CRC FOR

ALERTNESS, SAFETY & PRODUCTIVITY

INNOVATION
THROUGH
COLLABORATION

SAFETY&
PRODUCTIVITY

MEASURING
& PREDICTING
ALERTNESS

PERSONALISED
SLEEP HEALTH

RESHAPING ALERTNESS MANAGEMENT

2013-2020 | Alertness CRC Legacy Book

CRC ALERTNESS SAFETY AND PRODUCTIVITY

Australian Government
Department of Industry, Science, Energy and Resources

Business Cooperative Research Centres Program

ALERTNESS SAFETY AND PRODUCTIVITY

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As an Australian Government funded industry-focused research and development consortium, the CRC for Alertness, Safety and Productivity was established to improve alertness, safety and productivity in individuals and across organisations.

Through its highly engaged and effective industry, government and university sector partners, this unique collaboration focused on the prevention and control of sleep loss and sleep disorders and the development of novel alertness prediction and sleep health management technologies that provide viable real-world workplace and community solutions.

The Alertness CRC's mission has been to:

- Promote the prevention and control of sleep loss and sleep disorders; and
- Develop new evidence-based tools for individuals and organisations to improve alertness, productivity and safety.

CRC FOR **ALERTNESS, SAFETY & PRODUCTIVITY**

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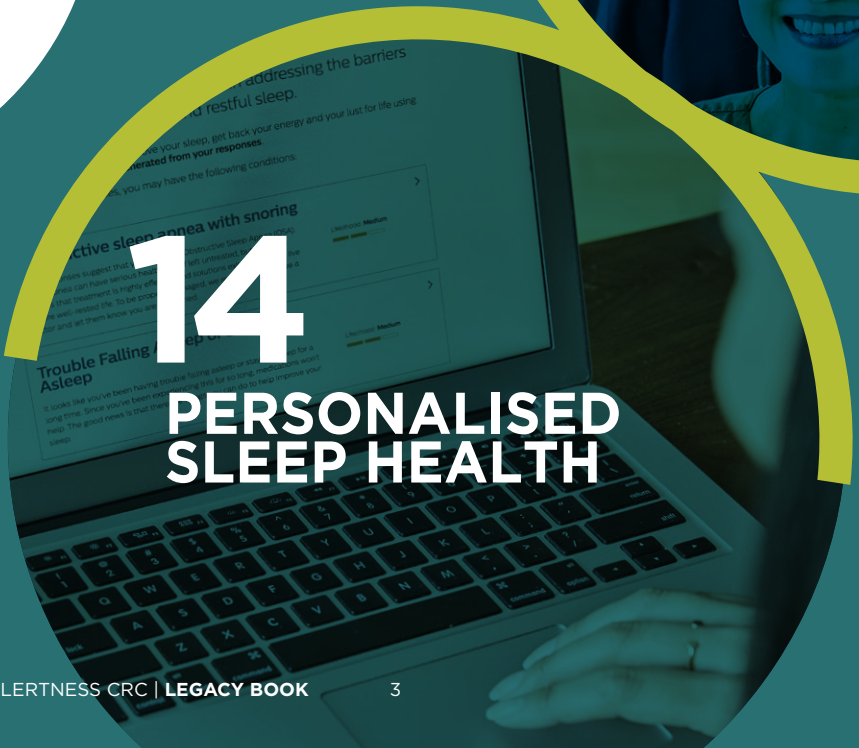


$13.3M
cash contributions

$63.8M
in-kind contributions

7 years

$14.5M
Commonwealth Government funding

47 students **28** postdoctoral fellows
with **$1.87 million** awarded

>280
publications

32
participants

26 research projects and independent parcels of Alertness CRC-generated intellectual property (IP)

7 patents filed

4 registered trademarks

AlertSafe® | **WorkAlert®**
SleepFix® | **AlertWell®**

THE CONSORTIUM

- Seven-year CRC term with 32 Participants.
- $13.3 million cash contributions, $63.8 million in-kind contributions and $14.5 million Commonwealth Government funding.
- A total of 26 research projects and independent parcels of Alertness CRC-generated intellectual property (IP).
- Support for 47 students (24 x PhD, 7 x Masters, 16 x Industry Based Learning) and 28 postdoctoral fellows with $1.87 million awarded over the funding period for scholarships and stipends.
- Over 280 publications in the form of abstracts, manuscripts, conference presentations, media summaries and peer reviews.
- Seven formal placements with industry partners including Philips Respironics, Austin Health, Metabolomics Australia, Cogstate Pty Ltd., and Seeing Machines Ltd.
- Registered trademarks (AlertSafe®, WorkAlert®, SleepFix®, AlertWell®).
- Seven patents for key outputs including the Sleep Disorders Decision Support Tool, Novel Digital Insomnia Treatment, Individual Shift Work Management Software, and circadian-based dynamic lighting solutions.

