Progress/Final Report Template

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Title of Project: *Sports related concussion and its correlates among current and former professional contact sports athletes.*

Summary: *(approximately 1,000 words)*

Update: we have completed MRI scanning and neuropsychological assessments on 60+ participants. Data analysis is on-going. We have identified group differences in **retired** rugby league players in DTI and MRS metrics as well as neuropsychological measures compared with age, gender and education matched controls.

All of the following publications/presentations acknowledged funding from the Brain Foundation:

Published journal articles:

1. **Gardner, A.J.,** Iverson, G.L., Wojtowicz, M.A., Makdissi, M., Quinn, T., Shultz, S.R., Wright, D., & **Stanwell, P.** (2015). A systematic Video Analysis of Concussion in the National Rugby League: a preliminary study. Brain Injury, online first.
2. **Gardner, A.J.,** Tan, C.O., Ainslie, P.N., van Donkelaar, **Stanwell, P., Levi, C.R.,** & Iverson, G.L. (2015). Cerebrovascular reactivity assessed by transcranial Doppler ultrasound in sport-related concussion: a systematic review. British Journal of Sports Medicine, in press.
3. **Gardner, A.,** Iverson, G.L., & McCrory, P. (2014). Chronic traumatic encephalopathy in sport: a systematic review. British Journal of Sports Medicine, 48 (2), 84-90.
4. **Gardner, A.J.,** Iverson, G.L., Williams, W.H., Baker, S. & **Stanwell, P.** (2014). A systematic review and meta-analysis of concussion in rugby union. Sports Medicine, 44 (12), 1717-1731.
5. **Gardner, A.,** Iverson, G.L., **Levi, C.R.,** Schofield, P.W., Kay-Lambkin, F.J., Kohler, R. & **Stanwell, P.** (2014). Systematic review of concussion in rugby league. British Journal of Sports Medicine, online first April, 10.

Conferences:

1. **Gardner, A.J.,** Iverson, G.I., Wojtowicz, M.A., Makdissi, M., Quinn, T., Shultz, S.R., Wright, D., & **Stanwell, P.** (2015). A systematic Video Analysis of Concussion in the National Rugby League. Oral presentation and poster presented at American Academy of Neurology Annual Meeting, Washington, DC, USA.

2. **Gardner, A.J, Levi, C.L., Stanwell, P.,** & Iverson, G.I. (2015). A video analysis of the use of the 'concussion interchange rule' during the first year of implementation in the National Rugby League. Poster Presented at International Neuropsychological Society Annual Mid-Year Conference, Sydney, NSW, Australia.
3. **Gardner,** A.J., Iverson, G.L., Wojtowicz, M., **Levi, C.R.,** Kay-Lambkin, F., Schofield, P.W., Zafonte, R., Shultz, S.R., Lin, A.P. & **Stanwell, P.** (2015). Magnetic Resonance Spectroscopy Findings in Retired Professional Rugby League Players. Poster Presented at American Sports Neuropsychology Society Symposium, Atlanta, GA, USA.
4. **Gardner, A. & Stanwell, P.** (2013). Neuropsychological correlates of a remote history of multiple sports concussions in a sample of retired elite level collision sport athletes: pilot data. Poster presented at the 4th Australian Neurotrauma Symposium, Hobart, Tasmania.

Hypothesis vs Findings

Hypothesis: We proposed to correlate the findings of neuroimaging, genotyping, neuropsychological and psychosocial results to develop a risk/likelihood profile, in an attempt to reduce the rates of dementia in retired athletes.

Findings: We found group differences in DTI and MRS metrics as well as neuropsychological measures in retired rugby league players vs. age, gender and education matched controls.

Unanswered Questions
Further investigation is required to determine whether these differences are pre-existing or due solely to exposure to concussion. Thus we are proposing a prospective study with measures before and after concussion.

What these research outcomes mean
Further research is required to study the evolution of concussion with players studied at baseline and serially tracked following a concussive brain injury to study the true nature of sport-related concussion.

Please include any appropriate photos or diagrams.

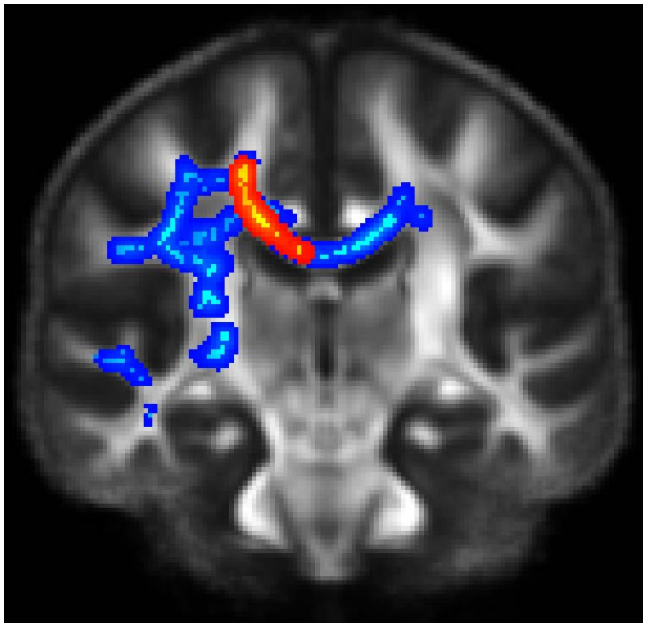

Fig 1. DTI in concussed NRL players. We have found decreased FA (red) and increased mean diffusivity (blue) in the white matter of retired NRL players who have suffered previous concussions vs. age/education/gender matched controls with no concussion history.

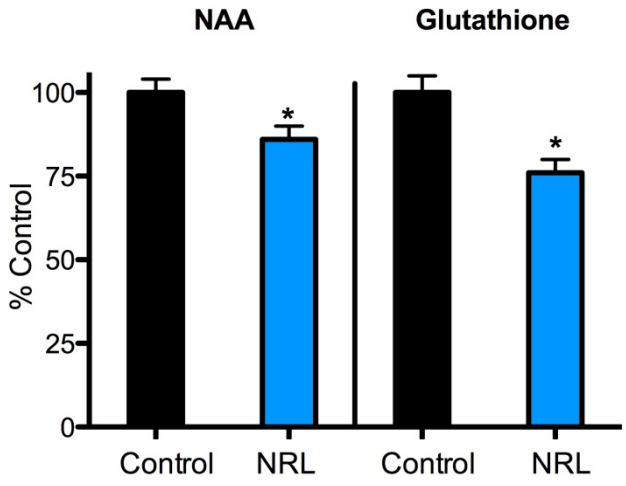

Fig 2. MRS in retired NRL players with history of concussion. We have found decreased NAA, a marker of neuronal health, and decreased glutathione, an anti-oxidant, in retired NRL players with a history of concussion. * = $p < .05$.

Please submit this report as a PDF using the following naming convention:

Lastname Firstname – Simplified Project Title

For example: Smith Jane – The anatomy of the Brain.PDF