

Impact case study (REF3)

Institution: University of Kent		
Unit of Assessment: 24: Sport and Exercise Sciences, Leisure and Tourism		
Title of case study: Improving Respiratory Care in Athletes by Internationally Informing Best Practice and Influencing Anti-Doping Regulations		
Period when the underpinning research was undertaken 2013-2018		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Prof. John Dickinson	Professor in Sport and Exercise Sciences	2012-present
Period when the claimed impact occurred: August 2013-2020		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact (indicative maximum 100 words)		
<p>The University of Kent's Respiratory Clinic, established in 2013, is now recognised internationally as a leader in research and consultancy in respiratory care for athletes. Findings from Professor Dickinson's clinical research on respiratory care in athletes and the use of asthma therapy have led directly to changes to World Anti-Doping Agency and UK Anti-Doping policy on the use of asthma therapy by athletes.</p> <p>In addition, Dickinson and his team have helped a number of leading national and international sports governing bodies and professional associations to improve the respiratory care received by their athletes. Through undertaking research-based assessments and providing training and resources for practitioners and policymakers, Dickinson and the Kent Respiratory Clinic have advanced the practice, thinking, and strategies of the GB Swimming Team, the Football Association, GB Cycling, GB Boxing, UK Athletics, Arsenal FC, Liverpool FC, the English Institute of Sport, USA Cycling, England Rugby Union, and Swim Ireland.</p>		
2. Underpinning research (indicative maximum 500 words)		
Screening and Identifying Respiratory Issues in Athletes		
<p>In 2014-15, in the build-up to the 2016 Rio Olympic Games, Dickinson led the first ever study screening the entire GB boxing and swimming teams for asthma-related conditions. Athletes underwent assessments for airway inflammation and maximal lung function and completed an objective airway challenge (Eucapnic Voluntary Hyperpnoea) to trigger an asthmatic response in those with an asthma-related condition. The research was undertaken in response to previous studies that found that poor respiratory care provision, misdiagnosis, and respiratory symptoms were more common in high-level athletes. Data from the screening undertaken by Dickinson demonstrated that while elite boxers (8% prevalence) were no more likely to have an asthma-related condition than the general population (approximately 9%), prevalence among the GB swimming team was 69%. Of the swimmers with an asthma-related condition, 19 (63%) had no previous history or diagnosis [R1].</p> <p>This research provided significant new evidence of the importance of appropriate screening protocols to ensure all elite athletes' airway health is appropriately cared for. A follow-up study conducted in 2017, using similar objective assessments, identified for the first time that the prevalence of asthma-related conditions in a large cohort of elite footballers (28%) was greater than the general population in the UK [R2]. This latter research again identified that a large proportion (37%) of the players detected with an asthma-related condition did not have a previous diagnosis. Furthermore, the study established for the first time that appropriate management of asthma-related conditions using inhaler therapy significantly improved players'</p>		

respiratory health, demonstrated by reductions in asthma severity and improved aerobic fitness [R2].

Investigating whether Asthma Therapy Has an Ergogenic Action

In **2013-14**, Dickinson led an investigation by the Respiratory Clinic into the potential for asthma therapy to have an ergogenic action in non-asthmatic athletes [R3-R6]. Participants in these studies inhaled large maximally permitted doses of asthma therapy (salbutamol) up to 1600µg, either acutely or over a six-week period. The investigations established that using doses of inhaled salbutamol permitted within the World Anti-Doping Agency (WADA) Code does not improve athletes' endurance, strength, or power performance; but, when athletes lose approximately 5% body mass via water loss (i.e. sweating), and use the upper permitted dose of inhaled salbutamol (1600µg), the urine concentration of salbutamol rises above the permitted level, making the athlete at risk of committing a doping violation. The findings were, and still are, extremely significant in demonstrating that athletes using therapeutic doses of permitted asthma therapy inhalers do not experience a performance enhancement beyond preventing their asthma condition, and, should not, therefore, be restricted during competition. When the research was published in **2014**, it demonstrated to the World Anti-Doping Agency that the current upper permitted dose of salbutamol, accompanied with an acute loss in body mass from dehydration, could result in an athlete providing an adverse analytical finding and a potential anti-doping sanction [a].