US launch of the
Philips SmartSleep Analyzer

Worldwide release of
ALFA lighting design software

6 major alertness-related product concepts

World-first:

blood based marker for sleep loss

integrated implementation software for optimal rostering

Validation of the **Philips SmartSleep Deep Sleep Headband**

A portfolio of **AlertSafe®** technologies and tools

New lighting product specifications leading to the **MelaGen™** range

SleepFix® insomnia therapy and individualised shift work management software

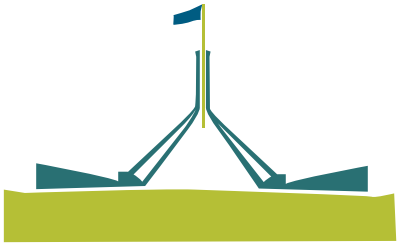
ACHIEVEMENTS SNAPSHOT

- Six major product concepts commercialised (circadian lighting design software; slow wave sleep enhancement device; automated sleep disorder diagnoses; AlertSafe® roster builder; human centric lighting product range; a digital insomnia therapy).
- US launch of the Philips SmartSleep Analyzer sleep health management system with over five million users per month.
- Worldwide release of ALFA (Adaptive Lighting for Alertness) lighting design software with Solemma LLC – incorporating the non-visual (alerting, circadian) effects in the lighting design process.
- Discovery of a world-first blood based marker for sleep loss in collaboration with Metabolomics Australia, to help objectively address the risks of impaired driving due to sleep loss and sleep disorders.
- World-first integrated implementation software released by Australian SME Opturion Pty Ltd to automate and optimise rostering whilst classifying fatigue risk and managing alertness in roster building and human capital management.
- New lighting product specifications leading to the MelaGen™ range by Australian SME Versalux Pty Ltd.

- WorkAlert® research translation initiative in collaboration with the Sleep Health Foundation helping employers and employees better manage alertness and sleep health in the workplace.
- Decision support algorithms creating a 'virtual sleep physician' for the diagnosis and treatment of sleep health issues and disorders.
- 'Early Adopter Program' and working group to promote best practice fatigue management in healthcare, and encourage the trial and evaluation of the advances in group work scheduling and individual approaches to managing shift work.
- Delivery of a prototype of an ambulatory driver-operator device for roadside alertness testing incorporating sensitive fitness-to-drive algorithms based on eye movements

WorkAlert® research translation initiative

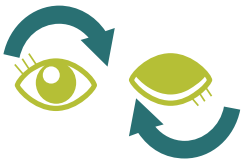
Decision support algorithms creating a **'virtual sleep physician'**



Contribution to the **2019 Commonwealth Parliamentary Inquiry into Sleep Health**

'Early Adopter Program' and working group for **best practice fatigue management in healthcare**

Prototype **ambulatory driver-operator device** for roadside alertness testing



that can measure impairment before, during and after driving.
- Partnership with the Sleep Health Foundation to further examine the costs of inadequate sleep in Australia and to establish sleep health as a national priority culminating in a 2019 Commonwealth Parliamentary Inquiry into Sleep Health.
- Verified definitions and criteria for defining and evaluating alertness, sleepiness, fatigue and performance – key to the identification and development of biomarkers of alertness.
- Heavy vehicle driver fatigue research through the National Transport Commission to directly inform national workplace regulation reform.
- Collaboration agreement with Qantas Ltd to examine the implications of long-haul flight operations on the sleep and alertness of pilots and crew.

Assessed **sleep and alertness of pilots and crew** on long-haul flights

Sophisticated biophysical model of the **sleep-wake cycle**

Informing the **heavy vehicle national workplace regulation reform**

INNOVATION THROUGH COLLABORATION

$66.3 billion is the estimated **total cost of inadequate sleep in Australia** in 2016-17

WHY AN ALERTNESS CRC?

Human performance and wellbeing are significantly impacted by impaired alertness, often caused by inadequate sleep and sleep disorders.

A high proportion of the working population also experience disruption of the body clock due to shift work and unusual or extended hours, resulting in poor sleep health and reduced alertness.

