to perform.

- ☐ Perform preventative maintenance on well-deck equipment
- ☐ Load amphibious craft
- ☐ Unload amphibious craft
- ☐ Recover amphibious craft
- ☐ Recover amphibious vehicle
- ☐ Launch amphibious craft
- ☐ Launch amphibious vehicle

Amphibious Operations - Importance

The following question relates to the importance of physical ability to accomplish these tasks either in training or actual

operations.

10. Choose the top 3 tasks the importance of physical ability is to be able to successfully complete.

- [ ] Perform preventative maintenance on well-deck equipment
- [ ] Load amphibious craft
- [ ] Unload amphibious craft
- [ ] Recover amphibious craft
- [ ] Recover amphibious vehicle
- [ ] Launch amphibious craft
- [ ] Launch amphibious vehicle

***11. The following questions relate to conducting Anchoring, Mooring, Towing (e.g., working on the foc'sle, working with mooring lines, moving ground tackle). Have you actively participated in Anchoring, Mooring, Towing?**

- ◯ Yes
- ◯ No
- ◯ Don't Know

Anchoring, Mooring, Towing - Frequency

The following question relates to how often you perform these tasks either in training or in actual operations.

12. Choose the top 3 tasks you most often perform.

- [ ] Prepare lines for mooring and getting underway evolutions
- [ ] Handling mooring lines
- [ ] Secure mooring lines after getting underway
- [ ] Rig clear hawse pendants
- [ ] Unrig clear hawse pendants
- [ ] Rig for tow
- [ ] Unrig for tow
- [ ] Mooring to a buoy

Anchoring, Mooring, Towing - Physically Demanding

An Examination of Physical Ability Testing

The following question relates to how physically demanding these tasks are to perform either in training or in actual operations.

13. Choose the top 3 tasks that are the most physically demanding to perform.

- [ ] Prepare lines for mooring and getting underway evolutions
- [ ] Handling mooring lines
- [ ] Secure mooring lines after getting underway
- [ ] Rig clear hawse pendants
- [ ] Unrig clear hawse pendants
- [ ] Rig for tow
- [ ] Unrig for tow
- [ ] Mooring to a buoy

Anchoring, Mooring, Towing - Importance

The following question relates to the importance of physical ability to accomplish these tasks either in training or actual operations.

14. Choose the top 3 tasks the importance of physical ability is to be able to successfully complete.

- [ ] Prepare lines for mooring and getting underway evolutions
- [ ] Handling mooring lines
- [ ] Secure mooring lines after getting underway
- [ ] Rig clear hawse pendants
- [ ] Unrig clear hawse pendants
- [ ] Rig for tow
- [ ] Unrig for tow
- [ ] Mooring to a buoy

An Examination of Physical Ability Testing

***15. The following questions relate to conducting Deck Seamanship (e.g., standing bridge watch, working with lines, setting up ladders for personnel movement). Have you actively participated in Deck Seamanship?**

- ◯ Yes
- ◯ No
- ◯ Don't Know

Deck Seamanship - Frequency

The following question relates to how often you perform these tasks either in training or in actual operations.

16. Choose the top 3 tasks you most often perform.

- ☐ Rig ship's accommodation ladder
- ☐ Unrig ship's accommodation ladder
- ☐ Tend lines for deck seamanship evolutions
- ☐ Operate ship's control console during special evolution (e.g., UNREP, channel transit)
- ☐ Rig pilot's ladder
- ☐ Unrig pilot's ladder

Deck Seamanship - Physically Demanding

The following question relates to how physically demanding these tasks are to perform either in training or in actual operations.

17. Choose the top 3 tasks that are the most physically demanding to perform.

- ☐ Rig ship's accommodation ladder
- ☐ Unrig ship's accommodation ladder
- ☐ Tend lines for deck seamanship evolutions
- ☐ Operate ship's control console during special evolution (e.g., UNREP, channel transit)
- ☐ Rig pilot's ladder
- ☐ Unrig pilot's ladder

Deck Seamanship - Importance

The following question relates to the importance of physical ability to accomplish these tasks either in training or actual operations.

An Examination of Physical Ability Testing

18. Choose the top 3 tasks the importance of physical ability is to be able to successfully complete.

- [ ] Rig ship's accommodation ladder
- [ ] Unrig ship's accommodation ladder
- [ ] Tend lines for deck seamanship evolutions
- [ ] Operate ship's control console during special evolution (e.g., UNREP, channel transit)
- [ ] Rig pilot's ladder
- [ ] Unrig pilot's ladder

***19. The following questions relate to conducting Replenishment at Sea (e.g., transferring fuel, stores, ammunition, mail from one ship to another ship). Have you actively participated in Replenishment at Sea?**

- ◯ Yes
- ◯ No
- ◯ Don't Know

Replenishment at Sea - Frequency

The following question relates to how often you perform these tasks either in training or in actual operations.

20. Choose the top 3 tasks you most often perform.

- [ ] Rig cargo for Vertical Replenishment (VERTREP)
- [ ] Unrig cargo for VERTREP
- [ ] Rig cargo replenishment stations
- [ ] Unrig cargo replenishment stations
- [ ] Rig fueling replenishment stations
- [ ] Unrig fueling replenishment stations
- [ ] Phone and Distance (P&D) line handler
- [ ] Fuel/Cargo rig line handler

Replenishment at Sea - Physically Demanding

The following question relates to how physically demanding these tasks are to perform either in training or in actual operations.

