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The future for sport officiating research: an expert statement

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ABSTRACT

Research, coverage, and understanding in sport officiating related scholarly activity have increased markedly in the last decade. Sport officials (referees, judges, umpires) have been historically underrepresented in the sport management, psychology, and physiology literature, but this collection of experts provides avenues for collaboration and exploration that can contribute to understanding systems, individuals, and initiate real-world changes for sporting organisations, policy makers, and officials themselves. Focused and organised around the key research areas and priorities of physiology, decision making, psychology, mental health, management, and training and development, this statement offers detail on the development of the research and associated literature and provides proposals for future scholarship linked to each of the key research areas.

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Introduction

Research into sport officials has increased and evolved considerably since 2010 (Hancock et al., 2021; Webb et al., 2024). As organised sport, even at grassroots levels, has become more professionalised, scholars have identified the rich opportunities that exist around the study of sport officials, those who manage them, and those associated with the role. The growth in attention that sport officials, as a group, have garnered within academic communities has meant an increase in the research agendas utilising officiating populations as participants.

Historically, sport officiating research tended to focus around broadly physiological or technical studies and often from individuals and researchers involved with elite refereeing – specifically association football (Webb, 2022). An integrative review on research regarding association football refereeing (Aragão e Pina et al., 2018) revealed that 82.4% of the studies were published in the previous 10 years, that most studies were about physical ($n = 74$) and technical performance ($n = 90$), but that research around assistant and women referees was scarce. By 2021, Hancock et al. (2021)

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analysed the literature and publications related to sport officials more widely. This review considered 386 articles and noted the increase in published articles, identifying that by 2000, the average rate of publication had risen to 16.8 articles per year, more than a tenfold increase on the previous two decades.

Research into sport officials is constantly evolving and so are the areas of investigation that researchers are pursuing. It is the intention of this expert statement to outline key areas of current and potential future research, whilst seeking to clarify and standardise some of the terminology used when describing sport officials, as well as how data related to sport officiating populations are gathered and reported.

Clarity in reference, terminology, and data collection

Scholars have been referring to those individuals who arbitrate sporting competitions in a variety of ways. For example, it is common to see research and publications referring to both "sport" and "sports" officials, match officials, referees, and umpires. There is specific terminology that refers to arbitrators in different sports (e.g. referees in association football and umpires in baseball) and when referring to a specific sport and a body of arbitrators in that particular sport, it is advisable to refer to the specific terminology. Some sports, however, use different terms within the ranks (e.g. a basketball crew has both a referee and umpires and an American football crew can include a referee, an umpire, and a line/side/back judge). Given the inconsistency, we contend that the term "sport official" is an inclusive term to refer to arbitrators as a group, permitting a more standardised approach to collective terminology.

Similarly, we contend that data gathering and reporting should be more consistent, and a move towards such uniformity would provide a directive for what and how scholars should collect and report data. The standardisation of variables makes comparison across data sets more achievable and realistic, thus deepening learning across transnational boundaries and sports. To move towards a unified approach to data collection, we advise that the competitive level of the sport officiating sample be reported, and the descriptions of competition levels be standardised across sports as much as possible. We offer the following categories: (1) international/professional; (2) national/interuniversity; (3) regional/high school; (4) recreational/grassroots/youth. We also advocate collecting and reporting relevant demographic information of the sample of sport officials. First, for ***age***, we suggest reporting both the average age of the sport officials in the sample, along with the frequency of participants who appear in the following age categories: under 18; 18–24; 25–34; 35–44; 45–54; 55–64; 65+. Second, for ***experience of sport officiating*** we advise the use of average time, and frequency of participants in the following categories: less than 3 years; 3–5; 6–10; 11–15; 16–20; 21+ years. Where possible, it is beneficial to have participants estimate number of hours per week they dedicate to sport officiating. Third, for ***education***, we suggest secondary education, post-secondary technical and vocational education, bachelor's degree or equivalent, and post-graduate (master's or doctoral level). Fourth, for ***employment*** we recommend full-time employed, part-time employed, self-employed, student, retired, not currently employed, and homemaker. We also advise the collection of demographic data related to ***sex/gender/sexuality***, ***race/ethnicity***, and ***sport/s officiated***; concepts we return to throughout this paper.