This in turn has widespread impacts on core brain functions: reaction time; decision-making; information processing; and the ability to maintain attention. Such impairment leads to preventable errors, accidents and injuries, especially in high-risk environments.

In a report commissioned by the Sleep Health Foundation ("Asleep on the Job: Costs of inadequate sleep in Australia", August 2017), the total cost of inadequate sleep in Australia was estimated to be $66.3 billion in 2016-17 and includes:

- $26.2 billion in financial costs incorporating:
  - » health system costs of $1.8 billion, or $246 per person with inadequate sleep;
  - » productivity losses of $17.9 billion, or $2,418 per person with inadequate sleep;
  - » informal care costs of $0.6 billion, or $82 per person with inadequate sleep; and
  - » other costs (including welfare payments, tax losses) of $5.9 billion or $802 per person with inadequate sleep.
- $40.1 billion in loss of wellbeing, estimated using World Health Organisation and Australian Government metrics that assess the non-financial costs of healthy life lost through disability and premature death from inadequate sleep and associated conditions.

The report estimates that 39.8% of Australian adults are experiencing some form of inadequate sleep. And, according to the Centers for Disease Control and Prevention, an estimated 30% of working adults in the US sleep less than six hours per night (ref: Centers for Disease Control and Prevention, 2009).

Alertness CRC Ltd was incorporated on 24 April 2013 as a public company limited by guarantee, to manage the consortium and drive towards sophisticated solutions that could improve alertness for individuals and across organisations.

$17.9billion **in productivity losses** witnessed in Australia in 2016-17 due to **inadequate sleep**

PARTICIPANTS

The success of the Alertness CRC's program of activities lies in the make-up of the consortium itself, and recognises the complex regulatory and policy environment in which sleep health and alertness management solutions have needed to be delivered.

Technology companies, the insurance industry, regulatory and policy agencies, and safety-sensitive industry sectors have all been represented and supported by world-class academic expertise. In its final year, FY2019-2020, the Alertness CRC had a total of 32 participants.

Technology & Development

SOLEMMA · COGSTATE · OPTALERT · fmi · BIOPLATFORMS AUSTRALIA · PHILIPS · SMART CAP · seeingmachines · GREY INNOVATION TECHNOLOGY COMMERCIALISATION · ELECTRO LIGHT · OPTURION · goAct · Versalux

Industry & Employment

Austin HEALTH · ICMM International Council on Mining & Metals · asmofnsw · Government of South Australia SA Health · Australian Government Department of Defence Science and Technology

Policy, Regulatory & Insurance

TAC Transport Accident Commission · WorkSafe Victoria · Bupa · National Transport Commission ntc · vicroads

Research, Education & Training

Australasian SleepTrials Network · Sleep Health Foundation · IBAS Institute for Breathing & Sleep · WOOLCOCK Institute of Medical Research · Flinders University · The University of Sydney · CSIRO · MONASH University · NeuRA Discover. Conquer. Cure.

39.8% of Australian adults are experiencing some form of **inadequate sleep**

BUILDING CAPACITY FOR INNOVATION

The Education Program of the Alertness CRC was the backbone of the capacity-building power of the consortium, including all students in all aspects of the collaborative process.

Working together through the Education Committee and in collaboration with its university participants, the Alertness CRC supported 24 PhD students, 7 Masters students, 28 Postdoctoral Fellows, and 16 Industry-Based Learning students across a total of 26 research projects.

A total of 7 PhD students undertook physical placements with industry participants including Philips Respironics in the US and The Netherlands, Metabolomics Australia (Part of the Bioplatforms Australia Network), Cogstate Pty Ltd, Austin Health, and Seeing Machines Ltd.

PhD projects were designed to add value to the product concepts in development, and postdoctoral involvement was directed towards project leadership.

A total of 15 of the 28 postdoctoral fellows took up leadership roles that covered planning, execution, and the regular review and reporting of project status, and they played a critical role in managing the collaboration across project parties.

The Alertness CRC created an intellectual property (IP) register that includes 26 separate parcels of CRC project IP. Centre IP includes core modelling capabilities, data sets and trademarks (AlertSafe®, AlertWell®, WorkAlert® and SleepFix®). The CRC has also developed over 280 relevant publications in the form of abstracts, manuscripts, conference presentations, media summaries and peer reviews.

MEASURING & PREDICTING ALERTNESS

Research Program One saw the Alertness CRC developing and verifying tools to measure alertness levels accurately, predict the risk of future critical lapses, and intervene before poor alertness impairs productivity and safety.