An Examination of Physical Ability Testing

21. Choose the top 3 tasks that are the most physically demanding to perform.

- ☐ Rig cargo for Vertical Replenishment (VERTREP)
- ☐ Unrig cargo for VERTREP
- ☐ Rig cargo replenishment stations
- ☐ Unrig cargo replenishment stations
- ☐ Rig fueling replenishment stations
- ☐ Unrig fueling replenishment stations
- ☐ Phone and Distance (P&D) line handler
- ☐ Fuel/Cargo rig line handler

Replenishment at Sea - Importance

The following question relates to the importance of physical ability to accomplish these tasks either in training or actual operations.

22. Choose the top 3 tasks the importance of physical ability is to be able to successfully complete.

- ☐ Rig cargo for Vertical Replenishment (VERTREP)
- ☐ Unrig cargo for VERTREP
- ☐ Rig cargo replenishment stations
- ☐ Unrig cargo replenishment stations
- ☐ Rig fueling replenishment stations
- ☐ Unrig fueling replenishment stations
- ☐ Phone and Distance (P&D) line handler
- ☐ Fuel/Cargo rig line handler

Damage Control Job Dimensions and Job Duties

The upcoming questions will assist in identifying job dimensions for the DC rating to include: time spent engaged in a job, physical effort required to perform a job, and importance of physical ability for successful job completion. Job duties include performing donning fire fighting equipment (FFE), etc..

An Examination of Physical Ability Testing

***23. The following questions relate to Chemical, Biological, Radiological, and Nuclear Explosive (CBRNE) Defense while underway. Have you actively participated in CBRNE defense? (e.g., through training/drills; simulated threats of hazards)**

- ◯ Yes
- ◯ No
- ◯ Don't Know

CBRNE - Frequency

The following question relates to how often you perform these tasks either in training or in actual operations.

24. Choose the top 3 tasks you most often perform.

- ☐ Perform CBRNE decontamination operations on ship
- ☐ Perform CBRNE decontamination operations on individual
- ☐ Perform CBRNE decontamination operations Decontamination Control (DECON) stations
- ☐ Don chemical protection ensembles
- ☐ Doff chemical protection ensembles

Other (please specify)

CBRNE - Physically Demanding

The following question relates to how physically demanding these tasks are to perform either in training or in actual operations.

25. Choose the top 3 tasks that are the most physically demanding to perform.

- ☐ Perform CBRNE decontamination operations on ship
- ☐ Perform CBRNE decontamination operations on individual
- ☐ Perform CBRNE decontamination operations Decontamination Control (DECON) stations
- ☐ Don chemical protection ensembles
- ☐ Doff chemical protection ensembles

Other (please specify)

CBRNE - Importance

The following question relates to the importance of physical ability to accomplish these tasks either in training or actual operations.

An Examination of Physical Ability Testing

26. Choose the top 3 tasks the importance of physical ability is to be able to successfully complete.

- [ ] Perform CBRNE decontamination operations on ship
- [ ] Perform CBRNE decontamination operations on individual
- [ ] Perform CBRNE decontamination operations Decontamination Control (DECON) stations
- [ ] Don chemical protection ensembles
- [ ] Doff chemical protection ensembles

Other (please specify)

***27. The following questions relate to Damage Control underway. Have you actively participated in Damage Control (e.g., extinguishing a fire, using fire fighting equipment)?**

- ◯ Yes
- ◯ No
- ◯ Don't Know

Damage Control - Frequency

The following question relates to how often you perform these tasks either in training or in actual operations.

28. Choose the top 3 tasks you most often perform.

- [ ] Light-off installed eductors in unmanned space
- [ ] Doff Fire Fighting Ensembles (FFE)
- [ ] Don Fire Fighting Ensembles (FFE)
- [ ] Doff Self-Contained Breathing Apparatus (SCBA)
- [ ] Don Self-Contained Breathing Apparatus (SCBA)
- [ ] Install soft patch on system with 150 PSI
- [ ] Install K-type shoring
- [ ] Rig and operate a peri-jet eductor in Aft Chem.
- [ ] Set up and conduct Rescue and Assistance (R&A) operations
- [ ] Install a hull patch

Other (please specify)

An Examination of Physical Ability Testing

Damage Control - Physically Demanding

The following question relates to how physically demanding these tasks are to perform either in training or in actual operations.

29. Choose the top 3 tasks that are the most physically demanding to perform.

- [ ] Light-off installed eductors in unmanned space
- [ ] Doff Fire Fighting Ensembles (FFE)
- [ ] Don Fire Fighting Ensembles (FFE)
- [ ] Doff Self-Contained Breathing Apparatus (SCBA)
- [ ] Don Self-Contained Breathing Apparatus (SCBA)
- [ ] Install soft patch on system with 150 PSI
- [ ] Install K-type shoring
- [ ] Rig and operate a peri-jet eductor in Aft Chem.
- [ ] Set up and conduct Rescue and Assistance (R&A) operations
- [ ] Install a hull patch

Other (please specify)

Damage Control - Importance

The following question relates to the importance of physical ability to accomplish these tasks either in training or actual operations.