A uniform approach to both terminology and the collection of standardised demographic information from data samples would benefit our understanding of sport officiating samples. Next, we turn our attention to specific areas of future sport officiating research that we believe will further develop our

understanding of sport officiating populations, performance, and administration. We have identified the areas of physiology, decision making, psychology, mental health, management and training, and development.

Physiology

In the context of sport officiating, physiological demands are the most researched area, with data mostly drawn from time-motion analyses (e.g. distances covered and number of sprints), heart rates, and ratings of perceived exertion. Historically, research shows male sport officiating represents a substantial physical task, one contextualised by factors such as a sport official's age and experience, competitive standard, and competition intensity. Unfortunately, less is known about the physical demands imposed on female sport officials and whether the same contextual factors observed in male sport officials apply. This represents an important area of future research.

Those involved in the collection, interpretation, and research of competition physical demands are encouraged to consider contextual factors when interpreting time-motion analysis data and deciding on whether sport officials are "coping" with the demands. Understanding pure demands through time-motion analysis can be considered saturated, outside of significant game changes or other related questions (e.g. understanding female sport demands). So, as decision making represents the most important aspect of sport officiating, we recommend a shift toward spatio-temporal analyses (i.e. where and when sport officials move) as this approach can explore movement patterns in context of decision making as well as the collective behaviours between sport officials, such as the on-field official and their assistants (Gonçalves et al., 2021).

Sport officials' training practices continue to be dominated by physical training over skill practice. Fortunately, sport officials often now have access to experts in sport science and strength and conditioning to help plan their fitness training routines, thereby ensuring a holistic developmental approach (e.g. endurance, strength, speed, or power) – one that could help minimise injury risk and maximise sport official availability (Weston, 2014). Even full-time sport officials undertake most training sessions "remotely", which necessitates an effective and time-efficient monitoring system whereby training is reliably monitored with timely feedback provided. The use of Global Position Systems, heart rate monitoring, and ratings of perceived exertion represent popular and effective means of monitoring training with sufficient data provided to carefully monitor the high volume of training that sport officials undertake. In instances where cost, time, or personnel represent organisational barriers to monitoring procedures, ratings of perceived exertion are recommended as they are a low cost, highly usable measure with good reliability that can prescribe *and* interpret training.

High physical competition demands combined with a culture of physical training over skill practice require adequate nutritional strategies that are specific to sport officials and not generalised from athletes. It is therefore important that evidence-based fuelling and recovery guidelines are developed for sport officials and that recommendations are contextualised by sex, level, employment, and physical activity status.

In many countries, sport officials are often required to pass a fitness test prior to receiving appointments. These tests represent a physical employment standard which is often regarded as a barrier, rather than a bridge, to future performance. When selecting and implementing testing procedures, we urge organisations to strike a balance between pragmatism and rigour, in that tests can be performed in large groups with minimal specialised equipment, but that task movement, timings, and intensity accurately reflect the crucial physical tasks of sport officiating. Finally, the implementation

of test minimum standards should not be arbitrary, but chosen following a rigorous, scientific validation.

Decision making

Decision making is fundamental for sport officials, with sport officials encountering numerous decision points during competitions. Over the past two decades, there have been significant advancements in the theory, research, and training of sport officials' decision making.

Theoretical progress in understanding sport officiating decision making began with the social cognition approach and the game-management approach, highlighting the accuracy–adequacy balance. Researchers have also utilised the embodied cognition framework, considering sport officials' motor, visual, and sport officiating experiences. Current models aim to explain sport officials' decision making in specific sports and to address how sport officials balance law enforcement and game management, emphasising context and individual differences.

