

Institution: University of Edinburgh		
Unit of Assessment: 24 (Sport and Exercise Science, Leisure and Tourism)		
Title of case study: Enhancing professional judgement and decision making expertise in hyperdynamic environments inside and outside the world of sport		
Period when the underpinning research was undertaken: 2004 – 2020		
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:
Professor Dave Collins	Professorial Fellow in Human Performance Management	10/1998 – 3/2005 and 4/2019 – present
Dr Amanda Martindale	Senior Lecturer in Sport & Performance Psychology	8/2006 – present
Mr Hugh Richards	Senior Lecturer in Sport & Exercise Psychology	10/1999 – present
Period when the claimed impact occurred: 1/08/2013 – 31/12/2020		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact		
<p>Over the past 8 years, the Human Performance Science research group's work has had a demonstrable impact on enhancing professional judgement and decision making (PJDM) expertise in hyperdynamic environments, both inside and outside sport. These environments are characterised by time-pressured decision making, uncertainty, ill-defined and competing goals, high stakes, and stressful field conditions. Research in sport and performance psychology has established new evidence, which has been applied and had impact to:</p> <ul style="list-style-type: none"> • advance sports coaching policy and practice to develop more than 3,000 practitioners' judgement and decision making, who in turn provide courses to more than 25,000 individuals across the UK each year; • change Scottish Police Authority Forensic Services' policy (by embedding PJDM in standard operating procedures) and influence the development of internal training programmes to enhance professional judgement among 120 crime scene examiners who make vital decisions at approximately 25,000 crime scenes across Scotland each year; • inform the UK National Organ Retrieval Service's decision to reassess a proposed reconfiguration which, based on the researchers' new findings, was predicted to compromise the success of more than 5,000 organs retrieved for transplant each year. 		
2. Underpinning research		
<p>Over the past 16 years, Collins and Martindale have worked together to advance the study of professional judgement and decision making (PJDM) expertise in applied sport psychology and sports coaching, and in other hyperdynamic environments beyond sport. Their collaboration continued during Collins' time away from the University of Edinburgh from 2005-2019, and since his return.</p>		

Introducing PJDM to applied sport psychology and sports coaching

Collins and Martindale were among the first to promote the need to explore how applied sport psychologists and sports coaches form judgements and make decisions about their practice. Their body of work published from 2005 onwards, which coined the term PJDM, promoted the concept as a way of advancing training, evaluation, and practice for professionals.

Collins, Martindale and colleagues' 2014 paper challenged the prevalent competency-based training models used in sports science, medicine, and coaching, which focus on observable behaviours to assess practitioners' development (3.1). Their 2018 paper further highlighted the role of PJDM in underpinning an expertise-based approach for "raising our game" in training applied sport psychologists (3.2). Both papers argued that an expertise-based approach, focused on developing adaptive thinking and professional judgement, would better prepare practitioners. They promoted complex decision making and proactive experimentation as essential for providing consistently optimal support in the dynamic and uncertain contexts of sport.

Martindale's collaborative research published in 2019 explored UK trainee sport and exercise psychologists' perspectives on developing PJDM expertise (3.3). A longitudinal, qualitative data set was established by tracking 7 trainees over a 3-year training period. Participants reported that the use of experience, analytical reasoning, and observation of other practitioners were useful for accelerating the development of PJDM expertise. The paper re-iterated an earlier call made by Collins and Martindale to use knowledge elicitation techniques such as applied cognitive task analysis (ACTA) to capture and disseminate the knowledge used during experts' decision making.

Collins' recent collaborative research published in 2020 enabled the development of adventure sport coaches' PJDM using a structured approach to critical reflection termed the "Big 5" (B5) (3.4). After training on the B5, 38 Senior Instructors used the approach for a 12-month period as an experiential method of enhancing PJDM. Following the intervention, interviews were conducted with 4 Heads of Centre and 5 Learning and Adventure Managers who reported that the adventure sport coaching professionals at their centres found the B5 approach to be positive and adaptable to underpin their work in these hyperdynamic, high-stakes environments.

Applying PJDM research to hyperdynamic environments outside sport

In 2013 the Scottish Police Authority Forensic Services (SPA FS) approached Martindale and Collins to identify the cognitive demands on PJDM in crime scene examiners for the first time. Funded by a University of Edinburgh College Knowledge Exchange grant and the Scottish Institute for Policing Research (SIPR), the research used ACTA methods to access the knowledge and PJDM of 6 of Scotland's most senior scene examiners. The methods which helped to identify the cues and strategies needed to effectively perform forensic recovery, included retrospective recall and simulations of crime scenes. The researchers used these data to develop a scenario-based training tool for crime scene examination response to major incidents and licensed it to SPA FS. The 2017-published study illuminated how experienced professionals make judgements and decisions at crime scenes (3.5).