An Examination of Physical Ability Testing

30. Choose the top 3 tasks the importance of physical ability is to be able to successfully complete.

- [ ] Light-off installed eductors in unmanned space
- [ ] Doff Fire Fighting Ensembles (FFE)
- [ ] Don Fire Fighting Ensembles (FFE)
- [ ] Doff Self-Contained Breathing Apparatus (SCBA)
- [ ] Don Self-Contained Breathing Apparatus (SCBA)
- [ ] Install soft patch on system with 150 PSI
- [ ] Install K-type shoring
- [ ] Rig and operate a peri-jet eductor in Aft Chem.
- [ ] Set up and conduct Rescue and Assistance (R&A) operations
- [ ] Install a hull patch

Other (please specify)

***31. The following questions relate to Equipment Maintenance while underway. Have you actively participated in Equipment Maintenance (e.g., maintaining FFE, eductors, fire fighting stations)?**

- ◯ Yes
- ◯ No
- ◯ Don't Know

Equipment Maintenance - Frequency

The following question relates to how often you perform these tasks either in training or in actual operations.

An Examination of Physical Ability Testing

32. Choose the top 3 tasks you most often perform.

- [ ] Inspect Damage Control Repair Station (DCRS) equipment
- [ ] Replace and weigh CO2/Halon bottles
- [ ] Perform PMS on P-100 pump
- [ ] Inspect ballistic watertight doors, hatches, and scuttles
- [ ] Maintain electrical submersible pumps

Other (please specify)

Equipment Maintenance - Physically Demanding

The following question relates to how physically demanding these tasks are to perform either in training or in actual operations.

33. Choose the top 3 tasks that are the most physically demanding to perform.

- [ ] Inspect Damage Control Repair Station (DCRS) equipment
- [ ] Replace and weigh CO2/Halon bottles
- [ ] Perform PMS on P-100 pump
- [ ] Inspect ballistic watertight doors, hatches, and scuttles
- [ ] Maintain electrical submersible pumps

Other (please specify)

Equipment Maintenance - Importance

The following question relates to the importance of physical ability to accomplish these tasks either in training or actual operations.

34. The following questions relate to the importance of physical ability to accomplish these tasks either in training or actual operations.

- [ ] Inspect Damage Control Repair Station (DCRS) equipment
- [ ] Replace and weigh CO2/Halon bottles
- [ ] Perform PMS on P-100 pump
- [ ] Inspect ballistic watertight doors, hatches, and scuttles
- [ ] Maintain electrical submersible pumps

Other (please specify)

An Examination of Physical Ability Testing

Job Dimensions and Job Duties

35. Please rate the following question with the provided scale.
Your job is physically demanding during normal underway operations (e.g., normal underway watch).

Not Physically Demanding	2	3	4	Very Physically Demanding
○	○	○	○	○

36. Please rate the following question with the provided scale.
Your job is physically demanding during sustained operations (e.g., flight operations, UNREP).

Not Physically Demanding	2	3	4	Very Physically Demanding
○	○	○	○	○

37. Please rate the following question with the provided scale.
Your job is physically demanding during emergency operations actual or when simulated (e.g., General Quarters, Condition IIDC).

Not Physically Demanding	2	3	4	Very Physically Demanding
○	○	○	○	○

Job Performance and Personnel Evaluation Reports (EVALS)

The following questions will assist in gaining an understanding of your view of physical ability testing (e.g., the ability to perform a physical act) and how it affects in the performance of your rate.

Physical Fitness - The capacity to perform physical exercise, consisting of the components of aerobic capacity, muscular strength, and muscular endurance in conjunction with body fat content within an optimal range.

38. Please rate the following question with the provided scale.
Physical fitness is important for you to do your job.

Not Very Important	2	3	4	Very Important
○	○	○	○	○

39. Please rate the following question with the provided scale.
There is a relationship between your physical fitness level and how you do in the performance of your job.

No Relationship	2	3	4	Very Strong Relationship
○	○	○	○	○

An Examination of Physical Ability Testing

***40. Which of the following Performance Traits (from the Evaluation Report & Counseling Record), does physical fitness affect? Select all that apply.**

- ☐ Block 33. Professional Knowledge
- ☐ Block 34. Quality of Work
- ☐ Block 35. Equal Opportunity
- ☐ Block 36. Military Bearing / Character
- ☐ Block 37. Personal Job Accomplishment / Initiative
- ☐ Block 38. Teamwork
- ☐ Block 39. Leadership
- ☐ Don't Know

***41. Enter your most recent Evaluation Report (EVAL) performance trait average.**

- ◯ 0.0-1.9
- ◯ 2.0-2.9
- ◯ 3.0-3.9
- ◯ 4.0-5.0
- ◯ I prefer not to say

42. Should physical ability testing be included in the selection process for job placement?

- ◯ Yes
- ◯ No
- ◯ I don't know

Physical Readiness

The following questions will help identify the extent of your physical readiness (e.g., the overall capacity to perform the physical duty of military service and combat, consisting of the components of physical fitness, health, and motivation) and how it affects the performance of your rate.

43. How physically healthy are you?

Not at all healthy	2	3	4	Extremely healthy
◯	◯	◯	◯	◯

44. How important is exercise to you?

Not at all important	2	3	4	Extremely important
◯	◯	◯	◯	◯

An Examination of Physical Ability Testing

45. How many strength training workout(s) (e.g., weight-lifting, P90X®, Insanity®, kick-boxing) do you do in a week?

	Frequency
Workout(s)	

46. On average select the time spent conducting a workout (in minutes)

47. How many cardio-respiratory training workouts (e.g., running, walking, elliptical) do you do in a week?

	Frequency
Workout(s)	

48. On average enter the time spent conducting a workout (in minutes).

The following questions pertain to the PRT.

