

**TITLE**

Developmental activities that contribute to creativity in soccer players

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### Acceptability, feasibility and effect of a neck strengthening program in Australian elite rugby union: A team case study over one season

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**Introduction:** In rugby union, head and neck injuries, including concussions, are highly prevalent and can be severe. There is emerging evidence that neck strengthening exercises may have a protective effect against the incidence of these injuries. Despite this, widespread implementation of neck strengthening programs into rugby has been slow. One reason may be poor acceptability and feasibility within rugby clubs, coaches, and players.

**Aims:** To evaluate the acceptability and feasibility of a neck strengthening exercise program in an elite rugby union team and to explore the effect of a neck strengthening program on neck strength and incidence of head and neck injuries, including concussion.

**Methods:** A pilot quantitative, pre- and post-intervention design was used. A neck strengthening exercise program was implemented with one elite rugby union team (n=39) throughout their 2020 super rugby season. Acceptability and feasibility was evaluated by players and staff using surveys and reported as percentage of agreement. Neck strength was measured pre- and post-training phases. Strength changes were analysed using a one-way, repeated measures analysis of variance and a paired samples t-test. Injury data from 2019 and 2020 was compared using incidence rates per 1000 player activity hours.

**Results:** Survey responses revealed high percentages of acceptability and feasibility agreement. Neck flexion ( $p < 0.001$ ), left side flexion ( $p = 0.026$ ) and flexor-extensor ratios ( $p < 0.001$ ) significantly improved over time. The team experienced a non-significant reduction in head and neck injuries including concussion between seasons.

**Conclusion:** This study presents high acceptability and feasibility of integrating neck strengthening programs into elite rugby union. The results add to the body of evidence supporting neck strengthening as a possible tool to reduce head and neck injuries including concussion. Further research is recommended using a larger, randomised control trial.

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### Developmental activities that contribute to creativity in soccer players

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**Introduction:** The most skilled soccer players create excitement for spectators when they touch the ball because they often produce unique, creative actions during match-play. The ability to produce creative decisions in game situations is a key attribute of team sports players (Memmert & Roca, 2019). Yet very few researchers have studied how this type of creative behavior is acquired and developed in the sporting domain. The aim of this study was to assess the link between sport-specific creative decision making and prior engagement in developmental activities in skilled adult soccer players.

**Methods:** Players were classified as either high- or low-creative decision makers based on their performance on an established soccer-specific video-based creativity test. Their solutions on the test were measured using the three observation criteria for creativity of originality, flexibility, and fluency of decisions. We used retrospective recall questionnaires to collect participation history data on their engagement in soccer and other sport development activities.

**Results:** The high-creative group spent significantly more average hours per year ( $M = 345 \text{ h} \cdot \text{year}^{-1}$ ) in free, unstructured soccer-specific play activity during childhood and early adolescence (i.e., 6-15 years of age) when compared with their low-creative counterparts ( $M = 192 \text{ h} \cdot \text{year}^{-1}$ ). No differences were reported for hours per year in soccer-specific formal practice or competition between the two groups throughout their development. Moreover, hours accumulated in other sports, as well as milestones achieved, did not differentiate groups.

**Conclusion:** Our findings suggest that informal unorganized, free play in the primary sport is positively associated with and necessary for the development of superior levels of creative decision making in this sport.

References

Memmert and Roca, Tactical creativity and decision making in sport, 2019, pp 203-214.