KEY RESEARCH OUTPUTS

New alertness monitoring and testing systems using neurophysiological biomarkers:
In early phase studies, the Alertness CRC tested and identified candidate neurophysiological biomarkers of alertness state. Ocular measures of alertness were used in developing a test for predicting alertness failure. The CRC then developed a prototype driver alertness testing device that incorporates a fitness-to-drive algorithm that can predict subsequent driving impairment and retrospectively detect prior driving impairment.

Novel biomarkers to form the next generation of sleep, circadian and alertness tests:
The Alertness CRC has identified novel biomarkers that track how long a person has been awake, and the timing of the internal circadian clock. Validation involved on-road driving studies to benchmark the biomarkers against driving performance impairment, including metabolomic biomarkers, gold nanoparticle chemiresistor sensors, and newly-established metrics derived from functional near-infrared spectroscopy (fNIRS).

A biophysical model to predict alertness state, sleep, and circadian timing:
The Alertness CRC model generates group average predictions of arousal state dynamics under normal and disturbed sleep, including shift work and chronic sleep disturbances. Personalised predictions are delivered following input on individuals' environmental, work, and biological factors. The model is deployed via a web-based application programming interface (API) and provides developers, industry end-users and researchers direct access and integration with other tools.

A personalised tool for shift workers to help plan and manage their sleep and improve alertness and wellbeing:
A prototype app-based solution that helps shift workers plan and manage their sleep around work and social commitments has been developed. The app includes monitoring, prediction and feedback elements, and was developed based on feedback from in-depth interviews with nurses. Following user testing and positive proof of concept results, the app is being developed for deployment in a range of shift work settings beyond healthcare, and will be rigorously evaluated in a research trial.

INNOVATION AND COMMERCIALISATION

Alertness API:
This is the first tool in the world to enable global access to validated models of alertness to a variety of potential users, ranging from scheduling and wearable device companies to shift work application developers and individual researchers. This biophysical model of arousal dynamics incorporates novel features that are not yet present in any other model of alertness, including: effects of light spectrum (colour) on circadian timing and alertness; unified dynamics of melatonin across body fluids and its interaction with the sleep system; dynamical changes in circadian timing, sleep and alertness depending on environmental factors; and simultaneous prediction of a number of cognitive outputs, including objective (e.g. reaction time) and subjective (e.g. sleepiness) measures.

Novel biological markers of sleep/wake state:
The Alertness CRC sleep biomarkers are a world-first metabolomic marker of sleep loss, which is reproducible. Commercial opportunities now exist to develop biosensors and devices to accurately and objectively detect impaired state. The CRC has commenced work with Nutromics Pty Ltd to develop biosensors to monitor sleep health, while further validation continues for applications in workplace and roadside fatigue testing.

Prototype low-cost, non-invasive, real-time ocular-based test for alertness suitable for workplace and potential roadside testing applications:
This prototype drowsiness detection device uses validated algorithms that detect impairment via objective physiological ocular parameters. The wearable device delivers an impaired/non-impaired outcome within four minutes, and its universal fitment makes it suitable for use by roadside – it is lightweight, has recyclable or disposable skin-contact components (for hygiene), can be operated through a car window, and shrouds out light that can impact upon alertness levels.

Novel non-invasive measure of sleep/wake state using function near-infrared spectroscopy (fNIRS):
The Alertness CRC developed algorithms to accurately track sleep and wake states using near-infrared technology, using metrics derived from connectivity within brain networks. This technology, and associated connectivity metrics, has provided future opportunity to measure nuanced aspects of the alertness state, beyond simply a dichotomy of sleep versus wake.

CASE STUDY

Achieving safer roads through more alert, healthier heavy vehicle drivers

Fatigue is a key risk to safety. Driving a heavy vehicle while fatigued will increase the risk of a crash and, over time, may impact the physical and mental wellbeing of the driver.

Alertness CRC research suggests that the most significant causes of driver fatigue in heavy vehicles are longer periods of work, night driving and shift work (especially early shifts, night shifts, backward shift rotations, long shift sequences, and shift sequences where a shorter break allows for less sleep). And, according to the National Transport Commission (NTC), fatigue is the leading cause of fatal single-vehicle accidents, and a key factor in 9.8 per cent of major accidents.

