

Functional vision in the real-world environment with a 44-channel suprachoroidal retinal prosthesis



CENTRE FOR
Eye Research
Australia



Hope in sight



Lewis Karapanos^{1,2}, Carla J. Abbott^{1,2}, Lauren N. Ayton^{1,2,3}, Maria Kolic¹, Myra B. McGuinness^{1,4}, Elizabeth K. Baglin¹, Samuel A. Titchener^{5,6}, Jessica Kvasakul^{5,6}, Dean Johnson⁷, William G. Kentler⁸, Nick Barnes⁹, D.A.X. Nayagam^{5,10}, Matthew A. Petoe^{5,6}, Penelope J. Allen^{1,2}

¹Centre for Eye Research Australia, Royal Victorian Eye and Ear Hospital, Australia; ²Ophthalmology, University of Melbourne, Department of Surgery, Melbourne, Australia; ³Department of Optometry and Vision Sciences, University of Melbourne, Australia; ⁴Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Australia; ⁵Bionics Institute, East Melbourne, Australia; ⁶Medical Bionics Department, University of Melbourne, Melbourne, Australia; ⁷Specialised Orientation and Mobility, Melbourne, Australia; ⁸Department of Biomedical Engineering, University of Melbourne, Melbourne, Australia; ⁹Research School of Engineering, Australian National University, Australia; ¹⁰Department of Pathology, University of Melbourne, St. Vincent's Hospital, Australia

Introduction

- The Bionic Vision Technologies Australia **suprachoroidal retinal prosthesis** has been shown to improve functional vision in patients with late-stage retinitis pigmentosa (RP) in a laboratory setting (See Kolic talk #3544660)
- AIM: To determine if late-stage RP patients implanted with a prosthesis could increase their performance in real-world functional visual tasks with the device ON than OFF