***49. Choose how many push-ups you performed on your most recent PRT.**

- ◯ 10-19
- ◯ 20-29
- ◯ 30-49
- ◯ 50-59
- ◯ 60-69
- ◯ 70-79
- ◯ 80-89
- ◯ 90+
- ◯ I have not performed a PRT
- ◯ Don't Know

An Examination of Physical Ability Testing

***50. Choose how many curl-ups (sit-ups) you performed on your most recent PRT.**

- ◯ 10-19
- ◯ 20-29
- ◯ 30-49
- ◯ 50-59
- ◯ 60-69
- ◯ 70-79
- ◯ 80-89
- ◯ 90+
- ◯ I have not performed a PRT
- ◯ Don't Know

***51. Select which cardio-respiratory event you performed on your most recent PRT.**

- ◯ 1.5-mile run
- ◯ 500-yd swim
- ◯ 450-m swim
- ◯ Elliptical Trainer
- ◯ Stationary Bike
- ◯ I have not performed a PRT

***52. Select your 1.5 mile run time. (Time in minutes)**

- ◯ 8:00-8:59
- ◯ 9:00-9:59
- ◯ 10:00-10:59
- ◯ 11:00-11:59
- ◯ 12:00-12:59
- ◯ 13:00-13:59
- ◯ 14:00-14:59
- ◯ 15:00+
- ◯ I don't remember my time

An Examination of Physical Ability Testing

***53. Select your 500 yd swim time. (Time in minutes)**

- ◯ 6:00-6:59
- ◯ 7:00-7:59
- ◯ 8:00-8:59
- ◯ 9:00-9:59
- ◯ 10:00-10:59
- ◯ 11:00-11:59
- ◯ 12:00-12:59
- ◯ 13:00+
- ◯ I don't remember my time

***54. Select your 450 meter swim time. (Time in minutes)**

- ◯ 6:00-6:59
- ◯ 7:00-7:59
- ◯ 8:00-8:59
- ◯ 9:00-9:59
- ◯ 10:00-10:59
- ◯ 11:00-11:59
- ◯ 12:00-12:59
- ◯ 13:00+
- ◯ I don't remember my time

***55. Select your calorie(s) burned on the elliptical machine.**

- ◯ 0-99
- ◯ 100-199
- ◯ 200-299
- ◯ 300-399
- ◯ 400+
- ◯ I don't remember

An Examination of Physical Ability Testing

***56. Select your calories burned on the stationary bike.**

- ◯ 0-99
- ◯ 100-199
- ◯ 200-299
- ◯ 300-399
- ◯ 400+
- ◯ I don't remember

***57. Select your most recent PRT overall score.**

- ◯ Outstanding
- ◯ Excellent
- ◯ Good
- ◯ Satisfactory
- ◯ Failure
- ◯ Don't Know

58. Do you follow a physical fitness training program that includes only the PRT exercises?

- ◯ Yes
- ◯ No
- ◯ Don't Know

59. Do you think that a specialized physical fitness training program will help you do your day to day job?

- ◯ Yes
- ◯ No
- ◯ Don't Know

Demographics

The following questions will help identify the characteristics of military personnel participating in this study.

An Examination of Physical Ability Testing

60. Select your time in rate (TIR). (In years)

- ◯ 0-4
- ◯ 5-9
- ◯ 10-14
- ◯ 15-19
- ◯ 20-24
- ◯ 25+

61. If you have you served in a different rate, please select the rate.

Rate

Select Rate

62. Select your time in service (TIS). (In years)

- ◯ 0-4
- ◯ 5-9
- ◯ 10-14
- ◯ 15-19
- ◯ 20-24
- ◯ 25+

63. Select the military branch you have served. Select all that apply.

- ☐ United States Army
- ☐ United States Marine Corps
- ☐ United States Air Force
- ☐ United States Coast Guard

Other (please specify)

An Examination of Physical Ability Testing

64. Select the surface ship you have previously served on. Select all that apply.

- [ ] CV/CVN
- [ ] LHA/LHD/LHA(R)
- [ ] LCC
- [ ] LPD
- [ ] LSD
- [ ] CG
- [ ] DDG
- [ ] FFG
- [ ] LCS
- [ ] MCS/MCM

65. Of the ships you served on, enter the time on board you served on this ship.

	Year
CV/CVN	
LHA/LHD/LHA(R)	
LCC	
LPD	
LSD	
CG	
DDG	
FFG	
LCS	
MCS/MCM	

An Examination of Physical Ability Testing

66. Of the ships you served on, enter the number of deployments you participated in on this ship.

	Deployments
CV/CVN	
LHA/LHD/LHA(R)	
LCC	
LPD	
LSD	
CG	
DDG	
FFG	
LCS	
MCS/MCM	

67. Select your total sea-duty service (In years).

- ◯ 0-3
- ◯ 4-7
- ◯ 8-11
- ◯ 12-15
- ◯ 16-20
- ◯ 20+

68. Are you male or female?

- ◯ Male
- ◯ Female

An Examination of Physical Ability Testing

69. Select your age from the listed ranges.

- ◯ 17-19
- ◯ 20-24
- ◯ 25-29
- ◯ 30-34
- ◯ 35-39
- ◯ 40-44
- ◯ 45-49
- ◯ 50-54
- ◯ 55-59
- ◯ 60-64
- ◯ 65+

70. Select your current weight.

	Pounds
Weight	

71. Select your height.

	Feet	Inches
Height		

This concludes the survey. Thank you for your participation.