Subsequently, Martindale and colleagues' further research employed the ACTA methods to identify the cognitive demands on PJDM in transplant surgeons and scrub nurse practitioners, and used a simulation study to assess organ retrieval team performance. Consequently, in 2016 the UK National Organ Retrieval Service (NORS) commissioned Martindale, Richards and PhD student Gala Morozova to undertake evaluative research to determine how a proposed change to their service delivery model would affect team performance. The "Vanguard Study" published in 2020 (3.6) evaluated the performance of 56 abdominal and 54 cardiothoracic teams attending UK multiorgan retrievals. This was the first large-scale study in the world to examine human performance during organ retrieval, using data from psychometric scales, qualitative comments, and quantitative outcome measures. Findings identified significant negative impacts of the new model on team performance.

3. References to the research

3.1 **Collins, D.**, Burke, V., **Martindale, A.** & Cruickshank, A. (2014). The Illusion of Competency Versus the Desirability of Expertise: Seeking a Common Standard for Support Professions in Sport. *Sports Medicine*. 45, 1-7. <https://doi.org/10.1007/s40279-014-0251-1>

3.2 Cruickshank, A., **Martindale, A.** & **Collins, D.** (2018). Raising Our Game: The Necessity and Progression of Expertise-Based Training in Applied Sport Psychology. *Journal of Applied Sport Psychology*, 32(3), 237-255. <https://doi.org/10.1080/10413200.2018.1492471>

3.3 Smith, M., McEwan, H., Tod, D. & **Martindale, A.** (2019). UK Trainee Sport and Exercise Psychologists' Perspectives on Developing Professional Judgment and Decision-Making Expertise During Training. *The Sport Psychologist*, 33, 334-343. <https://doi.org/10.1123/tsp.2018-0112>

3.4 **Collins, D.** & Collins, L. (2020). Developing Coaches' Professional Judgement and Decision Making: Using the "Big 5". *Journal of Sport Sciences*, 39(1), 115-119. <https://doi.org/10.1080/02640414.2020.1809053>

3.5 **Martindale, A.**, **Collins, D.**, & Morton, V. (2017). Cognition at the Crime Scene: Identifying Cognitive Demands on Professional Judgement & Decision Making Expertise of Crime Scene Examiners. Paper in conference proceedings of 13th International Conference on Naturalistic Decision Making, Bath, UK. 20-23 June 2017 (Can be supplied by HEI on request).

3.6 Morozova, G., **Martindale, A.**, **Richards, H.**, Stirling, J., McIntyre, C. & Currie, I. (2020). The Vanguard Study: Human Performance Evaluation of UK National Organ Retrieval Service Teams Utilizing a Single Scrub Practitioner in Multiorgan Retrieval. *Transplantation*. <https://doi.org/10.1097/TP.0000000000003385>

4. Details of the impact

Impact on UK sports coaching policy and practice

Collins and Martindale's research (3.1, 3.2, 3.3, 3.4) demonstrated the need to improve PJDM training and evaluation for sports practitioners. This influenced the UK Strength and Conditioning Association (UKSCA) to incorporate the approach into its systems. In collaboration with the Chartered Institute for the Management of Sport and Physical Activity, UKSCA have built PJDM and expertise ideas into a new, multi-tier accreditation process for its more than 2,500 members [5.1]. These coaches work in professional sports clubs, institutes and training gyms across the UK. In a December 2020 letter, the UKSCA Executive Officer commended the research for providing a *"strong evidence base which enables us [UKSCA] to move beyond the simple competency frameworks which have dominated work in British coaching"*. She also said the research offered *"very practical and face-valid methods through which these aspects can be operationalised, taught and evaluated"*, which *"impact on the quality and efficacy of training for the vast majority of professional, Olympic and Paralympic athletes"* in the UK [5.1].

The UK's national outdoor centre, Plas y Brenin in Wales, introduced PJDM to its training and assessment of outdoor sports professionals [5.2]. The change was a direct consequence of the researchers' work to establish the value of PJDM development among sports practitioners (3.1, 3.2, 3.3, 3.4). The centre provides courses for more than 3,000 people each year, in areas such as climbing and kayaking.

In a March 2020 letter, the Plas y Brenin Director of Learning and Development explained the organisation needed *"a strong evidence base to underpin the content and method of our planned [training] activities."* He also stated that the PJDM work provided Plas y Brenin *"with a tool which acknowledges and caters for the full complexity of coaching"* and commended the approach in

allowing *“for the hyperdynamic, high stakes environments which characterise adventure sports”* [5.2].

