Journal of Science and Medicine in Sport 18 (2015) 268–271

Contents lists available at ScienceDirect

Journal of Science and Medicine in Sport

journal homepage: www.elsevier.com/locate/jsams

Original research

Effects of heavy episodic drinking on physical performance in club level rugby union players

Christopher Prentice, Stephen R. Stannard, Matthew J. Barnes*

School of Sport & Exercise, Massey University, New Zealand

ARTICLE INFO

Article history:
Received 4 December 2013
Received in revised form 11 April 2014
Accepted 17 April 2014
Available online 26 April 2014

Keywords:
Alcohol abuse
Rugby
Team sport
Anaerobic performance
Sleep
Hydration

ABSTRACT

Objectives: This study investigated the effects of acute alcohol consumption, in a natural setting, on exercise performance in the 2 days after the drinking episode. Additionally, alcohol related behaviours of this group of rugby players were identified.
Design: Prospective cohort study.
Methods: Nineteen male club rugby players volunteered for this study. Measures of counter movement jump, maximal lower body strength, repeated sprint ability and hydration were made 2 days before and in the 2 days following heavy episodic alcohol consumption. Participants completed a questionnaire at each time point so that alcohol consumption and sleep hours from the previous 24 h period could be quantified. Additionally, participants completed the Alcohol Use Disorders Test (AUDIT) prior to completing baseline measures of performance.
Results: Reported alcohol consumption ranged from 6 to >20 standard drinks (mean category scale score = 11–19 standard drinks). A significant decrease in sleep hours ($p = 0.01$) was reported after the drinking episode with participants reporting 1–3 h for the night. A significant reduction (-1.8 ± 1.5 cm) in counter movement jump ($p < 0.01$) the morning after the drinking episode was observed; no other measures were altered at any time point compared to baseline ($p > 0.05$). AUDIT scores for this group (18.2 ± 4.3) indicate regular alcohol consumption at a hazardous level.
Conclusions: Heavy episodic alcohol use, and associated reduced sleep hours, results in a reduction in lower body power output but not other measures of anaerobic performance the morning after a drinking session. Full recovery from this behaviour is achieved by 2 days post drinking episode.

1. Introduction

A strong association continues to exist between alcohol consumption and sport, particularly male dominated sports, such as the various football codes including rugby union.[1] While rugby union progressed from an amateur game in 1995 to a professional sport with growing global significance, the historical sub-culture[2] of rugby appears to have persisted. This sub-culture is evidenced by the reports of heavy, episodic (binge) drinking in both the scientific literature[3–5] and the often reported upon alcohol related misdemeanours of high profile, elite players. In recent years significant media attention has been given to the non-selection and/or suspension of high profile rugby union and rugby league players for alcohol fuelled late night breaches in team protocol. While significant harm, both physical and social,[6] are associated with such behaviour, little is known as to how this conduct, at realistic doses of alcohol in a natural environment, impacts physical performance in the days after the drinking episode.

Prentice et al.[5] recently described the effects, or lack thereof, of consuming very high volumes of alcohol in the hours after a rugby game. Heavy episodic drinking in the hours after the game had no effect on measures of strength, power, hydration, markers of muscle damage and repeated sprint ability in the days after the game, when compared to an optimal recovery strategy. Similarly, O'Brien[7] reported no effect of a range of self-administered doses (1 standard drink (StD) up to 38 StD) of alcohol on anaerobic performance the day after the drinking episode; aerobic performance however was significantly reduced at all levels of alcohol consumption. Prentice et al.[5] and O'Brien[7] used a naturalistic methodology so that the dose of alcohol and related behaviour was not influenced by the investigators, thus mimicking normal life. The background setting for each of these studies differed in that Prentice et al.[5] investigated the interaction between the stresses of a rugby game and alcohol use, while O'Brien[7] provided participants with money to purchase

* Corresponding author.
E-mail address: m.barnes@massey.ac.nz (M.J. Barnes).

http://dx.doi.org/10.1016/j.jsams.2014.04.009
1440-2440/

alcohol and asked them to consume alcohol at the level they would normally consume the evening before a rugby game. Therefore, each of these previous studies had a unique environment that may have altered normal social and alcohol drinking behaviour. The levels of acute alcohol consumption, independent of the influence of a rugby match (either pre or post), and its effects on performance is currently not known.

Alcohol use, particularly at high doses, is often associated with reductions in sleep quality and time.[8] Although sleep deprivation alone may not impact next day physical performance,[9,10] it is possible that the combination of alcohol consumption and sleep loss, which anecdotally is a common occurrence, may alter performance. Therefore, when investigating the effects of alcohol in a natural setting this relationship is worth consideration.

The objective of this study was to investigate alcohol use, both acute and chronic, in a group of young, male club rugby players, outside of a rugby related setting, and to better understand the implications acute alcohol consumption may have on physical performance in the days after the drinking episode. It was hypothesised that "normal" alcohol consumption would be at a hazardous level and that this behaviour would be associated with a reduction in sleep hours and impaired performance the morning after the drinking session, but not 2 days after.

