

## Scientific breakthrough on objective diagnosis of PTSD

- **Scientific breakthrough for non-invasive, automatic, objective diagnosis of PTSD leveraging autonomic biomarkers**
- **Accuracy of 80% (+/- 1%) for objectively diagnosing subjects with PTSD**
- **Medibio has exclusive worldwide rights to commercialise the technology**

**Sydney, Australia and Minneapolis, MN – 26 June 2017: Australian Stock Exchange listed medical technology company Medibio Limited (MEB or the Company)** announces a new research study, conducted at Emory University, Atlanta GA and funded by Medibio, demonstrates that post-traumatic stress disorder (PTSD) can be accurately diagnosed using a non-invasive protocol involving heart rate data and machine learning algorithms. The research was based on technology developed at Emory University and licensed by Medibio.

The research is described in a paper titled *"Classification of post-traumatic stress disorder from heart rate variability metrics with heart rate-based window segmentation,"* published in the June issue of *Physiological Measurement*. Emory researchers Gari Clifford, DPhil, MSc, MA, and Amit Shah, MD, MSCR, achieved an accuracy of 80% (+/- 1%) for objectively diagnosing subjects with PTSD and differentiating them from those without PTSD using 24-hour heart rate data and machine learning algorithms.

The researchers noted that, ***"Our results suggest the potential for a non-invasive tool to objectively track PTSD status."***

Medibio's collaboration with Emory was announced in January 2017 and is aimed at expanding the use of the technology beyond depression to classifying post-traumatic stress disorder. Under a license agreement, Medibio has the exclusive option and worldwide rights to commercialise new discoveries based on the PTSD diagnostic and monitoring technology developed by Clifford and Shah. The license agreement extends and further solidifies Medibio's intellectual property position and enables the company to service the vast veterans affairs and military clinical markets.

The research was conducted in collaboration with the Department of Veterans Affairs, using its twins database. It is part of a broader ongoing initiative between Emory University and Medibio. A full copy of the paper will be made available on Medibio's website.

Emory's approach used features extracted from quiescent segments, or periods with lowest heart rate (HR), rather than features calculated from the entire 24 hours of ECG heart rate data. The paper states that ***"Overall, these findings underscore physiologic changes that occur with PTSD, particularly during periods of relative HR quiescence."***

The paper concludes that ***“Our approach of estimating PTSD status from Heart Rate Variability features is non-invasive, automatic, objective, and potentially useful for monitoring progression and/or improvement of a condition”***. It suggests that ***“future studies could evaluate if this classifier reflects changes with effective treatment and resolution of PTSD.”***

“We appreciate the research done by Emory University and our collaboration. The findings from this research provide a significant step forward in assisting veterans by identifying and diagnosing PTSD. This technology will also assist in the direct benefit for screening, diagnosing and treating mental illness among active military service personnel. We look forward to future research and commercial activity in the critical areas of veterans mental health diagnosis and management,” said Jack Cosentino, Medibio CEO. “ In the United States, over 22 veterans a day commit suicide due to PTSD and mental illness. This technology will change the way care is delivered to millions of people around the world.”

#### **About PTSD**

PTSD is a chronic disabling psychiatric condition, with prevalence rates of 3.5% in the general US population <sup>(2)</sup> and 11-30% amongst returning US service members <sup>(1)</sup>. The disorder represents a significant and costly illness to veterans, their families, and society. The US Congressional Budget Office has reported that the annual cost of treating a veteran with PTSD is US\$8,300. There are 18.8 million veterans in the US including 2.3 million troops deployed in Iraq and Afghanistan over the past 10 years.

#### **Principal researchers**

Dr Gari Clifford, DPhil, MSc, MA, has an international reputation in mHealth and critical care data analysis and the application of signal processing and machine learning to medicine. He joined the faculty at Emory and Georgia Tech in 2014 as an associate professor in the departments of Biomedical Engineering and Bioinformatics, where he is now the interim chair. Previously, as an Associate Professor at the University of Oxford, Dr Clifford helped found and led one of the five themes at its Sleep & Circadian Neuroscience Institute, where he is now an Honorary Professor. Prior to that, Dr Clifford was a Principal Research Scientist at MIT, where he managed the collection and dissemination for the world’s largest open access hospital database. His research interests focus on machine learning and signal processing for data fusion, prediction and developing confidence intervals and trust metrics. Application areas in health: critical care, mHealth, sleep and circadian rhythms, and resource-constrained environments.

Dr. Amit Shah, MD, MSCR, is an Assistant Professor of Epidemiology with an adjunct appointment in Medicine (Cardiology) at Emory University, and a practicing cardiologist. He is an expert in the study of autonomic function and psychological risk factors for heart disease, and much of his research focuses on understanding the cardiovascular pathophysiology of depression and posttraumatic stress disorder. His training has largely been dedicated to studying the psychophysiology of PTSD, including circadian abnormalities associated with the condition. Recently, his work on PTSD and abnormal circadian rhythm was presented at the American Psychosomatic Society conference.

*Disclosure: As inventors and licensees, Drs. Clifford and Shah and Emory University are eligible to benefit financially from this technology. This relationship has been reviewed and is managed by Emory University through its Conflict of Interest office.*

### **About Medibio Limited**

Medibio (ASX: MEB) (OTCQB: MDBIF), headquartered in Melbourne, Australia, with US headquarters in Minneapolis, Minnesota, is an evidence-based medical technology company that has developed an objective test to assist in the diagnosis and management of depression, chronic stress and other mental health disorders. Based on research conducted over 15 years at the University of Western Australia, this test utilizes a panel of patented (and patent pending) circadian, sleep and autonomic system biomarkers to objectively quantify and characterize mental state. Medibio's depression diagnostic is being validated in clinical studies undertaken by Johns Hopkins University School of Medicine and The University of Ottawa, among others. The clinical trials will support Medibio's application to become the first FDA approved, objective, and evidence based approach to the diagnosis of mental health disorders. Medibio's technology also provides an objective method for the assessment of stress and mental wellbeing that can be translated to the workplace stress/wellbeing market, wearable technology and App market. Medibio is listed on the Australian Securities Exchange. and also trades on the OTCQB Venture Market for early stage and developing U.S. and international companies. Investors can find Real-Time quotes and market information for the company on [www.otcmarkets.com](http://www.otcmarkets.com) and [www.asx.com.au](http://www.asx.com.au).

To learn more about Medibio visit [www.Medibio.com.au](http://www.Medibio.com.au)

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(1) <http://www.ptsd.va.gov/public/PTSD-overview/basics/how-common-is-ptsd.asp>

(2) <http://www.nimh.nih.gov/health/statistics/prevalence/post-traumatic-stress-disorder-among-adults.shtml>

<b>Further Information:Website:</b>		<a href="http://www.medibio.com.au">www.medibio.com.au</a>
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