

MEDIA RELEASE

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Study reveals new insights into neuropsychological health of former athletes

History of concussion has been found to be associated with small to moderate cognitive difficulties in athletes following their retirement from competitive sport, according to a study published in *Sports Medicine*.

The study, conducted by Auckland University of Technology (AUT) in partnership with New Zealand Rugby and financially supported by World Rugby, investigated long-term differences in cognition (or thinking) between former rugby and non-contact sport players, and assessed the link between concussion history and cognitive function. A total of 366 former New Zealand athletes from three groups participated in the study: elite rugby, community rugby, and non-contact sport (cricket and hockey) retirees.

Players who had experienced one or more concussions performed worse on cognitive flexibility, complex attention and executive function than players with no history of concussion. Participants in the two rugby groups were found to have sustained substantially more concussions than the non-contact sport group; 85% of elite rugby players reported having had at least one concussion, while the rate among community rugby players was 77% and 23% for non-contact sport players.

Both rugby groups studied performed worse on executive functioning and cognitive flexibility than the non-contact sport group. The elite rugby group also performed worse than the non-contact sport group on complex attention and processing speed (see notes for additional details). With the exception of reaction time, the average values for all three former player groups on all tests were within normal ranges provided by the CNS-VS age-matched normative database.

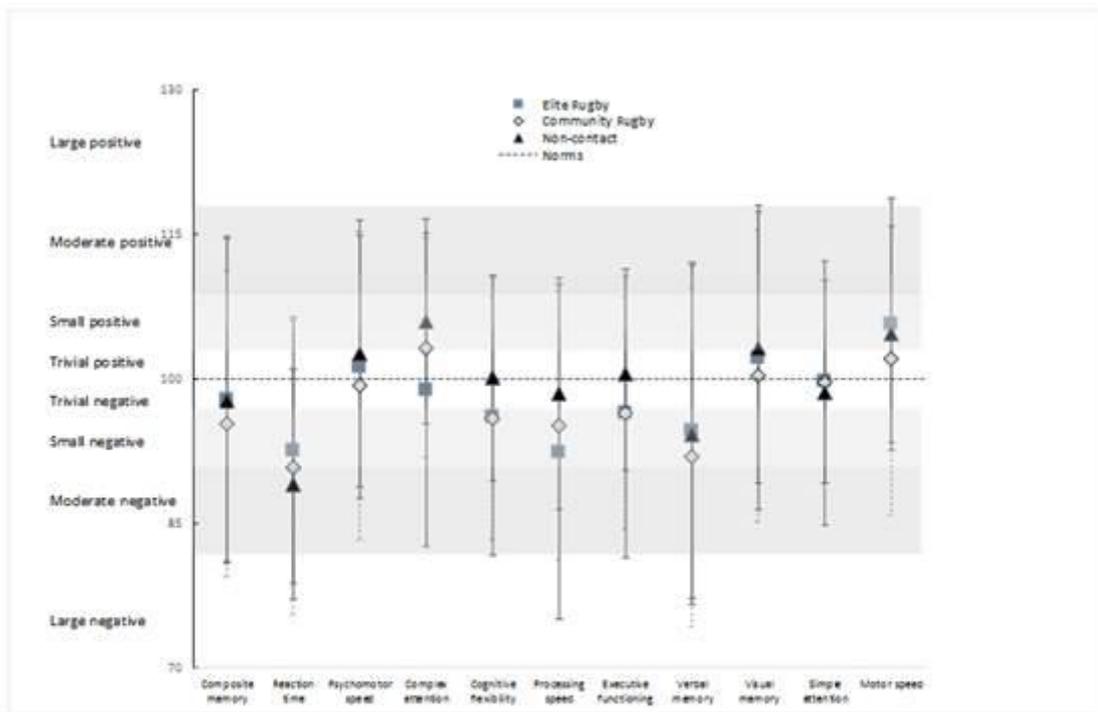
Concussive head impacts are known to produce changes in the brain that may result in a temporary decline in thinking abilities, and may potentiate long-term cognitive deficits similar to those associated with the aging process. Studies have also indicated head trauma in sport has negative short-term and cumulative neurocognitive effects.

The association between concussion and negative long-term neuropsychological effects in former adult rugby players had not been investigated prior to this research, which is part of the wider Rugby Health Study conducted by AUT, New Zealand Rugby and World Rugby.

Notes for editors:

- The study obtained details of participants' engagement in sport, general health, sport injuries, concussion history, and demographic information through an on-line self-report questionnaire. Cognitive functioning was assessed using the online CNS-vital signs (CNS-VS) neuropsychological test battery.

- The CNS-VS test battery includes seven tests assessing functioning across different cognitive domains including verbal, visual and composite memory, psychomotor and information processing speed, reaction time, executive functioning, motor speed, cognitive flexibility, simple and complex attention (for additional details, see section 5.4 of the paper). For example:
 - Processing speed is the ability to understand and process new information quickly. Important for fitness-to-drive, occupation tasks, and possible danger/risk signs.
 - Executive function is how well a subject recognises rules, categories, and manages or navigates rapid decision making. Needed to sequence tasks and manage multiple tasks simultaneously, as well as tracking and responding to a set of instructions.
 - Cognitive flexibility is the ability to switch attention between tasks, such as focusing on writing an email then answering a phone call.
 - Complex attention is the ability to track and respond to information over lengthy periods of time and/or perform mental tasks requiring vigilance quickly and accurately. Important for self-regulation and behavioural control, such as holding information in the head while performing mental arithmetic.
- Figure 1 below shows CNS-VS scores for each Rugby Health player group, compared to the US normative sample, and each other, using Hopkin’s scale of effect sizes.



The US norms mean score for each standardised variable was 100, with a standard deviation of 15. The standard deviation error bars for the means are bold for non-contact sport, dashed with half top for community rugby, and solid with full top for elite rugby.

- To access the paper, *A comparison of cognitive function in former rugby union players compared to former non-contact sport players and the impact of concussion history*, visit <http://link.springer.com/journal/40279>.

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