Research on sport officiating decision making has developed in four key areas. First, studies on sport officials' decision making accuracy and personal traits show that expert sport officials demonstrate superior decision making skills and perceptual-cognitive abilities, with experts being more accurate and demonstrating fewer fixations than non-experts. Specifically, there is evidence that personal attributes like self-efficacy, stress, exertion, self-control, and mental fatigue might influence decision making performance. Second, research on external/contextual factors impacting decision making includes crowd noise, team aggressiveness, athletes' and coaches' vocalisations, and previous decisions (Helsen et al., 2019). These effects were typically evaluated from either bias or game-management perspectives. Third, studies have explored sport official teamwork and effective communication. Finally, the impact of technology on decision making has garnered attention in various sports.

Future frameworks should consider the unique aspects of sport officiating, recognising that sport officials (based on sport, level, gender, country of origin, and culture) do not apply decision making uniformly and that it can be misleading to regard decisions as "right" or "wrong". This highlights the importance of qualitative research on decision making, whereby the process of applying decisions can be better understood. Meanwhile, more traditional decision-making studies should consider the multitude of contributions to quality decisions, including motor, cognitive, emotional, and communication factors (Samuel et al., 2024). Additionally, models are needed to explain how sport officials use technology to support the decision-making process (e.g. Video Assistant Referees; VAR).

Future researchers should continue to identify the perceptual-cognitive mechanisms that can influence sport officials' decision making, ideally in ecologically valid contexts. Investigating the effects of video replays on subsequent decision making and the decision-making processes of techno-monitors (e.g. VAR) are also crucial. Most existing research has not considered the sport official's perspective, indicating a need for further exploration. Additionally, examining sport officials' brain function under physical, emotional, and cognitive stress is warranted, since this would provide key insights into decision-making abilities during the challenging situations in which sport officials often find themselves.

Training in decision making has evolved significantly, utilising on-field and off-field methods, implicit and explicit feedback, and various technologies. Online platforms have also become accessible training tools in which video clips are used to provide an increased volume of decision making for skill acquisition and refinement. Although these clips are limited in their ecological validity (i.e. often

videoed from outside the competition area), they can enhance sport officials' practice poor environments. The structure and the content of the training interventions should mimic the perceptual difficulties of real-competition situations to mediate and enhance decision-making skills, both on- and off-field. Whilst VR-based training shows promise, commercial options for sport officials are lacking. We endorse Kittel et al.'s (2021) recommendations for decision-making training to (a) ecologically reflect sport officiating tasks, (b) consider context beyond accuracy, and (c) incorporate reflective learning. Training should also address human–technology interfaces and apply behavioural and physiological metrics to enhance ecological validity. Finally, we need to consider that sport officials do not usually practice their technical, tactical, and physical skills in the same way as athletes. The competition represents a learning event, whilst it should be a performance context. In future work, we must consider how to change this practice-poor culture.

Psychology

Whilst there has been an uptick in the last 2 years, in their analysis of sport officiating research, Hancock et al. (2021) noted only 32 studies focused on sport officials' psychology. Herein, three elements of psychology are discussed: mental skills, communication, and group dynamics.

Presumably, principles of athlete sport psychology apply – at least in part – to sport officials, though nuanced differences exist. Drawing upon the authors' experiences of sport psychology consulting with elite sport officials, examples of these nuances include: (a) motivation, passion, and goals (outcome and performance goals are not as easily identifiable for sport officials), (b) career development and change-events support, (c) mental preparation and imagery use (in most sports, sport officials' actions are often reactive rather than pre-planned, rendering imagery more difficult), (d) anxiety (in some sports, there are fewer in-competition opportunities for sport officials to employ arousal regulation tactics, along with less social support to encourage arousal regulation), and (e) attention allocation and concentration (some sport officials have fewer breaks than athletes, therefore must be more vigilant in their focus). Because psychological excellence is imperative for sport officiating performance, reliance on athlete-driven data is problematic – as evidenced by the nuances above. Domain-specific research is warranted and should be the primary source of evidence-based information. Some of this research exists, but largely, the literature consists of one-off studies on a particular topic rather than cohesive, directed research programmes.