3. References to the research (indicative maximum of six references)

All Kent staff working in the Respiratory Clinic are highlighted in bold with other names comprising contributors from within the various governing bodies and professional associations with whom we collaborated.

[R1] **Levai, Irisz Karolina**, Hull, James H., Loosemore, Mike, Greenwell, Jon, Whyte, Greg, and **Dickinson, John W.** (2016). 'Environmental influence on the prevalence and pattern of airway dysfunction in elite athletes', *Respirology* (Carlton, Vic.). ISSN 1440-1843. <https://doi.org/10.1111/resp.12859>

[R2] **Jackson, Anna**, Hull, James, **Hopker, James G.**, and **Dickinson, John W.** (2018). 'Impact of detecting and treating exercise-induced bronchoconstriction in elite footballers', *European Respiratory Journal Open Research*, 4 (2). <https://doi.org/10.1183/23120541.00122-2017>

[R3] **Dickinson, John W.**, Hu, Jie, Chester, Neil, Loosemore, Mike, and Whyte, Greg (2014). 'Impact of ethnicity, gender, and dehydration on the urinary excretion of inhaled salbutamol with respect to doping control', *Clinical Journal of Sport Medicine*, 24 (6), pp. 482-489. ISSN 1536-3724. <https://doi.org/10.1097/JSM.0000000000000072>

[R4] **Dickinson, John W.**, Molphy, John, Chester, Neil, Loosemore, Mike, and Whyte, Greg (2014). 'The ergogenic effect of long-term use of high dose Salbutamol'. *Clinical Journal of Sport Medicine*, 24 (6), pp. 474-481. ISSN 1050-642X. <https://doi.org/10.1097/JSM.0000000000000076>

[R5] Molphy, John, **Dickinson, John W.**, Chester, Neil, Loosemore, Mike, and Whyte, Greg (2016). 'The Effect of 400 µg Inhaled Salbutamol on 3 km Time Trial Performance in a Low Humidity Environment', *Journal of Sports Science & Medicine*, 16. pp. 581-588. ISSN 1303-2968. <https://kar.kent.ac.uk/65965/>

[R6] **Dickinson, John W.**, Hu, Jiu, Chester, Neil, Loosemore, Mike, and Whyte, Greg (2014). 'Acute impact of inhaled short acting b2-agonists on 5 km running performance', *Journal of Sports Science & Medicine*, 13 (2). pp. 271-279. ISSN 1303-2968. <https://kar.kent.ac.uk/43896/>

4. Details of the impact (indicative maximum 750 words)

Since 2013, the Respiratory Clinic has seen more than 1,500 athletes from across the UK, Europe, the USA and Australia. The Clinic supported a significant number of the Team GB athletes who competed at the 2016 Rio Olympic and Paralympic Games, and continues to do so for the 2021 Olympic Games. As a result of his research on diagnosis and management of asthma-related conditions, Professor Dickinson has provided consultancy and advice to sports governing, professional, and regulatory bodies, and respiratory clinics, both in the UK and overseas. In addition, the Respiratory Clinic provides bespoke training for sports medicine practitioners, sports physiotherapists, respiratory physiotherapists, and sports scientists, based on Dickinson's research. Below is a selection of examples of how Dickinson's research and expertise has significantly influenced these stakeholders.