On 15 April 2019, the NTC and the Alertness CRC released the results of a world-first study into heavy vehicle driver fatigue. The two-year study evaluated alertness monitoring technology by using it to evaluate the impact of work-rest scheduling features on alertness and drowsiness in order to inform fatigue policy. The research was supported by the Department of Infrastructure and Regional Development, Monash University, Institute for Breathing and Sleep, Transport for New South Wales and the NTC.

The project findings validated the alertness monitoring technology, confirming its ability to identify drowsiness-related driving impairment, and provided unique objective evidence regarding heavy vehicle driver schedule features that enable safe driving with high alertness levels and features that lead to high levels of drowsiness.

The NTC is now undertaking a review of the Heavy Vehicle National Law that will result in performance-based and outcomes-focused regulation for improved road safety. Findings from this project have assisted the NTC in developing potential policy options to amend fatigue regulation, such as:

- Implementing the use of fatigue monitoring technology;
- Broadening the scope of fatigue-regulated heavy vehicles to capture all vehicles with a Gross Vehicle Mass greater than 4.5 tonne (i.e. all heavy vehicles as per the HVNL definition); and
- Applying fatigue management requirements to all drivers that are at higher risk of fatigue due to the nature of their work, such as those who have long hours on task, undertake night driving and those who have had inadequate sleep opportunity across an extended amount of time.

SAFETY & PRODUCTIVITY

In response to the challenges of inadequate sleep, Research Program Two addressed how alertness can be maximised at the individual, workplace and community level to deliver measurable improvements in safety and productivity.

KEY RESEARCH OUTPUTS

Field-testing in high-risk, safety-critical operational settings:
The Alertness CRC sought opportunity to field-test in such areas through strong support and engagement from key participant organisations in healthcare, mining and road transport settings – particularly Austin Health, the International Council on Mining and Metals, and the National Transport Commission (NTC).

Work Hours Expert Reference Group:
This multi-sector reference group was formed to include representatives from regulatory, consumer, research, employer and employee representative organisations. The group created a framework for rostering and scheduling practices and guidelines for individuals to optimise alertness in shift working environments, informed by the scientific evidence base in circadian biology and sleep medicine, human factors and safety science. The framework also builds upon advances in national and international regulatory frameworks and operational demands of maintaining 24-hour acute healthcare services.

World-first study into heavy vehicle driver fatigue:
In collaboration with the NTC, the Australian Government, Transport for NSW, Austin Health, Monash University, Institute for Breathing and Sleep and the heavy vehicle industry, the Alertness CRC conducted a world-first two-year scientific study evaluating alertness monitoring technology and the impacts of work-rest scheduling features on driver alertness. Establishing a scientific link between alertness and drowsiness patterns associated with specific work shifts for heavy vehicle driving will now inform future fatigue policy as part of the NTC-led review of the Heavy Vehicle National Law (HVNL).

Sky-high alertness testing:
A high-impact collaboration between the Alertness CRC and Qantas examined the sleep and alertness of pilots and cabin crew during extended flight duty, as part of the Qantas Project Sunrise research flights. The research examined the factors influencing sleep and alertness in these crew members to better understand the barriers and requirements for better sleep health during international flight patterns. This involved assessment of the impact of circadian phase on crew sleep and alertness during extended flight duty, in order to develop evidence-based recommendations for optimising alertness during such ultra-long-haul flights.

INNOVATION AND COMMERCIALISATION

Dynamic Scheduling:
From the development of an Alertness CRC Healthcare Work Hours Framework came an AlertSafe® Rostering solution – a way to implement the framework. SME participant Opturion Pty Ltd led a world-first integrated implementation combining logistics optimisation, work hours guidelines, and alertness/fatigue modelling into a user-friendly tool, with rostering outcomes classified from a fatigue risk perspective on an individual, team and enterprise basis.

The result of this work has been the development of two key AlertSafe® product outputs: AlertSafe® roster building and management software tool; and the AlertSafe® Software Developer Kit (SDK), which offers sophisticated fatigue management in roster building, roster management, human capital management, time and attendance systems.
https://www.opturion.com/alertsafe

Circadian Lighting Design Software:
Participants Monash University and US-based Solemma LLC developed a world-first circadian lighting design software module named ALFA – 'Adaptive Lighting for Alertness' – which helps architects, lighting designers and health professionals predict and control the way lighting works on the human senses, and allows lighting design approaches to configure different light combinations that will have predictable impacts on alertness, safety and productivity.