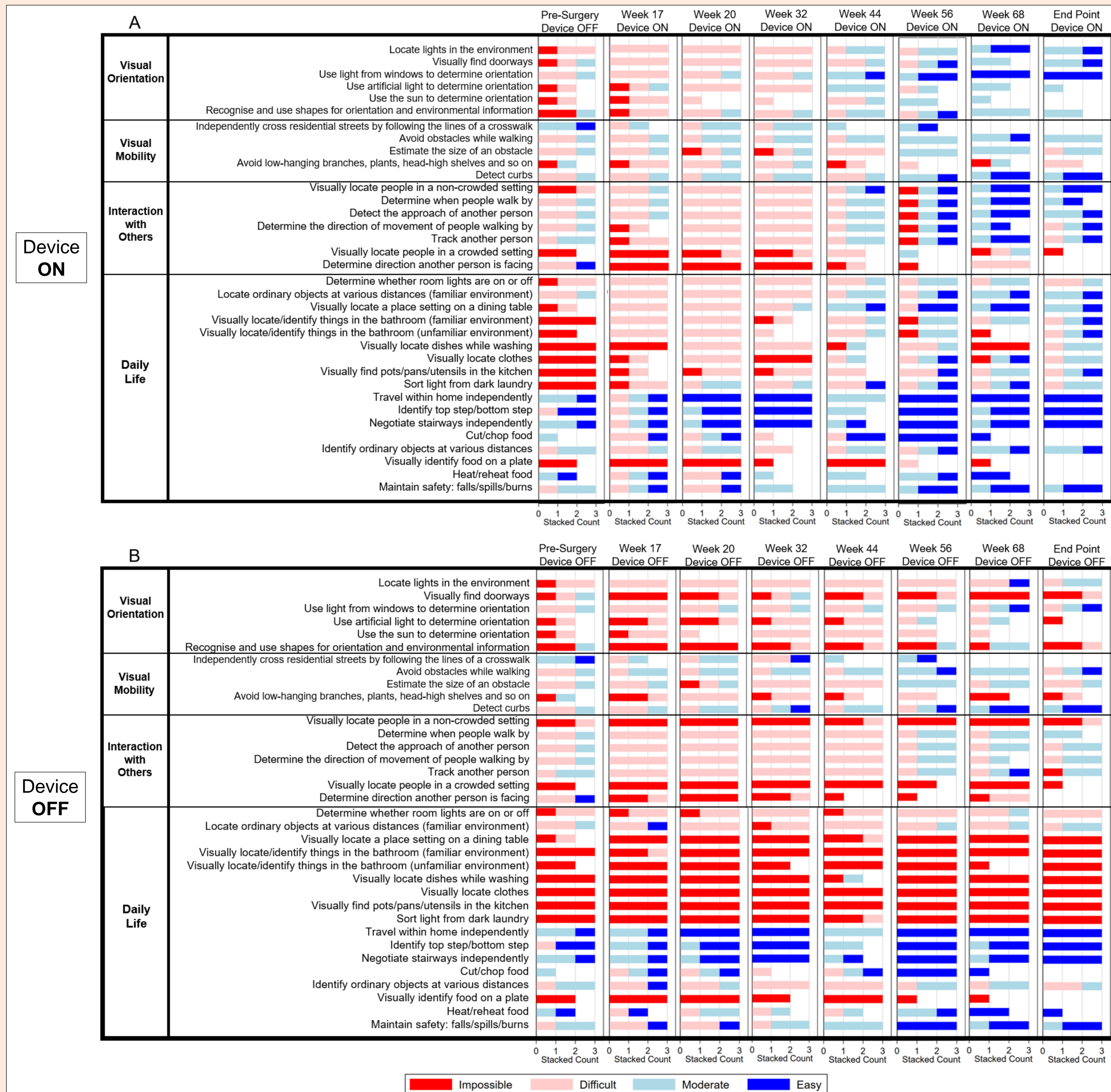
Methods

SUBJECTS (N=3)

- Three subjects with advanced RP (bare light perception only) who received a 44-channel suprachoroidal retinal implant as part of a clinical trial (NCT03406416; 2017-2021)