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APPENDIX B: REQUEST E-MAIL TO SHIP SQUADRON COMMANDER

Commodore,

Good afternoon sir/ma'am. I am LT JR Munoz, a student at the Naval Postgraduate School (NPS) and I wanted to make contact with you to request approval to contact the ships under [SquadronNumber], regarding possible participation of the ship's BMs and DCs for my thesis.

I am a former Deck Division Officer (LSD 45) and a TRAINO (DDG 106). I have an undergraduate degree in Kinesiology (TAMU). My work with BMs and DCmen and having a great interest in physical fitness is what guided me to this thesis topic.

I am interested in physical ability testing and the relationship between EVAL performance trait averages and PRT scores. I have attached a copy of my thesis proposal along with candidate survey questions that will be in the online survey. The survey will serve as the medium for obtaining data.

Under the NPS Institutional Review Board (IRB) policy I can only administer the survey once I have the respective ship's permission. Participation in this study is voluntary.

Additionally, to administer the survey I will need a ship representative to assistance me in gathering contact information.

To facilitate that the survey is sent to the appropriate audience (BM & DC) I will need an abbreviated alpha roster that includes the personnel's: Rate/Rank, Last Name and E-mail address.

This information will be safeguarded IAW NPS IRB guidelines. Each link has an individual survey identifier, which if duplicated will affect the data analysis; therefore each participant will need to access it through their own email account.

The survey will be ready on [Date] for participants and it will remain available through [Date]. The survey will take no more than 20 minutes to complete.

The data I collect will not only contribute to the completion of my thesis, but also provide an additional study to support the research for the Navy's PRT program.

Please let me know if you have any questions regarding my request or thesis topic. Questions about the rights of the research subject or any other concerns may be addressed to the Navy Postgraduate School IRB Vice Chair, Dr. Maiah Jaskoski, 831-656-3167, majaskos@nps.edu.

Thank you for your time sir/ma'am.

V/r,
LT JR Munoz

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APPENDIX C: SURVEY INVITATION E-MAIL

To: [participant@navyship.mil]
From: dmunoz@nps.edu via surveymonkey.com member@surveymonkey.com
Subject: Physical Ability Testing Survey

Body:
[FirstName] [LastName],

Greetings. My name is LT JR Munoz and I am a thesis student from the Naval Postgraduate School in Monterey, California. I am conducting a study titled "An Examination of Physical Ability Testing and the Relationship Between Enlisted Performance Trait Average and Physical Readiness Test Score."

I would very much appreciate your view on physical ability testing, physical readiness and job performance for the [Damage Control] [Boatswain's Mate] rating by completing an online survey.

This survey will take up to 20 minutes to complete. Please note that I will keep all information collected confidential.

Here is the link to the survey:
https://www.surveymonkey.com/s.aspx

This link is uniquely tied to this survey and your email address. Please do not forward this message.

Participation in this survey is voluntary.

If you have any questions or experience any problems while taking this survey, feel free to e-mail me at dmunoz@nps.edu. Questions about your rights as a research subject or any other concerns may be addressed to the Navy Postgraduate School IRB Vice Chair, Dr. Maiah Jaskoski, 831-656-3167, majaskos@nps.edu.

V/r,
LT JR Munoz

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APPENDIX D: JOB DIMENSION/TASK LIST – BOATSWAIN'S MATE/DAMAGE CONTROLMAN

Boatswain's Mates

Amphibious Operations				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
BM-1	Launch amphibious craft			
BM-2	Load amphibious craft			
BM-3	Unload amphibious craft			
BM-4	Recover amphibious craft			
BM-5	Launch amphibious vehicles			
BM-6	Recover amphibious vehicles			
BM-7	Perform preventative maintenance on well deck equipment			
Anchoring, Mooring and Towing				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
BM-8	Prepare lines for mooring and getting underway evolutions			
BM-9	Handling mooring lines			
BM-10	Secure mooring lines after getting underway			
BM-11	Rig clear hawse pendants			
BM-12	Unrig clear hawse pendants			
BM-13	Rig for tow			
BM-14	Unrig from tow			
BM-15	Mooring to a Buoy			
BM-16	Heave an heaving line from ship to a pier			
Cargo Handling, Rigging and Cranes				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
BM-17	Package cargo for transfer			
BM-18	Perform cargo handling			
BM-19	Rig cargo handling equipment			
BM-20	Unpack cargo for storage			
BM-21	Unrig cargo handling equipment			

Deck Seamanship				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
BM-22	Master Helmsman operate ships control console			
BM-23	Rig pilot's ladder			
BM-24	Rig ship's accommodation ladder			
BM-25	Tend lines for deck seamanship evolutions			
BM-26	Unrig pilot's ladder			
BM-27	Unrig ship's accommodation ladder			

Replenishment at Sea				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
BM-28	Rig cargo for Vertical Replenishment (VERTREP)			
BM-29	Unrig cargo for VERTREP			
BM-30	Rig cargo replenishment stations			
BM-31	Unrig cargo replenishment stations			
BM-32	Rig personnel transfer at sea			
BM-33	Unrig from personnel transfer at sea			
BM-34	Rig fueling replenishment stations			
BM-35	Unrig fueling replenishment stations			

Small Boat Operations				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
BM-36	Launch small boats from ship			
BM-37	Operate small boats			
BM-38	Recover small boats to ship			
BM-39	Moor small boats along side pier			
BM-40	Perform preventative maintenance on small boat davits			
BM-41	Perform preventative maintenance on small boat hulls			