Solemma continues to promote the use of ALFA as part of its DIVA-for-Rhino (DIVA) 3-D Modeling Program tool suite through regular Solemma-hosted symposiums. ALFA is available directly from the Solemma website for evaluation and/or annual subscription.
https://www.solemma.com/Alfa.html

Human Centric Lighting:
Extensive feasibility studies and a review of the latest state-of-the-art scientific literature enabled the development of product specifications and guidance for the application of alertness promoting and sleep permissive/promoting capability into a single lighting fixture. This resulted in the development of a new lighting engine in partnership with SME Versalux Pty Ltd, which has three variants:

1) MelaGen™ Blue luminaires featuring specialised Blue-Enriched LED chips with alertness promoting capability; 2) MelaGen™ ReFresh luminaires featuring specialised Blue-Depleted LED chips for sleep permissive/promoting capability; and 3) MelaGen™ ReGen luminaires featuring a combination of both MelaGen™ Blue and MelaGen™ ReFresh LED chips allowing for transitions between alertness promoting and sleep promoting capability to suit the environment, such as those that exist in hospitality, military, healthcare, aged care, and correctional facilities.
www.versalux.com.au/melagen/

CASE STUDY

Keeping workers alert and workplaces safe

The Alertness CRC has conquered many challenges of staying alert in a busy world, enabling both employers and employees to keep themselves and their workplaces safe.

Shift work and irregular rostered hours can significantly impact worker health, safety and productivity. Research shows that by avoiding fatigue, mistakes and non-conformances can be reduced by up to 30 per cent.

In partnership with Australian SME Opturion Pty Ltd, an optimisation software company, the Alertness CRC helped to create the world's first software program that automatically applies fatigue rules to create better staff rosters.

AlertSafe® Rostering is a cloud-based integrated scheduling system that encompasses a complex algorithm, offering sophisticated fatigue management in roster building, roster management, human capital management, and time and attendance systems. The tool considers employees' constraints and preferences in building optimal rosters to limit and mitigate worker fatigue. Other benefits include increased productivity and a reduction in sickness absence. Initial results from a trial with the Monash Medical Centre in Victoria demonstrated that this rostering solution has the capacity to deliver improvements to health, safety and productivity in the workplace.

Light can also impact worker performance, through affecting our sleep-wake cycles and internal body clocks. High dosages of electric light at night can be very confusing for the body clock and can lead to disrupted sleep that, over time, affects people's health and mood – which is partly why many long-term shift workers experience health issues.

Alertness CRC research has shown that it is not the brightness of this artificial light that can most impact our internal clocks; it's actually the amount of blue light in a light source. From these findings, the CRC in collaboration with Australian SME Versalux Lighting Systems and Monash University developed MelaGen™ – LEDs that can be programmed to vary blue light content across any single building environment. This dynamic approach regulates visual and non-visual light to maximise wellbeing.

MelaGen™ is fast gaining recognition by hospitals, prisons and aged care facilities, among other shift-working institutions – not just for its ability to assist in resetting circadian rhythms and promote good quality sleep, but also for its role in enhancing vision and improving health, safety, performance and wellbeing in the workplace.

Developed as a joint initiative between the Alertness CRC and the Sleep Health Foundation in 2017, the WorkAlert® website continues through the SHF to provide science-driven advice and knowledge around these topics and more, to help conquer the challenges of staying safe and alert at work: **https://www.workalert.org.au/**.

PERSONALISED SLEEP HEALTH

Research Program Three saw the Alertness CRC developing sleep health management tools together with an understanding of phenotypes, to be able to personalise the tools.

KEY RESEARCH OUTPUTS

Insomnia Research Program:
Insomnia is the most prevalent sleep disorder affecting about 10% of Australian adults. The total cost of insomnia to Australia is estimated to be $11 billion. People with insomnia have increased risk of depression, increased workplace disability and costs, and poor health-related quality of life.

Cognitive behavioural therapy for insomnia (CBTi) is an effective treatment but is limited in scope due to a shortage of skilled practitioners. Digital-based therapies provide new ways of treating large numbers of insomnia patients. The new smartphone application (SleepFix®) developed by the Alertness CRC uses an evidence-based behavioural therapy to treat insomnia and has undergone extensive clinical testing and validation at the Woolcock Institute of Medical Research.

The latest data science techniques were used to explore insomnia phenotypes based on a range of objective markers of sleep, such as electroencephalographic signals. Three new insomnia subtypes based on sleep macroarchitecture and EEG spectral power variables have been identified, having distinct objective sleep duration, coupled with differences in EEG power and showing differences in sleep misperception.

