**Introduction**

Psychological problems related to post traumatic stress (PTS), often occurs after experiencing combat stress, accidents, sexual assault, and other trauma. Many individuals with PTS try to cope and do not avail themselves of psychological care. Our hypothesis is that such individuals may benefit from self-screening and self-help interventions (SHIs) to identify and mitigate PTS symptoms, thereby preventing development of PTSD or other major disorders. The PHIT for Duty™ application supports this at-risk population by monitoring health and offering SHIs to mitigate symptoms and prevent disease, while advising those at risk to seek professional help.

Our goal is to support prevention of psychological health problems through innovation in personal health assessment and intervention. The objectives were to (1) conduct formative research with post-deployed soldiers to inform user-centric design and to optimize the operational aspects of mobile health in the military environment; (2) develop an integrated application for longitudinal health assessment and intervention; and (3) conduct initial field tests of developed PHIT for Duty technologies for functional performance and usability.

**PHIT Platform**

The Personal Health Intervention Tool (PHIT) platform is a generalist toolkit for implementing mobile health applications. The PHIT platform integrates multimodal data collection with an intelligent virtual advisor that analyzes real-time data to recommend, tailor, and present domain-specific activities based on rules and scripted processes (Exhibit 1). PHIT can be readily used for logs and diaries, momentary data collection, clinical decision support, health screening, and communications.

PHIT facilitates building complex applications with both self-entry and autonomous sensor-based instruments. Subjective data are acquired via psychometric instruments and diaries. Objective data are acquired via cognitive tests, interactive exercises, serious games, and Bluetooth sensors. Data are reviewed for errors and processed to produce measures such as psychometric scores, sleep quality, and heart rate variability. A library of validated instruments, sensors, and media modules are available for constructing applications via XML-based data collection, processing, and presentation constructs.

An intelligent Virtual Advisor (IVA) periodically assesses each domain to determine health status and recommends intervention activities tailored to current need. The IVA may choose to schedule another screening at a future date, request an immediate detailed assessment, add a domain-specific SHI to the user’s task list, or recommend the user to seek clinical help.

Data are stored locally on the mobile device using an encrypted database, periodically uploaded to a secure server, and made available for quality review and analysis via a password-protected website dashboard. Developing PHIT components such as instruments, IVA modules, and intervention activities is straightforward yet the XML structures provide considerable power in customizing content, logic, scheduling, and interactivity.

**PHIT for Duty**

Build upon the PHIT toolkit, the PHIT for Duty application comprises a variety of subjective and objective data collection instruments, interactive self-help activities, health information, feedback, cognitive behavior therapy, and other modules to address PTS (Exhibit 2). Required user actions, like completing a morning sleep quality questionnaire, are managed via a task menu screen. The task list is updated each day according to logic rules managed via the intelligent virtual advisor.

The health assessment and preventive intervention schema is shown in Exhibit 3. At baseline, personnel, psychological, social, and combat history data will be collected via self-entry instruments. Then, on a periodic basis (e.g., bi-weekly), health status is assessed via brief screening questionnaires in five domains (i.e., stress, anxiety, sleep quality, depression, and alcohol use). For each domain, the screening data are analyzed by the IVA and a detailed assessment may be scheduled.

Persons with likely risk are advised to consult their primary care provider for a professional health assessment. Persons with mild or moderate risk (i.e., subscale scores), are presented with intervention, therapeutic, and monitoring activities to support PTS reduction and symptom mitigation: health information (e.g., cognitive lessons), tools (e.g., sleep hygiene checklist), skills acquisition (e.g., mindfulness meditation, muscle relaxation), and self-monitoring activities (e.g., alcohol use diary). The “to-do” list of assessments and activities to be performed by the user is updated daily and displayed on the PHIT for Duty task list screen.

**Evaluation**

Eight individuals used PHIT for Duty to enter pre-determined scripted answers to a set of psychological health questionnaires over one and two-week field trials. Prior to testing, each participant was advised about the purposes, risks, and benefits of their participation and asked to provide informed consent. They were then trained on using the devices, and allowed to take the devices home for their use over their designated time frame. At the end of this period, participants were debriefed on system usability, technical performance, and suggestions for improvements.

**Conclusions**

PHIT for Duty, a mobile health application for reducing the impact of stress exposures in military personnel, provides psychological health assessment and tailored health interventions on a smartphone or tablet platform. With mobile technology, PHIT for Duty provides privacy which may help reduce stigma and encourage user adherence to personal assessment and interventions. Initial evaluation of PHIT instrument interface, physiological sensors, system functionality, system acceptability, and overall usability have shown positive results and affirmation of the PHIT mobile application framework design.