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Original research

The effects of binge drinking behaviour on recovery and performance after a rugby match

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ABSTRACT

Objectives: This study compared the effects of "normal" post-game behaviour with recommended behaviour on physical performance in the days after a rugby union game. Additionally, the habitual drinking habits of rugby players were identified.
Design: Prospective cohort study.
Methods: After a rugby game, 26 players were split by team into a customary behaviour group (CB), who carried out their usual post-game behaviour, or recommended behaviour group (RB), whose diet and activity was controlled in the hours after the game. Counter movement jump, lower-body strength, repeated sprint ability, CK and hydration status were measured prior to and in the days after the game. Twenty-four hour behaviour recall questionnaires where completed throughout the trial period. The Alcohol Use Disorders Identification Test (AUDIT) was also administered to participants.
Results: Compared to baseline values, large volumes of alcohol ($p < 0.01$) and a loss in sleep ($p < 0.001$) was reported by the CB group in the hours after the game. Measures of performance and hydration status were unchanged over time and no difference was evident between groups (all $p < 0.05$). Total AUDIT scores for all participants were 17.7 ± 5. CK was elevated in the days following the game ($p < 0.001$).
Conclusions: Physical performance was not affected by participation in a game of senior club rugby, irrespective of post-game behaviour and possible muscle damage. AUDIT scores indicate that club rugby players may be at risk of serious alcohol related harm, with post-game binge drinking likely to be a major contributor.

1. Introduction

Alcohol is regularly consumed at hazardous levels by players of contact sport, particularly in the hours after a game.[1–3] Despite this customary behaviour there is a surprising lack of research into the effects such potentially detrimental conduct has on recovery from a game. Recently, a dose of 1 g of alcohol per kg bodyweight, when consumed after simulated[4] or competitive[5] contact team sport, was shown to have adverse effects on lower body muscular power in the days following the game. This dose has also been shown to detrimentally impact the magnitude of force loss when consumed after eccentric-exercise.[6,7] While together these studies suggest alcohol negatively impacts recovery and subsequent performance in the days after strenuous exercise, the doses of alcohol used to date are significantly less than those reported to be consumed by athletes involved with several football codes.[3,8]

While laboratory based studies allow for precise measurement of alcohol consumption, ethical limitations associated with the administration of high doses of alcohol and the fact normal alcohol-related behaviour may be altered in the laboratory setting makes investigating realistic doses of alcohol consumption, and subsequent behaviour, difficult.

For example, after a game large quantities of alcohol may be consumed at a self-administered rate and quantity over many hours resulting in disturbances in several normal behaviours including diet[9] and sleeping patterns.[10] It is difficult to replicate such behaviour in a laboratory and therefore the use of a "naturalistic" method, where the participant can dictate amount and rate of alcohol ingestion, is used when investigating alcohol consumption and its subsequent effects.[11] This method is limited to self-reporting alcohol consumption which, in itself, can be problematic.[12]

Utilising a naturalistic methodology, the aims of the present study were to (1) quantify habitual and post-game alcohol consumption amongst a group of senior rugby union players, investigate (2) whether the stress of a game of rugby is detrimental to subsequent physical performance and (3) whether normal post-game behaviour impacts recovery and subsequent performance in the days after a rugby game, when compared to a group undertaking optimal recovery strategies. It was hypothesised that rugby players would consume large amounts of alcohol in the hours after a game

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and that this behaviour would prove detrimental to performance in the days following the game.

2. Methods

Thirty male club rugby players (mean ± SD, age 21.2 ± 2.1 years, body mass 87.6 ± 6.0 kg, height 181.7 ± 6.2 cm) from two senior grade rugby teams volunteered to participate in this study. The study took place the week after the final game of the competitive rugby season. The teams participating in the study finished sixth and seventh in the local senior rugby competition and the final score of the game played for the purposes of this study was 9–6. All testing sessions were started at 0900 while the game was played between 1830 and 2000. Due to injury 4 players withdrew from the study after the game. Before the study, all procedures were explained and written informed consent was obtained from each participant. Participants then underwent familiarisation of all procedures used in the study. The study was approved by the University Human Ethics Committee.

Following the completion of the game participants were split by team into either the customary behaviour (CB; $n = 13$, 20.9 ± 2.1, body mass 87.1 ± 7.6 kg, height 181 ± 5.99 cm) or recommended behaviour (RB; $n = 13$, 21.5 ± 2.2, body mass 88.2 ± 4.2 kg, height 182.2 ± 6.89 cm) group. Such an allocation allowed all participants to compete in the one game, removing potential match related differences such as game intensity, weather and ground conditions.

Having abstained from strenuous exercise for 24 h, participants reported to the laboratory 66 h prior to the game to establish baseline measures. Participants completed a 24 h behaviour recall questionnaire and an Alcohol Use Disorders Identification Test (AUDIT) after which body mass, height, urine and blood samples and baseline performance measures were made. Urine and blood samples, performance measures and 24 h behaviour recall diaries were repeated at 13 and 37 h post-game.