Influencing International Athlete Anti-Doping Policy

As a result of Dickinson's research investigating the ergogenic action of asthma medication [R3-R6], in 2017 WADA modified the maximum permitted dose of inhaled salbutamol from 1600µg in a 24-hour period to 800µg in a 12-hour period, as well as the analysis of urine to account for hydration status [a]. This regulatory change has impact for every sport and for every athlete who competes under international anti-doping rules set by WADA. The WADA Senior Director for Sciences and International Partnerships has stated:

'Dr. Dickinson's and his colleagues' research has had a significant impact on the debates [... and] the decisions made by the WADA in 2017 to modify the maximum permitted dose of inhaled salbutamol to 800 µg in a 12-hour period. WADA has recently (2019) also modified the analysis of salbutamol in urine to account for hydration status, and the research from Dr. Dickinson and his colleagues continues to play a part in informing the updated guidelines' [a].

Since 2018, Dickinson has been invited to sit on the United Kingdom Anti-Doping Agency (UKAD) Respiratory Steering Panel. The Head of Science and Medicine at UKAD has commented that Dickinson's contribution to this panel 'informed our knowledge and thinking around the diagnosis and management of respiratory conditions [... and] has enabled us to refine our existing policies' [b].

In 2017, Dickinson was called upon to advise the House of Commons Culture, Media and Sport Select Committee on issues related to athlete doping within British Cycling. Dickinson's advice prompted the Committee to question management teams in elite sport on their approach to respiratory issues and informed the consequential report on 'Combatting Doping in Sport' issued in 2018 [c].

Advancing Respiratory Care in Elite Athletes

Since August 2013, Dickinson and his team have worked extensively on an ongoing basis with numerous GB and elite teams, including the GB Swimming Team, the Football Association, GB Cycling, GB Boxing, UK Athletics, Arsenal FC, and Liverpool FC. Each team has adopted the Clinic's research findings and changed how they manage and detect respiratory issues in their elite athletes. For example:

- For the GB Swimming Team, research by the Respiratory Clinic [R1] was used to demonstrate the impact of providing objective airway assessments for swimmers in the build-up to the Rio 2016 Summer Olympic Games. This led the team to change their athlete respiratory care strategy, implement screening practices, and better monitor appropriate therapy use, with Dickinson's guidance (2014-present) [d]. Research by Dickinson and his team indicated that athletes based at the Bath National Centre had increased airway inflammation compared with those at other centres; this contributed to a successful £5 million bid in 2016 to renovate the swimming pool and improve the pool environment [d]. Since 2016, the Clinic has continued its support for GB Swimming throughout their

preparations for the 2021 Olympic Games. GB Swimming's Athlete Health Lead said that Dickinson 'has been hugely influential in how we best manage our swimmers' respiratory health and in educating both myself as well as the coaches and athletes [...] helping us developing a programme to re-train'; and that 'everything that [they] now do has evolved from the work we've done with John [Dickinson] over the last number of years' [e]. Similarly, a member of the GB Swimming Team noted that she 'definitely wouldn't be in as good a place as [she is] today without seeing John Dickinson and getting the help from him'; that she is 'racing a lot better and finding breathing in the pool a lot easier'; and that 'all the help and feedback [she] got from John Dickinson [she will] definitely use for the rest of [her] career' [e]. Furthermore, as a result of such improvements, the team's Chief Medical Officer identified that since **2018** the team have endorsed the therapy and management practices they have learned from Dickinson throughout their feeder squads across England and Wales Swimming [d].

- In **2018** the England Men's Football Team adopted respiratory screening for their players ahead of the 2018 World Cup for the first time, as a result of collaboration with Dickinson [f]. The Team's Lead Performance Doctor emphasised that: 'as a direct consequence of this research [R2], we have worked directly with [Dickinson] in the build up to the 2018 FIFA World Cup in Russia to ensure those players requiring therapy are using it appropriately and their airway health is optimised' [f]. The Lead Performance Doctor endorsed the benefits of this change of practice by stating that the team have 'benefitted by some of the players with EIB receiving a secure up-to-date diagnosis, which we have been able to act on ensure their inhaler therapy is optimised' [f].
- In the build-up to the Tokyo 2021 Summer Olympic Games, Dickinson delivered consultancy and workshops to practitioners working within GB Cycling, based on his research into providing appropriate respiratory care for elite athletes [R1, R2]. The Head of Medical Services at GB Cycling commented: 'through application of the learning and knowledge we acquired in the workshop and from Dr. Dickinson, our team have developed and delivered new protocols [...] to better support our riders – new methods that have resulted in riders reporting less respiratory symptoms during training and improved their preparation for the upcoming Olympics' [h].