2. Methods

Nineteen male senior club rugby players (mean ± SD, age 20.8 ± 1.6 years: mass = 88.5 ± 15.9 kg; height = 182 ± 5.9 cm) participated in this study. Participants were recruited from a local rugby club via an electronically distributed advertisement which was sent to club members (n = 60) whose rugby season was scheduled to finish two weeks before the study was carried out. Of this group, 25 players responded however due to other commitments and injury 19 participants completed the study. The study was carried out two weeks after the rugby season so that individual and team training would not be impaired by the restriction put on participants to avoid physical activity 24 h prior to baseline measures and then over the duration the trial. The study was scheduled around a single Saturday as this was the most common night for the participants to undertake their "normal" alcohol consumption as part of socialising with team mates and friends. Therefore, baseline measures were made on Thursday morning, between 11am and 12pm (PRE), and follow up measures were completed on Sunday (POST1) and Monday (POST2) mornings, at the same time of day. After written informed consent was obtained from all participants, familiarisation of all aspects of the study was carried out. The study was approved by the University Human Ethics Committee.

Using the methods previously described by Prentice et al.[5] participants were asked to undertake normal socialising, including alcohol consumption, on the Saturday. A "naturalistic" approach was taken so that participants were free to undertake normal behaviour without intervention by the researchers, other than when they presented to the laboratory for testing. Measures of counter movement jump height (CMJ), repeated sprint ability and lower body, maximal isometric strength and urine specific gravity (U_{sg}) were made at PRE, POST1 and POST2 time points.

At each time point, participants arrived at the lab and were asked to supply a midstream urine sample before completing alcohol consumption and sleep hours questionnaires. U_{sg} was analysed using a refractometer (Atago, Japan) which was calibrated against deionised water. U_{sg} was compared to published indices of hydration status[11]. Alcohol consumption (as number of StD) and sleep hours were self-reported using the classification method of Prentice et al.[5] Due to potential inaccuracies in self reporting the exact number of StD consumed during the period investigated, alcohol use was categorised using the following scale: 1 = 0 StD; 2 = 1–3 StD; 3 = 4–6 StD; 4 = 7–10 StD: 5 = 11–19 StD: 6 = 20 or more StD. Number of sleep hours were estimated using a similar scale: 1 = 0 h; 2 = 1–3 h; 3 = 4–6 h; 4 = 7–8 h; 5 = 9–10 h; 6 = more than 10 h sleep.

Participants then completed a 5 min warm up on a cycle ergometer (Monark, Sweden) at 70 W followed by a set routine of lower and upper body stretches, the same warm-up and stretching protocol was used for all testing sessions. Participants then performed 3 counter movement jumps; each jump was separated by 1 min rest and jump height was recorded using an electronic jump mat (Smart Jump, FusionSport, Australia). Participants were instructed to jump straight upwards, utilising a full arm swing, and land back on the mat with both feet at the same time, hips extended and knees slightly flexed so that flight time was accurately calculated.[12] Maximum jump height from the 3 attempts was used for analysis. Participants were then given 5 min passive rest before maximal isometric lower body force was measured using a custom made dynamometer.[5] Force output from the s-beam load cell (Muller Germany) was amplified via a custom made amplifier and displayed in Chart for Windows V7.1 (ADInstruments, Australia). The highest peak force of 3 attempts was used for analysis; each maximal effort was separated by 1 min rest. After another 5 min passive rest period, participants completed 6 m × 40 m sprints with each sprint departing every 30 s.[13] Sprint times were recorded with a photoelectric timing gate system (SmartSpeed, Fusion Sport, Australia). Time for each sprint and total time spent sprinting were recorded and used for analysis.

During the familiarisation process participants filled out the Alcohol Use Disorder Identification Test (AUDIT) so that alcohol related behaviours of this group could be quantified.[14] A total AUDIT score of 8 or greater indicates harmful alcohol use.[15]

Results were analysed using SPSS 18.0 (SPSS Inc., Chicago, IL.). Changes in physical performance measures, U_{sg}, alcohol behaviour and sleep hours were analysed using one-way (time) repeated measures ANOVA. Pearson product-moment correlation coefficient and Students paired T-tests, carried out in Microsoft Excel (V14.0.6), were used to investigate the relationship between sleep hours and alcohol consumption. Data are reported as mean ± SD, and statistical significance was set at $p < 0.05$.

3. Results

The players participating in this study reported consuming alcohol at 5.4 ± 0.7 out of a maximum of 6 on the alcohol consumption scale; this equates to, on average, between 11 and 19 StD consumed on the day. This volume was significantly different ($p < 0.01$) to the amount of alcohol participants consumed in the 24 h period prior to (1.0 ± 0) and after (1.1 ± 0.3) the Saturday drinking episode. Ten participants reported consuming 20 or more StD on the night, while 7 participants reported consuming between 11 and 19 StD, with the remaining 2 participants consuming between 6 and 10 StD in the evening.

A significant decrease in sleep hours ($p = 0.01$) was evident on the night of the drinking session compared to the previous Friday and following Sunday evenings. On the evenings prior to and after the evening of the drinking episode participants reported sleeping for 4.4 ± 0.5 and 4.4 ± 0.8 out of 6, respectively. These values equate to between 7 and 8 h sleep, however on the night of the drinking session participants sleep was reduced to just below 3 h sleep (2.9 ± 0.7 out of 6). Overall, hours of sleep was not correlated ($r = -0.08$) with level of alcohol consumption, however, paired T-tests revealed that those participants who reported consuming > 10 StD experienced significant sleep loss (10–20 StD 3.4 ± 1.0 out of 6, $p = 0.038$; >20 StD 3.3 ± 1.1 out of 6, $p = 0.005$).

The mean total AUDIT score reported by this group was 18.2 ± 4.3. The Hazardous drinking subscale was 9.0 ± 1.6, Dependence subscale was 3.7 ± 2.2 and Harmful subscale was