Immediately following the rugby match, participants returned to the laboratory, urine and blood samples were taken and participants then split into their respective groups. The CB group left the laboratory to undertake whatever behaviour was typical for them after a game. The investigators had no contact with this group, or influence on their behaviour, until they returned to the laboratory 13 h post-game. The RB group remained in the laboratory where they were provided with a controlled meal and beverage containing 1 g CHO per kg body mass and 20 g protein.[13] The RB group then remained in the laboratory and were supplied with non-alcoholic beverages, which could be consumed *ad libitum*, and entertainment before being returned home to bed by 2300.

Creatine kinase (CK) activity was analysed as a marker of muscle damage. Venous blood was collected from the antecubital vein into 4 ml K_3EDTA vacutainer tubes (Beckton Dickinson, UK) which was then centrifuged at 4 °C for 10 min at 1650 g. Plasma was separated and frozen at −80° C for later analysis. A Vitalab Flexor clinical chemistry analyser (Vitel Scientific NV, Netherlands) and Roche CK-NAC liquid assay kit (Roche Diagnostics GmbH, Mannheim, Germany) were then used to determine CK activity. To analyse hydration status, a midstream urine sample was collected and analysed for urine specific gravity (U_{sg}) using a refractometer (Atago, Japan), calibrated with deionized water. U_{sg} was compared to the indices of hydration status.[14]

A behaviour recall questionnaire was completed by participants to provide information regarding hours of sleep and alcohol consumption for the previous 24 h period. Behaviour was categorised according to Table 1, and assigned an arbitrary ranking from 1 to 6 for statistical analysis. During baseline testing participants completed the AUDIT questionnaire,[15] allowing for analysis of habitual alcohol use. This test provides subscales to identify; hazardous alcohol use, dependence symptoms and harmful alcohol use.

Table 1
Categorisation of 24 h recall behaviour of alcohol (as standard drinks) and sleep hours.

Category	Alcohol (StD)	Sleep (h)
1	0	0
2	1–3	1–4
3	3–5	4–6
4	6–10	6–8
5	10–20	8–10
6	20 or more	10 or more

StD: standard drinks.

After completing the behaviour recall questionnaire and the collection of blood and urine samples, participants performed a 5 min warm up at 100 W on a cycle ergometer (Monark, Stockholm, Sweden), followed by stretching. Participants then completed 3 counter movement jumps (CMJ)[16] on an electronic jump mat (Smart Jump, Fusion Sport, Australia). Each jump was separated by 30 s and maximum jump height was recorded. Maximal isometric lower body (deadlift) force (LBF) was then measured using a custom made dynamometer consisting a modified barbell and chain connected to a calibrated, tension s-beam load cell (Muller, Germany) and platform. The load cell, in turn, was connected to a custom made amplifier and PowerLab data acquisition system (ADInstruments, Australia). Each participant was instructed on the proper technique of lifting during familiarisation. Participants performed 3 maximal efforts separated by 1 min of rest with the maximum value recorded. Finally, participants completed 6 m × 40 m sprints departing every 30 s, as described by Fitzsimons et al.[17] The protocol was electronically controlled and sprint times recorded by a photoelectric timing system (SmartSpeed, Fusion Sport, Australia). Each repetition time as well as total time spent running was recorded. Five min passive recovery was given between each performance test.

Data analysis was carried out using SPSS 18.0 (SPSS Inc., Chicago, IL). Changes in performance, CK, U_{sg} and behaviour recall were analysed using a two-way (group × time) repeated measures ANOVA. If significant main effects were found, Bonferroni *post hoc* analysis was performed to locate the differences. AUDIT questionnaire results were analysed using a one way ANOVA to establish whether any significant differences existed between each of the three subscales (hazardous alcohol use, dependence symptoms and harmful alcohol use). Students paired *T*-tests were used to identify between group differences in total AUDIT score. Data are reported as mean ± SD, with statistical significance set at $p < 0.05$.

3. Results

As hypothesised, the CB group reported consuming a large volume of alcohol after the game, compared to their baseline ($p < 0.01$) and 37 h ($p < 0.01$) values. The mean ranking of 5.6 ± 0.5 out of 6 is equivalent to a mean of just below 20 standard drinks. Eight of the 13 participants reported a ranking of 6 out of 6 for alcohol consumption post-game with the remaining participants reporting a ranking of 5. Similarly, the number of hours slept over that same period (2.3 ± 0.6, equivalent to 1–4 h sleep) was significantly lower than baseline ($p < 0.001$) and 37 h ($p < 0.001$) values. No difference in alcohol consumption or hours slept were reported for the RB group (both $p > 0.05$).

The competitive game of rugby had no effect on any of the measures of physical performance (Table 2) made in the current study. CMJ height was unchanged over time ($p = 0.497$) and no difference was observed between groups ($p = 0.855$). Similarly, no significant changes in LBF were evident over time ($p = 0.129$) or between groups ($p = 0.427$). No group × time interaction effect was observed for either CMJ ($p = 0.764$) or LBF ($p = 0.168$).