Task Statement Definitions				
BM-1	Craft (e.g., landing craft utility [LCU]), crossing the seal of departure from the well-deck of ship out to the water; directed by personnel.			
BM-2	Personnel manually handling materials to be placed inside/onto craft.			
BM-3	Personnel removing by manually handling materials from inside/onto craft.			
BM-4	Craft breeching the seal of well-deck from the water to inside well-deck; directed by personnel.			
BM-5	Vehicles (e.g., amphibious attack vehicle [AAV]), crossing the seal of departure from the well-deck of ship out to the water; directed by personnel.			
BM-6	Vehicles breeching the seal of well-deck from the water to inside well-deck; directed by personnel.			
BM-7	Monitoring, maintaining and servicing equipment to ensure they operate effectively by conducting specified periodic inspections and correcting malfunctions before major malfunctions or major failures occur.			
BM-8	The manual transfer of lines from storage to stations. Manipulate line with hand over hand actions to retrieve from pier.			
BM-9	Continuous control of line, with intermittent isometric and concentric contractions.			
BM-10	The manual transfer of lines from station to storage area.			
BM-11	Manipulate pendant from deck to anchor chain			
BM-12	Manipulate pendant from anchor chain to deck			
BM-13	The manual transfer of ground tackle from storage to foc'sle/flight deck			
BM-14	The manual transfer of ground tackle from foc'sle/flight deck to storage			
BM-15	The manual transfer of ground tackle from storage to foc'sle. Handling of ground tackle from ship to buoy.			
BM-16	Throwing of weighted ball and line from ship to pier up to 100 feet.			
BM-17	Manual handling of objects from storage to vehicle			
BM-18	Manual handling and transfer of objects to and from.			
BM-19	Manual handling of equipment			
BM-20	Manual handling of objects from vehicle to storage			
BM-21	Manual handling of equipment			
BM-22	Continuous standing at operating station with limited range of motion and movement			
BM-23	Manual handling and transfer of heavy from storage to side of ship for personnel movement			
BM-24	Manual handling of ship's materials with limited range of movement in external setting of ship			
BM-25	Continuous control of line, with intermittent isometric and concentric contractions.			
BM-26	Manual handling and transfer of heavy from storage to side of ship for personnel movement			
BM-27	Manual handling of ship's materials with limited range of movement in external setting of ship			
BM-28	Manual handling of objects			
BM-29	Manual handling of objects			
BM-30	Manual handling of deck equipment to transfer cargo			
BM-31	Manual handling of deck equipment			
BM-32	Manual handling of deck equipment to transfer cargo			
BM-33	Manual handling of deck equipment			
BM-34	Manual handling of deck equipment for fuel transfer			
BM-35	Manual handling of deck equipment upon completion of fuel transfer			
BM-36	Handling lines and operating boat transfer equipment			
BM-37	Prolong standing at console in a unstable environment			
BM-38	Handling lines and operating boat transfer equipment			
BM-39	Handling lines to secure small boat			
BM-40	Manipulate tools and equipment			
BM-41	Manipulate tools and equipment			

Damage Controlman

Chemical, Biological, Radiological and Nuclear Explosive (CBRNE) Defense				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
DC-1	Perform CBRNE decontamination operations on ship			
DC-2	Perform CBRNE decontamination operations on DECON station			
DC-3	Perform CBRNE decontamination operations on individual			

Damage Control				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
DC-4	Light-off installed eductors in unmanned space			
DC-5	Doff Fire Fighting Ensembles (FFE)			
DC-6	Don Fire Fighting Ensembles (FFE)			
DC-7	Investigator Doff Self-Contained Breathing Apparatus (SCBA)			
DC-8	Investigator Don Self-Contained Breathing Apparatus (SCBA)			
DC-9	Install soft patch on 150 PSI system			
DC-10	Install K-type shoring			
DC-11	Rig and Operate Peri-Jet in Aft Chem			
DC-12	Set up and Conduct Rescue & Assistance operations			
DC-13	Install hull patches			

Equipment Maintenance				
		CRITERIA		
Task Number	Task Statement	Frequency	Demand	Criticality
DC-14	Inspect Damage Control Repair Station (DCRS) equipment			
DC-15	Replace and weigh CO2/Halon bottles			
DC-16	Perform PMS on P-100 pump			

Task Statement Definitions				
DC-1	Handling materials for hazardous clean up in an external environment on ship			
DC-2	Handling materials for hazardous clean up in an internal enclosed environment			
DC-3	Handling materials for hazardous clean up on personnel			
DC-4	Manual handling of equipment and manipulations of tensioned levels			
DC-5	To remove fire fighting clothing weighing in excess of 40 pounds			

DC-6	To put on fire fighting clothing weighing in excess of 40 pounds			
DC-7	Removing an object from back weighing in excess of 20 pounds			
DC-8	Putting on an object from deck to back weighin in excess of 20 pounds			
DC-9	Handling equipment/materials to cover a highly pressurized water source in overstretch position.			
DC-10	Handling and manipulating lumbar in a narrow space possibly in a flooded/damaged space			
DC-11	Handing and manipulating a large heavy fire fighting equipment in a confound space			
DC-12	Removing equipment from storage and moving to flight deck from inside of ship			
DC-13	Handling large plates for repair			
DC-14	Manipulating equipment			
DC-15	Handing large heavy inanimate objects, carried.			
DC-16	Moving equipment in excess of 120 pounds to perform maintenance			

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LIST OF REFERENCES

Air Force Reserve Officer Training Corps. (2012, January 3). AFI 36-2905. Washington, DC: Author.

