

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-7504-20

Topic # N172-132

Adaptive Physical Training
Charles River Analytics Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Proposed FNC CMP-FY19-02 FitForce and High Intensity Tactical Training (HITT) Program from M&RA

Transition Target: Marine Corps Recruiting Command

TPOC:

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Other transition opportunities: While initial deployment is toward Marine Poolees in the Delayed Entry Program who must meet the fitness demands of Boot Camp, additional transition opportunities include the Marine Corps Force Fitness Instructor Program, the Marine Corps Martial Arts Program, and other fitness training programs in the Navy and other service branches.

Notes: The goal of the Adaptive Training Protocols (ATP) physical fitness training mobile app is to help Marines meet and exceed physical fitness requirements at all stages of their careers. Photo: Marine Corps Recruit Depot - A Marine recruit gives maximum effort during the pull-ups portion of the Physical Fitness Test aboard Marine Corps Recruit Depot San Diego. The PFT is used to gauge the endurance of recruits after the first phase of training. Photo By: Lance Cpl. Pedro Cardenas.



<https://media.defense.gov/2013/Apr/18/2000016296/-1/-1/0/130329-M-SG512-167.JPG>

WHAT

Operational Need and Improvement: Marine physical fitness is a core element of force readiness. To meet this goal, the Marine Corps has high physical and combat fitness standards, and it invests significant time and effort developing and maintaining physical training programs, such as the Marine Corps Martial Arts Program (MCMAP) and the Force Fitness Instructor (FFI) program; workout routines, such as High Intensity Tactical Training (HITT); and facilities. However, due to logistical necessities, current Marine physical training is often applied with a one-size-fits all approach: a 6'5" 225lb male Marine seeking to improve his running times may be given the same training routine as a 5'5" 125lb female Marine seeking to increase her flexed arm hang score. The current training does not change as a function of the Marine's specific physical fitness goals, nor is it tailored to an individual as they progress towards that goal, meeting and overcoming hurdles along the way.

Specifications Required: To effectively tailor fitness workouts to individual needs and goals requires: (1) better methods to automatically collect and transform data from an evolving device ecosystem into sufficiently rich and reliable physical assessments (e.g., identifying instantaneous state and trends over time); (2) translation of these assessments to actionable training interventions (e.g., recommended workouts, schedules, and assessments); and (3) presentation to Marines (including both trainees and Commanders) to meaningfully capture progress and purposefully shape behavior towards individual fitness goals.

Technology Developed: ATP incorporates a modular, wearable hardware suite based on COTS wearable sensors to collect rich and reliable data on physical performance. To compute individual training needs, ATP builds on Charles River's proven, in-house physiological data processing framework, Sherlock™. ATP prescribes each trainee an automatic, adaptive high-intensity workout, adapting physical training routines in response to automated assessments of individual Marines' training needs. ATP delivers this functionality via an intuitive mobile application for individual Marine users and a web-based dashboard for Commanders and trainers.

Warfighter Value: ATP is a scalable and affordable system to maximize the speed and effectiveness of Marine Corps physical training through automated adaptation of workouts based on data from COTS wearable sensors.

WHEN

Contract Number: N00014-19-C-2028 **Ending on:** April 30, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop and test physical fitness training regime to enable Marine Poolees to pass the Initial Strength Test	N/A	Research study completed with non-Poolee sample	3	2nd QTR FY19
Identify wearable sensors	N/A	Software integration with COTS chest-worn heart rate monitor	4	4th QTR FY19
Develop workout adaptation algorithms	Med	Machine learning algorithms implemented in software	4	4th QTR FY20
Assess usability and acceptance	Med	Data collected from Marine Poolees in the Delayed Entry Program	5	2nd QTR FY21
Develop mobile application	Med	App available from the Google Play Store	6	3rd QTR FY21

HOW

Projected Business Model: We see two approaches to transitioning and commercializing ATP. First, the app can be licensed and distributed directly to end users via conventional app stores. Second, the underlying technologies can be licensed to other commercial entities that will use them directly or incorporate ATP components as added functionality to their commercial products.

Company Objectives: Our short-term goals are to incorporate the ATP program within the workout routine that Marine recruiters recommend to their Poolees. We have received approval from the Marine Corps Recruiting Command (MCRC) to conduct research to assess usability and acceptability of the protocol with Poolees. In the long-term, we expect the ATP program to have tangible benefits for Marines, Sailors, and Warfighters across the DoD. Our secondary target is to make ATP available for individualized training for the physical fitness test (PFT) and combat fitness test (CFT) over the Marine career. Additionally, we will engage with programs such as Force Fitness Instructor (FFI) and Marine Corps Martial Arts Programs (MCMAP) to integrate adaptive training.

Potential Commercial Applications: We will seek to partner with companies in the fitness wearables and actigraphy services markets as potential licensees of this technology. While current commercial offerings provide granular assessment and real-time monitoring of fitness state, they provide little in the way of tailored goal setting and adaptive workout recommendations. ATP shall be amenable to commercial applications such as law enforcement, fire-fighting, emergency-responding, and other domains where not only physically demanding tasks are critical to job performance/safety and measured on a group basis but also where adaptive physical training would be economical and instrumental to performance improvement and injury/risk mitigation.

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