This research will provide insights into the biological mechanisms underpinning insomnia, especially related to sleep misperception, a central tenet of insomnia patients, and will aid the targeting of personalised therapies in the future.

Sleep disorder decision support tool algorithms:
There are a wide range of sleep disorders that can be difficult to diagnose and treat. A collaboration between Philips Respironics, Flinders University, The University of Sydney, and The Woolcock Institute of Medical Research conducted extensive clinical testing and validation of an automated approach to sleep disorder diagnosis and treatment.

The Philips SmartSleep Analyzer enables users to identify some of the most common sleep challenges they may be experiencing, gain insights and personalised feedback on their sleep behaviour, review educational information on the sleep challenges identified for them, and receive guidance to the clinically validated solution to help them improve sleep.

The tool was developed with sleep physicians and specialists to provide personalised feedback and recommendations to help users take charge of their sleep. It uses a clinically validated and evidence-based sleep health assessment algorithm providing guidance to the user on where to turn for support.

Biomarkers of Alertness Failure in Obstructive Sleep Apnoea:
Obstructive Sleep Apnoea (OSA) is a common sleep disorder where patients have repeated episodes of partial or complete obstruction of the upper airway while they are sleeping. Some patients with this condition experience significant sleepiness during the day, while others do not. Partners Woolcock Institute of Medical Research, Flinders University, and Adelaide Institute of Sleep Health validated a phenotyping approach for OSA and measured it against retrospective real-world outcomes of driving performance. Biomarkers, including neurobehavioral, physiological and electrophysical signals, were identified.