Allen, Michael. (2005). *An Analysis of the Need for Annual Physical Fitness Testing in Law Enforcement*. (SLP Research Paper, Florida Department of Law Enforcement). Retrieved from http://www.fdle.state.fl.us/Content/getdoc/c71eba45-03d4-4f9a-8aa4-d46c5f2896b9/Author.aspx

Anderson, Gregory S., Plecas, Darryl, & Segger, Tim. (2001). Police officer physical ability testing – Re-validtating a selection criterion. *Policing: An International Journal of Police Strategies and Management*, 24(1).

Army, Department of the. (1992, September 30) Physical Fitness Training (FM 21-20). Washington, DC: Author.

Army, Department of the. (2001, June 1). Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process (AR 602-2). Washington, DC: Author.

Army, Department of the. (2009, December 18). Army Training and Leader Development (AR 350-1). Washington, DC: Author.

Army, Department of the. (2011a, March 1). Army Physical Fitness Test Revision. Washington, DC: Author.

Baur, Dorothee M., Christophi, Costas, A., Cook, E. Francis, & Kales, Sefanos N. (2012). Age-Related Decline in Cardiorespiratory Fitness among Career Firefigthers: Modification by Physical Activity and Adiposity. *Journal of Obesity*. Hindawi Publishing Corp.

Bilzon, J. L., Scarpello, E. G., Bilzon, E., & Allsopp, A. J. (2002). Generic task-related occupational requirements for Royal Naval Personnel. *Occupational Medicine*, 52(8).

Bowen, David E., Ledford Jr., Gerald E., & Nathan, Barry R. (1991). Hiring for the Organization not the Job. *Academy of Management Excecutive*, 5(4).

Bunch, Richard W. (2012). *Pre-Employment (Post-Offer, Pre-Placement) Functional Assessment and Benefits for the Employee and the Employer* (White Paper, Lousiana Assoication of Occupational Nurses). Retrieved from laohn.org/images/functional_testing.pdf

Centers for Disease Control and Prevention. (2012). *Centers for Disease Control and Prevention website*. Retrieved from www.cdc.gov

Chairman of the Joint Chiefs of Staff. (2011, September 1). Chairman's Total Force Fitness Framework (CJCSI 3405.01). Washington, DC: Author.

Coates, Glynn D. & Kirby, Raymond H. (1982). Organismic Factors and Individual Differences in Human Performance and Productivity. *Human Performance and Productivity: Stress and Performance Effectiveness*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Constable, S. & Palmer. B. (2000). *The Process of Physical Fitness Standards Development*. Wright-Patterson AFB, OH: Human Systems Information Analysis Center.

Defense, Department of. (2002, November 5). DoD Physical Fitness and Body Fat Programs Procedures (DoD Instruction 1308.3). Washington, DC: Author.

FitForce. (2007). *Fitness Tests, Standards, and Norms: What is Valid? What is Legal?* Salem, MA.

Foland and Williams (2007). The Adaptations to Strength Training: Morphological and Neurological Contributions to Increased Strength. *Sports Medicine*. 37(2). 145–168.

Garver, J. N., Jankovitz, K. Z., Danks, J. M., Fittz, A. A., Smith, H. S., & Davis S. C. (2005). Physical Fitness of an Industrial Fire Department vs. A Municipal Fire Department. *Journal of Strength and Conditioning Research,* 19(2).

Goetzel, R. Z., Anderson, D. R., Whitmer, R. W., Ozminkowski, R. J., Dunn, R. L., & Wasserman, J. (1998). The relationship between modifiable health risks and health care expenditures: An analysis of the multi-employer HERO health risk and cost database. *Journal of Occupational and Environmental Medicine*, 40(10).

Harman, Everett A. & Frykman, Peter N. (1992). The Relationship of Body Size and Composition to the Performance of Physically Demanding Military Tasks. *Body Composition and Physical Performance*, 105–118. Washington, DC: National Academy Press.

Hollar, David E. (2000). Physical Ability Tests and Title VII. *The University of Chicago Law Review*, 67(3), 777–803. Chicago, IL: The University of Chicago Law Review.

Jackson, Andrew S., Osburn, H. G., & Laughery, Kenneth R. (1984). Validity of Isometric Strength Tests for Predicting Performance in Physically Demanding Jobs. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, October 1984*, 28(5), 452–454.

Karter Jr., Michael J. (2012). An Analysis of Volunteer Firefighter Injuries, 2008–2010. Fire Analysis and Research Division, National Fire Protection Association. Quincy, MA.

Labor, Department of. (2010). *Oil and Gas Industry Fatal and Nonfatal Occupational Injuries Fact Sheet, April 2010*. Retreived from http://www.bls.gov/iif/oshwc/osh/os/osar0013.pdf

Laughery, Kenneth R. & Jackson, Andrew S. (1982). Preemployment Physical Testing for Jobs on Drilling Rigs. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, October 1982*, 6(4), 369–373.

Laughery, Kenneth R., Jackson, Andrew S., & Fontenelle, Gail A. (1988). Isometric Strength Tests: Predicting Performance in Physically Demanding Transport Tasks. *Proceedings of the Human Factors and Ergonomics Society 32nd Annual Meeting, October 1988*, 32(11), 695–699.

Lippa, Richard A. (2005). *Gender, Nurture, and Nature*. Mahwah: Psychology Press.

Mathis, Robert L. & Jackson, John H. (2008). Human Resource Management. Mason, OH: Thomson South-Western.