Communication is an integral component to sport officiating. Depending on the sport, officials might communicate decisions, warnings, infractions, and scores/results to athletes, coaches, and spectators. A growing number of researchers have highlighted the importance of team sport officials engaging in verbal communication with athletes and coaches (see Cunningham et al., 2024). Mostly overlooked is communication between sport officials (e.g. shared mental models), which seems an essential part of sport officiating performance. Further, non-verbal behaviours (e.g. body language and self-presentation) constitute a significant portion of sport officiating communication. These types of communications are crucial elements of sport officiating performance and deserve researchers' attention.

Whilst belonging to larger groups (e.g. local officiating organisations), most sport officials operate in smaller groups during competitions. Therein, these smaller officiating groups tend to be transient (i.e. different partners from one competition to the next) and have high rates of intra-team competition (i.e. vying for selection to top competitions). Because research on sport officiating groups is in its infancy, this

leaves many avenues for research. Specifically, researchers are advised to explore: (a) group development, (b) social identity, (c) shared mental models, and (d) cohesion and performance to better understand how sport officiating groups can operate most effectively.

Collectively, the existing literature on sport officiating psychology indicates clear gaps in our understanding that should be addressed by future, directed, domain-specific research. Broad surveys and mental skills interventions could be leveraged to create an evidence base, whilst qualitative studies would supplement such research through a deeper understanding of psychological mechanisms that are salient to sport officials. Ensuring diversity in the research (e.g. sports, regions, ages, and sexes/genders/sexualities) would enhance the research quality in this area. Only through these actions can we glean a true understanding of the influence that psychological variables have on sport officiating performance.

Mental health

Though in its infancy, the early research on sport officials' mental health highlights important concerns for scholars to address. Experiences of abuse, career change events (e.g. not transitioning to a higher level), alongside other role-related stressors such as errors in decision making and excessive workloads, lead to greater distress, increased symptoms of mental ill-health, and lowered psychological well-being (e.g. Brick et al., 2022). Less experienced sport officials and those operating at lower levels of participation appear particularly vulnerable, whereas female sport officials are exposed to additional stressors, including gender-related abuse, discrimination, and toxic, largely male-dominated sport officiating structures and environments that exacerbate mental ill-health outcomes. Collectively, these negative experiences and mental health impacts increase intentions to quit amongst sport officials.

Little is known about how best to protect and promote sport officials' mental health. This is important given that low levels of perceived social and organisational support have been shown to be predictive of poorer mental health outcomes amongst sport officials (see Tingle et al., 2021). Equally, sport officials have reported low levels of mental health literacy, high mental health stigma, and negative attitudes toward help-seeking for mental health difficulties (Gorczynski & Thelwell, 2022).

The goal of research in this domain should be to drive change that promotes mental health. To provide direction, we suggest that researchers align their work with a framework to develop evidence-based mental health literacy interventions. The following steps are advised to progress this research and to develop evidence-based practice to support sport officials' mental health:

1. *Establish links between mental health literacy and mental health in sport officials*

Future research should seek to establish causality between mental health literacy and mental health outcomes, highlighting a need for longitudinal studies in this area. Future intervention studies should incorporate follow-up data collection to determine longer-term effects. To add further insight, qualitative explorations would enrich our knowledge of sport officials' mental health literacy, especially amongst vulnerable populations, such as young, LGBTQ+, and racial/ethnic minority sport officials.

2. *Develop and use valid and reliable measures for mental health outcomes and mental health literacy*

The research on sport officials' mental health has used a variety of measures, making comparisons between studies challenging. Future studies should incorporate replicated use of valid and reliable measurements for mental

health literacy and mental health outcomes and report the psychometric properties of each. Where relevant, data on symptomology using recommended scale thresholds should be reported. For mental health literacy, researchers should consider instruments that provide more refined measures of well-being, anxiety, and depression literacy. The selection of measures should be in line with relevant psychological theory underpinning intervention development.

3. *Identify the influences and determinants of mental health and mental health literacy*

Given the limited scope of existing research (i.e. predominantly cross-sectional, quantitative designs), further insight on determinants of mental health and mental health literacy amongst sport officials is needed. Researchers should seek a more complete understanding of ill-being (i.e. mental illness) and well-being amongst sport officials and explore factors that influence mental health outcomes (e.g. the impact of both negative and positive interactions with athletes, coaches, spectators, their allies, and those in their sport officiating communities). Qualitative studies should provide insights into contextual and organisational factors that influence mental health, mental health literacy, or act as barriers to mental health help-seeking. Furthermore, only a handful of studies incorporate female sport officials and demographic information on race/ethnicity is largely unreported. Future researchers should intentionally incorporate underrepresented sociodemographic groups and report demographic characteristics.

