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Exercise-induced bronchoconstriction and exercise testing in an international rugby union team

Exercise-induced bronchoconstriction (EIB) is an acute, transient airway narrowing that occurs during or after exercise, defined as a ≥10% decline in forced expiratory volume in 1 s (FEV_1) after exercise.[1] Exercise-induced fatigue or dyspnoea due to EIB are often incorrectly attributed to deconditioning.[2] In elite athletes, EIB has a prevalence of 7–50%.[3] The prevalence of EIB in rugby union players has not been reported despite the sport's popularity, with >2 million players worldwide. We developed a rugby-specific exercise protocol and questionnaire to measure the prevalence of asthma/EIB in all players in the Irish Senior Rugby squad who attended preseason training.

The exercise protocol differed from regular field or laboratory-based testing, reflecting the type of exertion experienced by elite rugby players where whole-body musculature is recruited.[4] The combination of sport-specific manoeuvres and sprinting with a 4 kg exercise ball was designed to provoke 8 min of hyperpnoea (as per field testing guidelines). Pre-exercise and postexercise spirometric data were measured using a calibrated, computerised, pneumotachograph spirometer. Exertion was quantified using rates of perceived exertion, in-test heart rate and serum lactate levels (for additional methodology see supplementary material online). Players were grouped into two cohorts; an airflow obstruction group (AOG) included players with a previous diagnosis of asthma/EIB or spirometric airflow obstruction, and a non-airflow obstruction group (NAOG) included players with no history of asthma/EIB and normal spirometry.

Forty-two players were assessed with comparable levels of exertion in both groups (table 1). Twelve players (29%) demonstrated baseline airflow obstruction. The group consisted of seven players previously diagnosed with asthma/EIB who used their regular inhaled treatment at the time of testing (salbutamol (n=7), salmeterol/fluticasone combination (n=3) and salbutamol, salmeterol/fluticasone and montelukast (n=1). In this group, four (57%) had a >10% drop in FEV_1 after exercise challenge, despite regular therapy. Three additional players who had a positive exercise challenge test had a previous diagnosis of asthma but no longer took regular inhaled treatment. One of these had spirometric airflow obstruction before testing and a second had a strongly positive response to exercise challenge (FEV_1 decreased 18%). Two further athletes with no previous history of asthma/EIB were positive after exercise challenge.

Table 1 Player anthropometry, levels of exertion (heart rate and levels of perceived exertion) and spirometry

Characteristics	All (n=42)	NAOG (n=30)	AOG (n=12)	
Mean (range) (SD)				
Age (years)	26.5 (20–33) (±2.8)	26.1 (20–33) (±2.7)	27.6 (23–30) (±3.1)	
Height (m)	1.86 (1.72–1.98) (±0.06)	1.87 (1.77–1.96) (±0.06)	1.83 (1.72–1.98) (±0.06)	
Weight (kg)	99 (73–116) (±10.9)	101 (83–116)(±11.2)	95 (73–116) (±9.5)	
Heart rate (bpm)	175 (156–195) (±9)	174 (156–195) (±9)	176 (162–192) (±9.1)	
Perceived exertion	15.6 (14–18) (±0.9)	15.5 (14–17) (±0.9)	15.8 (15–18) (±0.9)	
Lactate	11.3 (5.7–16.2) (±2.3)	11.3 (8.1–16.2) (±2.1)	11.2 (5.7–15.8) (±2.3)	
Symptoms				p Value*
Wheezing	7 (17%)	2 (7%)	5 (42%)	0.006
Woken by dyspnoea	4 (10%)	0	4 (33%)	0.001
Attack of dyspnoea	5 (12%)	1 (3%)	4 (33%)	0.001
Atopy	6 (10%)	4 (13%)	2 (17%)	0.78
Pneumonia	4 (10%)	2 (7%)	2 (17%)	0.318
Dyspnoea postexercise	8 (19%)	3 (10%)	5 (42%)	0.015
Cough postexercise	13 (31%)	6 (20%)	7 (58%)	0.047
Spirometry; litres ±SD (% predicted±SD)				
FEV_1 pre-exercise	4.73±0.73 (100±12.63)	4.8±0.62 (100±11.8)	4.53±0.96 (98±14.9)	
FEV_1 postexercise	4.66±0.79 (98±14.1)	4.86±0.62 (101±12.3)	4.14±0.93 (90±15.7)	
FVC pre-exercise	5.88±0.79 (104±10.5)	5.79±1.04 (105±11.2)	5.92±0.68 (102±10.4)	
FVC postexercise	5.81±0.82 (102±10.8)	5.52±1.06 (100±11.7)	5.93±0.68 (103±10.6)	

*Pearson χ^2 test.
AOG, airflow obstruction group; FEV_1, forced expiratory volume in 1 s; FVC, forced vital capacity; NAOG, non-airflow obstruction group.

Wheeze was reported by 42% (n=5) of the AOG and 7% (n=2) of the NAOG (p=0.006). Exercise-increased dyspnoea (42% vs 10%; p=0.015) and cough (58% vs 20%; p=0.047) were reported in the AOG versus the NAOG (table 1).

Asthma/EIB is common in professional rugby players (29% vs 12–15% of the general population),[5] often occurring despite standard treatments. Exercise performance poorly reflects airflow obstruction. Wheeze, being woken from sleep by dyspnoea and cough postexercise are important symptoms in rugby players which, if present, warrant further investigation. The high prevalence of asthma/EIB in this study supports routine testing in professional rugby union players. We propose a sport-specific screening challenge that is acceptable to players/medical staff and compliant with World Anti-Doping Authority testing criteria. Spirometry with reversibility and/or inhalation challenge may prove useful where exercise challenge testing is non-diagnostic but players' symptoms suggest asthma/EIB.

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Corrections

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Polverino E, Dambrava P, Cilloniz C, *et al*. Nursing home-acquired pneumonia: a 10 year single-centre experience. *Thorax* 2010;**65**:354–59. The correct affiliation for affiliation 1 should have read "Respiratory Department, Hospital Clinic-IDIBAPS, Barcelona-Spain, Centro de Investigación Biomedica En Red-Enfermedades Respiratorias (CibeRes, CB06/06/0028, el Ciberes es una iniciativa del ISCIII) – 2009SGRQ - http://www.idibapsrespiratoryresearch.org."

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Lyons A, McNeill A, Chen Y, *et al*. Tobacco and tobacco branding in films most popular in the UK from 1989 to 2008. *Thorax* 2010;**65**:417–22. There is an error in figure legend 2 which currently reads "Trends in all tobacco intervals and tobacco use intervals per hour per **day** by British Board of Film Classification (BBFC) category (all figures expressed as means)." It should have read: " Trends in all tobacco intervals and tobacco use intervals per hour per **year** by British Board of Film Classification (BBFC) category (all figures expressed as means)."

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Kemp SV, El Batrawy SH, Harrison RN, *et al*. Learning curves for endobronchial ultrasound using cusum analysis. *Thorax* 2010;**65**:534–8. The author name A Roselli should have read A Rosell.