McArdle, William D., Katch, Frank I., & Katch, Victor L. (2010). Exercise Physiology: Nutrition, Energy, and Human Performance (7th ed.). Lippincott Williams & Wilkins.

Michaelides, M. A., Parpa, K. M., Thompson, J., & Brown, B. (2008). Predicting Performance on a Firefighter's Ability Test From Fitness Parameters. *Research Quarterly for Exercise and Sport*, 4(4).

Military Advantage. (2012, February 20). *ASVAB and Navy Jobs*. Retrieved from http://www.military.com/ASVAB/0,,ASVAB_MOS_Navy.html

Morriessey, S. J., Burford, C. L., Caddel, K., & Ayoub, M. M. (1980). Anthropometry and Strength Characterisitcs of Low Coal Miners with Respect to Sex and Age. *Proceedings of the Human Factors and Ergonomics Society 24th Annual Meeting, October 1980*, 24 (1) 434–437.

National Center for O*NET Development. (2012). *O*NET OnLine Website*. Retrieved from www.onetonline.org

Navy, Department of the. (2000). Physical Readiness Program (OPNAVINST 6110.1J). Washington, DC: Author.

Navy, Department of the. (2002, May 10). Marine Corps Physical Fitness Test and Body Composition Program Manual (MCO P6100.12). Washington, DC: Author.

Navy, Department of the. (2003). Damage Controlman (NAVEDTRA 14057). Washington, DC: Author.

Navy, Department of the. (2008a, August 1). Marine Corps Physical Fitness Program (MCO 6100.13). Washington, DC: Author.

Navy, Department of the. (2008b, August 8). Changes to the Marine Corps Physical Fitness Program (ALMAR 032/08). Washington, DC: Author.

Navy, Department of the. (2009, November 10). Navy Personnel Human Systems Integration (NAVPRINT) (OPNAVINST 5310.23). Washington, DC: Author.

Navy, Department of the. (2011a). U.S. Code Title 10. Subtitle C. Washington, DC: Author.

Navy, Department of the. (2011b, July 11). Physical Readiness Program (OPNAVINST 6110.1J). Washington, DC: Author.

Navy, Department of the. (2011c, November 9). MCRCO 1100.1. Washington, DC: Author.

Navy, Department of the. (2012a, February 25). *Getting Started*. Retrieved from http://www.navy.com/joining/getting-started.html

Navy, Department of the. (2012b, February 26). *Navy SEALs*. Retrieved from http://www.navy.com/careers/special-operations/seals.html

Navy, Department of the. (2012c, July 25). Manual of Navy Enlisted Manpower Classifications and Personnel Classifications and Occupational Standards (NAVPERS 18068F). Washington, DC: Author.

Navy, Department of the. (2012d). *Navy Personnel Command website*. Retrieved from http://www.public.navy.mil/bupers-npc/support/physical/Pages/default2.aspx

Office of the Under Secretary of Defense (Comptroller). (2012, February 27). *United States Department of Defense Fiscal Year 2012 Budge Request.* Retrieved from http://comptroller.defense.gov/budget2012.html

Paquette, S., Gordon, C., Bradtmiller, B. (2008). *Anthropometric Survey (ANSUR) II Pilot Study: Methods and Summary Statistics*. U.S. Army Natick Soldier Rearch, Development and Engineering Center. MA.

Petroleum Human Resources Council of Canada. (2012). *Careers in Oil and Gas: Working in the Canadian Petroleum Industry*. Retrieved from www.careersinoilandgas.com

Powers, Scott K., & Howley, Edward T. (2004). Exercise Physiology: Theory and Application to Fitness and Performance. New York, NY: McGraw Hill.

Pronk, N. P., Tan, A. W., & O'Connor, P. (1999). Obesity, Fitness, Willingness to Communicate and Health Care Costs. *Medical Science Sports Exercise*, 31 (11).

Rhyan, Steve. (2006). Improving Fatigue Resistance for a Firefighter Physical Ability Test. *Strength and Conditioning Journal*, 28(4).

Sackett, Paul & Mavor, Anne. (2003). Attitudes, Aptitudes, and Aspirations of American Youth: Implications for Military Recruitment. *Board of Behaviorial, Cognitive, and Sensory Sciences*. Washington, DC: The National Academies Press.

Schloesser, K. (2011, February 28). *TRADOC revises Army Physical Fitness Test*. Retrieved from http://www.army.mil/article/52548/

Schmitt, Neil & Chan, David. (1998). Personnel Selection A Theoretical Approach. Thousand Oaks, CA: Sage.

SurveyMonkey. (2012). *Free Online Survey Software & Questionnaire Tool*. Retrieved from http://www.surveymonkey.com/

Thomas, J. R. (1997). Reengineering DoD Recruiting. *RAND Issue Paper, IP-165*. Retrieved from http://www.rand.org/pubs/issue_papers/IP165/index2.html

U.S. Equal Employment Opprotunity Commission. (2012). *US EEOC Home Page website*. Retrieved from www.ecoe.gov

U.S. Office of Personnel Management. (2012a, February 27). *Physical Ability Tests*. Retrieved from http://apps.opm.gov/adt/Content.aspx?page=4-03&AspxAutoDetectCookieSupport=1&JScript=1

U.S. Office of Personnel Management. (2012b, August 4). *Job Analysis Tools.* Retrieved from http://www.opm.gov/hiringtoolkit/docs/jobanalysis.pdf

West Virginia Office of Miners' Health Safety and Training. (2010, June 2). *Summary of Injury Data 2009*. Retrieved from www.wvminesafety.org/inj2009.htm

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