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14. ABSTRACT

The proposed project aims to develop and test an intensive rehabilitative technology aimed at enhancing emotion regulation and reducing operator-related risk during civilian driving in OEF/OIF returnees burdened by severe driving-related distress and disability. This in-car technology will have two main components. The first is a system for measuring driving behavior (accelerator and steering wheel movements, lateral and longitudinal vehicle accelerations), visual attentional control, and autonomic arousal during actual driving. The second is a cognitive-behavioral intervention combining breathing retraining/heart rate variability biofeedback and cognitive reappraisal. Both components are compatible with onroad driving assessments currently performed by driving rehabilitation specialists at our VA Health Care System on neurologically intact patients and those with mild-to-moderate nonfocal traumatic brain injury.

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INTRODUCTION

The proposed project aims to develop and test an intensive rehabilitative technology aimed at enhancing emotion regulation and reducing operator-related risk during civilian driving in OEF/OIF returnees burdened by severe driving-related distress and disability. This in-car technology will have two main components. The first is a system for measuring driving behavior (accelerator and steering wheel movements, lateral and longitudinal vehicle accelerations), visual attentional control, and autonomic arousal during actual driving. The second is a cognitive-behavioral intervention combining breathing retraining/heart rate variability biofeedback and cognitive reappraisal. Both components are compatible with on-road driving assessments currently performed by certified driving rehabilitation specialists (CDRS) at the VA Palo Alto Health Care System (VAPAHCS) on neurologically intact patients and those with mild-to-moderate non-focal traumatic brain injury.

BODY

1) PRE-FUNDING STARTUP (2010/Q4)/STARTUP (2011-Q1)

Obtain local IRB and R&D approvals

Initiate and complete hiring processes

We accomplished all administrative startup tasks (Approvals/Hiring/Staffing/Training). As part of this process, we negotiated an arrangement with the Physical Medicine and Rehabilitation Service with the result that the project CDRS position would be staffed by two VAPAHCS driving rehabilitation specialists who are available at a substantially lower cost to the project than the planned outside hire, and present other advantages as well. One of these staff members served as a consultant to this project throughout its formative stages. Both have direct in-car experience with veterans whose driving is psychologically compromised as a result of deployment driving experiences. Both are also ideal representatives of the specialists to whom this treatment will be disseminated if proven efficacious.

Take delivery of and install MicroStrain SG-Link and additional measurement devices, install in VAPAHCS driving rehab vehicle

Accelerometer installations completed.

Additional startup-related tasks completed

Eye tracking componentry installations completed. A GPS device has been added which allows route mapping and continuously records vehicle speed. Currently, the driving behavior subsystem (minus gaze tracking, ECG, and biofeedback) can be installed in five minutes and costs less than $3,000.

Dr. Kuhn's consultations with outside experts led to the inclusion of additional assessment instruments, the Deployment-Related Driving History (Stern), the Driving Behavior Checklist Version II, and the Coping Self-Efficacy Scale for Trauma (Benight). Dr. Gross' review of the

study design and participant flow led to a plan to exploit any extended scheduling delays in order to assess effects of time alone on psychometric measures of driving behavior.

2) TESTING (2011/Q2-4)

Recruit, screen and test 48 participants in order to accrue 15 experimental and 15 controls

Screens, exclusions, enrollment and completion data are outlined in the following table.

		Total Screens	Excluded Screens	Positive Screens	Enrolled	Completers
2011 Q1	Jan-Mar	0	0	0	0	0
2011 Q2	Apr-Jun	12	8	4	1	0
2011 Q3	Jul-Sept	15	11	4	6	2
2011 Q4	Oct-Dec					
2012 Q5						
Total		**27**	**19**	**8**	**7**	**2**

The screen-to-enrollment ratio has recently increased following extensive consultation with the VA/Stanford IRB and the approval of revised screening criteria. These were detailed in Quarterly Report #3 and revised protocols submitted with that report. Additional strategies aimed at accelerating recruitment are as follows. First, we are in communication with the Public Affairs staff of the VAPAHCS in regards to the possibility of a local news segment focusing on the driving problems of recent returnees and the VA's efforts to address this via research projects such as this one. Second, as detailed in Quarterly Report #3, the cost savings realized by collaborating with VAPAHCS CDRS staff rather than hiring outside have allowed us to set aside monies for 1) radio advertising and 2) (contingent on approval) extending recruitment through September, 2013. A formal request for a no-cost extension will be filed prior to the original end date of this award.

Additional testing-related tasks completed

Direct experience with early study participants has led to further development of the assessment/treatment interface. The assessment has been re-designed to flow more directly into the in-car intervention, as follows. Dr. Abby Haile, the study Psychologist/Coordinator, has developed a structured assessment of driving-related trauma during deployment which focuses directly on event-related "triggers" which are re-engaged in civilian driving. Structured review of these events and triggers provides the content for the collaborative development of an ordered hierarchy of driving challenges to be attempted during the in-car portion of the treatment. This hierarchy is then sent forward to the CDRS staff who is familiar with local roadways and who can then plan routes of increasing difficulty for the participant to negotiate in subsequent in-car sessions.

Direct experience with delivering the treatment to early study participants has led to the following methodologies. Individualized coping self-statements (specific to the participant's current driving challenges and their origins in deployment driving experiences) will be written in large type on cards which are then placed in a driver-side visor pocket. Participants can simply flip the visor down to review these materials as needed. We have also developed a CD-ROM including two tracks, the first describing the over-arching treatment model (scripted by Drs. Kuhn and Haile and read by Dr. Haile), and a track containing a five-minute auditory breathing pacer based on 0.1 Hz amplitude modulation of the sounds of a constant heavy rain. This pacer has received the most approval of those we have trialed over staff and volunteers. Through these developments, the in-car apparatus for treatment delivery has been kept at a low-cost and would be easy to disseminate.

KEY RESEARCH ACCOMPLISHMENTS

1) Startup

- **Obtained local IRB and R&D approvals**
- **Initiated and complete hiring**
- **Took delivery of and installed MicroStrain SG-Link and additional measurement devices, installed in VAPAHCS driving rehab vehicle**
- **Installed eye-tracking components**
- **Installed GPS**
- **Enhanced psychometrics**

2) Testing

- **Initiated recruitment/screening/testing of participants**
- **Enhanced of Assessment/Treatment Interface**
- **Enhanced of Treatment Delivery**

REPORTABLE OUTCOMES:

We are too early in testing to have statistically-analyzable or publishable findings.

The current treatment model continues to rely upon close collaboration between psychology and driving rehabilitation staffs. A psychologist (or other trauma specialist) should perform the initial assessment. In our experience, these assessments have frequently elicited first disclosures of extraordinarily distressing driving-related combat trauma. This supports our early conjecture that "driving treatment" might provide a low-stigma gateway to mental health treatment for some veterans. The "hand-off" to CDRS staff involves only hierarchies of current driving triggers. To date, expressed affect from participants during the in-car sessions has been within the "comfort zones" of our CDRS staff. It is noteworthy that VAPAHCS CDRS staff are also certified occupational therapists.

We are in discussions with United Services Automobile Association (USAA) regarding their plans to develop risk-reduction educational technology aimed specifically at reducing risky driving in their veteran customers post-deployment. The results of this study should be of interest to them.

CONCLUSION:

Objective comparative data are not yet available; however, early experience suggests that an in-car driving distress reduction intervention is feasible and highly acceptable to OEF/OIF/OND veterans with severe combat driving trauma.

REFERENCES: N/A

APPENDICES: N/A

SUPPORTING DATA: N/A