Since 2018, The Outward Bound Trust has also applied PJDM approaches set out in the research (3.1, 3.2, 3.3, 3.4) in its work with more than 25,000 individuals each year. In an April 2020 testimony, the educational charity’s Director of Learning and Adventure wrote: *“Over the past 18 months, our Heads of Centre and Learning and Adventure Managers have been using the PJDM approach and the ‘Big 5’ method as the basis for increased conditionality and consideration in their coaching.”* He also explained how the PJDM approach had encouraged staff to consider *“their own and others’ practice with a critical eye”* [5.3].

Impact on crime scene examination policy and practice in Scotland

Encouraged by the insight offered by the PJDM research on previously hard-to-reach “covert” thought processes, Scottish Police Authority Forensic Services (SPA FS) approached Martindale and Collins to expand on their previous work in further, collaborative research that “made thinking visible” by capturing the knowledge and PJDM of highly experienced crime scene examiners (3.5). Funded by a GBP9,425 ESRC Impact Acceleration Account grant, this project mapped the cognitive demands of a further 6 of Scotland’s most senior scene examiners and, together with SPA FS, considered how these findings could be used to accelerate PJDM expertise in the workforce.

This research, which generated an expert knowledge base of over 60% of the Scene Examination Supervisors in Scotland, provided SPA FS with a unique opportunity to invest in their people and incorporate PJDM into multiple facets of the organisation. This research has not only raised understanding of the cognitive demands in crime scene examination, but has led to cultural and policy changes, particularly around the training of scene examiners in Scotland [5.4]. Importantly, the increased level of preparedness of 120 crime scene examiners, who attend approximately 25,000 incidents each year, has contributed to the wider Criminal Justice System and to the Public of Scotland. Specifically, the research led to changes in three critical areas:

1. It developed a scenario-based training tool for major incidents which allowed the SPA FS to identify differences in PJDM application and staff proficiency in different geographic regions of Scotland, and focus training needs in these areas.
2. It enabled SPA FS to harmonise its approach to major incidents, strengthening and standardising its contribution to police investigations.
3. It influenced the development of internal training courses. Since 2018, the SPA FS has delivered a PJDM course for Level 1 Scene Examiners. It also introduced PJDM and scenario-based training to its 2019-20 Level 2 course on serious and major crime [5.4, 5.5].

In April 2019, SPA FS revised its pay and reward staff evaluation process to include an assessment of PJDM activities [5.5]. In the same month, SPA FS’ Head of Scene Examination wrote: *“we have been able to harmonise our initial approach to complex and major incidents which has strengthened and simplified team-working dynamics, and improved effective deployment of resources from different areas [and] has standardised our contribution to the Police investigation, [as] evidenced by positive feedback from our Criminal Justice partners”* [5.5].

Impact on policy and practice in UK organ retrieval teams

The Vanguard Study (3.6), which was supported by a GBP7127 ESRC Impact Acceleration Account grant, has increased the understanding and awareness of how proposed changes to the NORS delivery model affect staff from a performance psychology perspective. The research informed policy recommendations that all 16 NORS teams across the UK should remain in standard configuration rather than adopt the new model. This research demonstrated that NORS teams were better able to cope in the standard configuration compared to the new model, and

that the proposed change would likely have a negative impact on NORS staff capacity to achieve and maintain high performance standards in this highly pressured environment.

The “Update on Vanguard Project” report presented to the NORS Workforce Transformation Project Board cites the performance psychology research carried out by the Human Performance Science research group at the University of Edinburgh and highlights that this robust methodology informed their recommendation to remain in standard configuration [5.6]. In February 2018, the Retrieval and Transplant Project Lead Specialist noted that *“this was the first behavioural research project ever undertaken within the UK organ retrieval service, which is a major innovation”* [5.6].

Without the Vanguard Study there would be no evidence to determine the correct way forward, so this research has directly informed the decision making of NORS. The health implications are significant given that effective retrieval is essential for these organs to be preserved and viable for transplantation. More than 5,000 organs are retrieved for transplant in the UK each year, which saves lives and improves people’s quality of life. The NORS Service Lead wrote: *“The Vanguard Study... developed an entirely new evidence base which allowed clear decisions to be made about implementation”*. They also explained: *“this study was a landmark in establishing the role of performance research in shaping retrieval practice”* [5.7].

5. Sources to corroborate the impact

5.1 Testimony from the UKSCA Executive Officer, 23rd December 2020

5.2 Testimony from the Plas-y-Brenin National Outdoor Centre Director of Learning and Development, 24th March 2020

5.3 Testimony from the Outward Bound Trust Director of Learning and Adventure, 9th April 2020

5.4 Testimonial from the SPA FS Scene Examination Lead, 26th April 2020

5.5 Letter from the SPA FS Head of Scene Examination, 29th April 2019

5.6 NORS Workforce Transformation Project Board - Update on Vanguard Project, February 2018, available at: <https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/10507/vanguard-report-nrg-18-10.pdf>

5.7 Email testimonial from the UK NORS/ Retrieval Edinburgh Lead, 27th January 2021