Informing the Management of Respiratory Care and Best Practice

Through the Respiratory Clinic, Dickinson works extensively with a number of national and international sports governing bodies, including USA Cycling, England Rugby Union, and Swim Ireland, sharing research findings to inform respiratory care and practice. For example, the Director of Athlete Health for the English Institute of Sport (EIS) – which works with sports science and medicine practitioners across over 35 Olympic and Paralympic sports – said that as a direct consequence of the Clinic's research and collaboration since **2018** they have 'offer[ed] diagnostic assessments for athletes within the EIS system to ensure [they] are addressing their respiratory health and providing appropriate management' [g].

In **2018**, the Clinic was commissioned by the EIS to collaborate on a £800,000 project investigating respiratory health and acute airway infection, founded on the Clinic's respiratory care management principles and techniques. The EIS reported that they: 'valued [Dickinson's] input into [its] design and operation that is contributing to the improved management and understanding of respiratory illness, the leading cause of restricted athlete availability for preparation and performance' [g].

As evidence of the reach of the impact of his research, internationally based Sports Medicine clinics have sought Dickinson's advice to deliver similar Respiratory Clinic services (e.g. Norway, Qatar). For example, the pulmonary laboratory at the Norwegian School of Sport Sciences is used to treat and diagnose Norwegian national team athletes, and through collaboration with them 'Dr Dickinson's research, clinical experience and research-based advice has informed the development of practices across Norway for the improvement of [their]

athletes' respiratory health and performance as they prepare for the World championships and the next summer and winter Olympics' [i].

5. Sources to corroborate the impact (indicative maximum of 10 references)

[a] Letter of Support and Guidelines: Senior Executive Director, Sciences & International Partnerships, World Anti-Doping Agency. Describes the impact that Professor Dickinson's and his colleagues' research has had on WADA's thinking and policy decision-making.

[b] Letter of Support: Head of Science and Medicine, UK Anti-Doping Agency. Identifies that Professor Dickinson informed UKAD's knowledge and thinking around the diagnosis and management of respiratory conditions.

[c] House of Commons Report: Digital, Culture, Media and Sport Committee: Combatting Doping in Sport Report. Professor Dickinson's research and contributions are referenced on pp. 22 & 36.

[d] Letter of Support: Chief Medical Officer, British Swimming. Describes Professor Dickinson's influence on the GB Swimming programme since 2014.

[e] Letter of Support: Athlete Health Lead, British Swimming. Confirms testimonials from interview recordings conducted in May 2020 with a GB Swimming Athlete, the Athlete Health Lead, and the Chief Medical Officer.

[f] Letter of Support: Men's Lead Performance Doctor, FA England Football Team. Describes Professor Dickinson's contributions to the England Football Team's knowledge and strategy for dealing with EIB in their football players.

[g] Letter of Support Evidence: Director of Athlete Health, English Institute of Sport. Establishes the impact of Professor Dickinson's work on the practices and thinking of the EIS.

[h] Letter of Support: Head of Medical Services, British Cycling. Describes the influence of Professor Dickinson in shaping and informing the GB Cycling team's knowledge of, and practices for, the respiratory care of its riders.

[i] Letter of Support: Sports Medicine Clinic, Norwegian School of Sports Sciences. Confirms the influence of Professor Dickinson in supporting the development of new respiratory care services internationally.