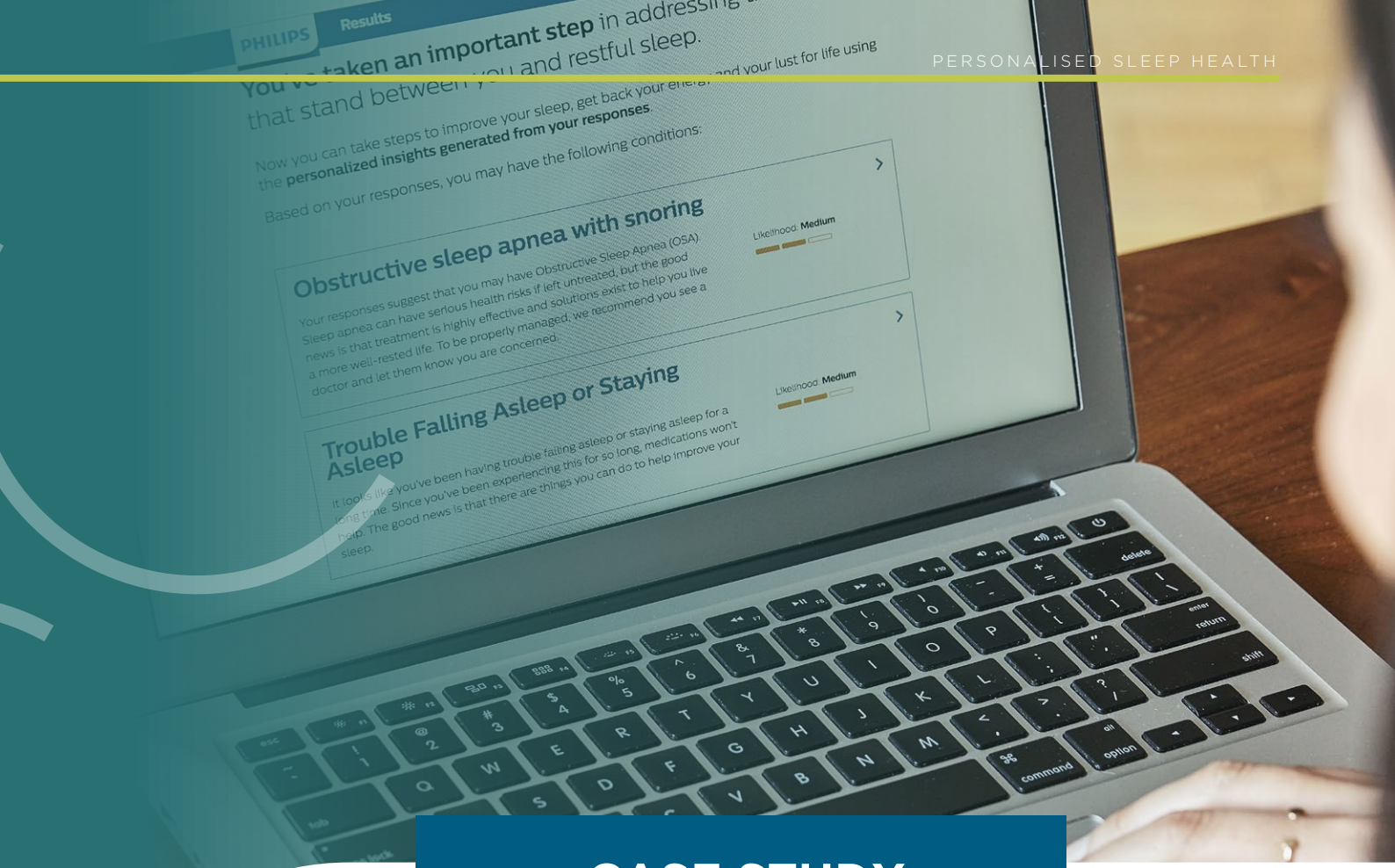
INNOVATION AND COMMERCIALISATION

SleepFix® application:
Developed in collaboration with Philips Respironics, SleepFix® is a novel mobile application for consumers with poor sleep. The software delivers behavioural therapy targeting insomnia and insomnia-like problems, and is fully integrated with a wearable device (FitBit). SleepFix® will be applicable for large numbers of the consumer population with sleep health problems, and it is anticipated that it will become part of the Philips SmartSleep suite of solutions.

Philips SmartSleep Analyzer tool:
The Philips SmartSleep Analyzer is a novel automated decision support system that is underpinning a major shift in the approach to sleep health management.

The tool comprises a comprehensive online sleep health support ecosystem for those seeking solutions online. It can be integrated into applications to identify symptoms and potential solutions for a number of sleep issues including short sleep, circadian rhythm misalignment, shift work disorder, trouble falling asleep and staying asleep, snoring and obstructive sleep apnoea.

Personalised results provide the user with guidance on where to turn including consulting with their physician, and what solutions to turn to for support. It is available as a digital solution on Philips.com, as part of the Philips SmartSleep suite of solutions.



CASE STUDY

Taking charge of your sleep – the science-backed way

From identifying an individual's sleep needs to recommending clinically proven solutions, a new tool is available to help empower individuals to get better sleep.

How can they start? With the Philips SmartSleep Analyzer.

In a collaboration led by the Alertness CRC involving participants Philips Respironics, Flinders University, The University of Sydney, the Woolcock Institute of Medical Research, and health technology specialist goAct, the Philips SmartSleep Analyzer was created with sleep physicians and specialists to provide personalised feedback and recommendations to help users take charge of their sleep.

The tool uses a clinically validated and evidence-based sleep health assessment decision support algorithm developed with the Alertness CRC, which can be integrated into applications to identify symptoms and potential solutions for a number of sleep issues including short sleep, circadian rhythm misalignment, shift work disorder, trouble falling asleep and staying asleep, snoring and obstructive sleep apnoea. Personalised results provide the user with guidance on where to turn including consulting with their physician, and what solutions to turn to for support.

SmartSleep Analyzer is available as a digital solution on Philips.com, as part of the Philips SmartSleep suite of solutions to address 80 percent of the most common sleep challenges.

Users access the decision support tool with results returned immediately, often in as little as 10 minutes. Philips then provides them with a sleep problem list along with personalised sleep tips and solution recommendations, which includes Philips products. Philips has scaled SmartSleep Analyzer into a flexible, well documented API optimised for external consumption. In this manner, Philips enables third parties to embed SmartSleep Analyzer as a function into their own digital solutions.

Through the Philips SmartSleep Analyzer, the Alertness CRC collaborated to deliver a novel decision support system that is underpinning a major shift in the approach to sleep health management, with the tool comprising a comprehensive online sleep health support ecosystem for those seeking solutions online.

Additional global launches of the SmartSleep Analyzer, including Australia, are being planned.

CRC FOR
ALERTNESS, SAFETY & PRODUCTIVITY

The Alertness CRC's industry-driven approach has delivered tools and technologies for individuals, organisations and the community that will create a safer, more productive society and shape future innovation in sleep health and alertness management.

With strong and productive collaborative relationships, rich datasets and sophisticated platform technologies, our participant organisations will continue to co-develop solutions and facilitate the early adoption of the new products to further improve the safety and productivity of all Australians.

CRC ALERTNESS SAFETY AND PRODUCTIVITY

Australian Government
Department of Industry, Science, Energy and Resources

Business Cooperative Research Centres Program