FLORA

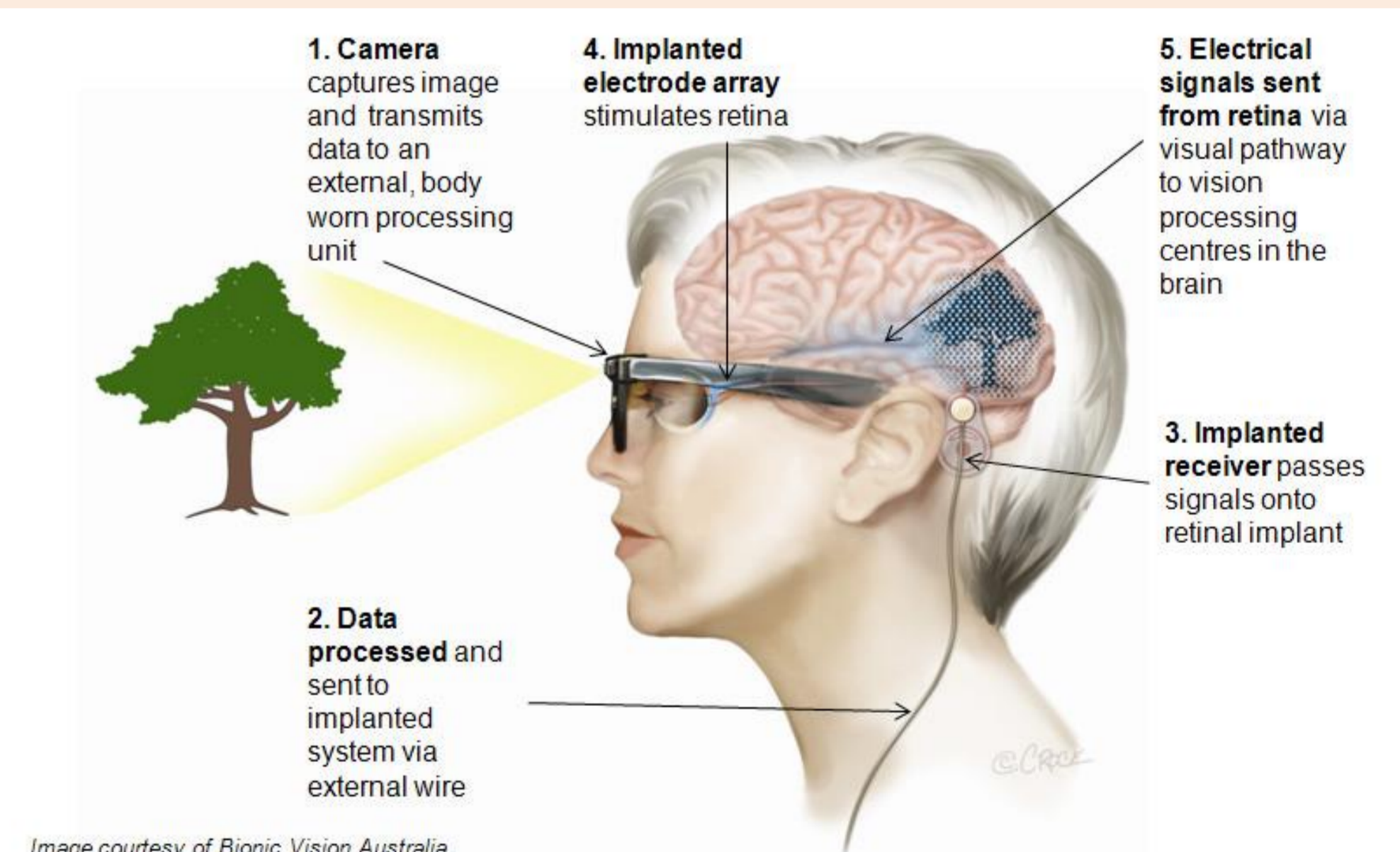
- Functional Low-Vision Observer Rated Assessment^{1,2} (FLORA™)** instrument
- FLORA™ consists of 35 functional vision tasks spanning across 4 domains ('Visual Orientation', 'Visual Mobility', 'Interaction with Others' and 'Daily Life')
- Ease of task was assessed by an independent orientation and mobility specialist using a four-point scale from impossible to easy
- There was an 8-week post-surgery recovery period prior to switch on
- Post-fitting & training baseline assessments were conducted at 17 weeks after switch on
- FLORA was conducted pre-surgery, at post-fitting & training baseline and then 3-monthly for 2 years.



End Point of study was defined as the last time point in the study where FLORA measures were taken. This was at 136-, 110- and 109-weeks post-device fitting for each of the participants.

Results

- Functional vision tasks were easier to complete over time with device ON, trending towards 'moderate' and 'easy' compared to 'difficult' at pre-surgical baseline.
- With device OFF, many tasks were 'impossible' or 'difficult' to complete throughout most time points.
- Most striking improvement is seen with device ON in the first 6 months from the post-fitting baseline (week 17 to week 44) indicating a learning effect from visual rehabilitation training.
- Ease of task scores remained stable from week 44 to the study endpoint (2 years).
- Tasks highly dependent on vision showed the greatest improvement (i.e., visually finding doorways in Visual Orientation, and 7 tasks in Daily Life).



Participants with late-stage RP implanted with the second-generation suprachoroidal retinal prosthesis demonstrated improved ease of task scores with the device ON over 2 years

Conclusion

- The device shows potential utility in everyday life, and further research into its real-world use is warranted.
- Except for a single neutral experience at week 20, there was an overall positive impact of the retinal prosthesis on daily life for all participants at all time points

¹Geruschat DR, et al. Clin Exp Optom. 2015;98(4):342-7

²Geruschat DR, et al. Clin Exp Optom. 2016;99(3):227-32.