4. *Evaluate and translate mental health literacy interventions and distribute them for widespread practice*

There is a lack of policy on sport officials' mental health, reinforcing an urgent need for researchers to develop efficacious mental health literacy interventions and translate these programmes into practice. Interventions should target multiple levels within sporting organisations, including sport officials and administrators, to maximise intervention effects. Adopting co-production methods involving all relevant organisational stakeholders is recommended to optimise the design, uptake, implementation, and longer-term impact of mental health literacy programmes.

Management

Prior to 2010, few sport management scholars considered the importance of sport officials. The Referee Attrition Model identified the key factors in recruitment, retention, and advancement for sport officials (Warner et al., 2013). The 10 dimensions associated with a sport official's development later served as the foundation for the Referee Retention Scale (Ridinger et al., 2017), which highlighted the most impactful dimensions that must be managed to preserve a high-quality and adequate sport officiating pool. The Referee Retention Scale factors were: Administrator Consideration (i.e. level of perceived fairness and consideration from assignors and administrators), Intrinsic Motives (i.e. reasons related to enjoyment of competition and staying involved with a sport that attracted someone to sport officiating), Mentoring (i.e. support and encouragement from a mentor to become involved with and develop in sport officiating), Remuneration (i.e. financial payment for sport officiating), Sense of Community (i.e. perceived sense of belonging to a supportive community), Lack of Stress (i.e. infrequent encounters with stressful situations), and Continuing Education (i.e. ongoing sport officiating education and training).

To advance our understanding of the management of sport officials, it is vital for researchers to continue to conduct more in-depth studies on each of these factors. Building from this research and specifically, the Intrinsic

Motives factor, Bright et al. (2022) considered why more athletes, who were especially primed for the sport officiating role, did not consider sport officiating as a post-athletic career option. The authors concluded the major recruitment barriers for athletes were the high-stress environment, financial instability, time, and lack of knowledge and support. Similarly, researchers have conducted a study exploring the connection between social networks and sport officials' Sense of Community (Tingle et al., 2024). From a practical standpoint, their results emphasised the importance of creating an environment where sport officials can connect beyond the sport. Although formal events (i.e. camps, clinics, and evaluation meetings) should be elements of the retention solution, the importance of creating informal social opportunities also needs to be highlighted. Additionally, developing formal or informal mentorship programmes could positively impact advancement opportunities, whilst simultaneously creating a sense of community and belonging. Efforts to create community are particularly important if we consider these support networks and environments related to the advancements in understanding concerning the abuse, aggression, and maltreatment of sport officials. Moreover, the reduction of these factors, and how any such reductions contribute to a safer and more enjoyable sporting environment for all stakeholders (sport officials, athletes, coaches, and spectators) are also important areas for future scholarship.

To address the pressing global officiating shortage, researchers need to continue to provide sport managers with strategic managerial knowledge by further exploring the sport officiating experience and specifically, how it relates to factors that predict retention.

Training and development

Training and career development in sport officiating is a largely unstudied area. Whilst there is research that examines isolated training of specific skills such as decision making, and to a lesser extent, communication, there is an absence of models, data, and a broader understanding of how skills and performance are developed over time.

In athlete development, a rich source of understanding comes from retrospective data related to the training activities, development environments, and backgrounds of current elite performers. There is little work in this area with sport officials. Gathering data and conducting analyses within sport officiating cohorts will aid understanding and should include the sampling of sport officials from different sports. For example, interactor sport officials with strong physical demands, such as association football referees, might show different developmental histories and profiles to those of monitor sports such as gymnastics. In addition, there is a need to gain more discriminating information by sampling cohorts at different competition levels and with different demographic profiles to inform training and development programmes that can cater to different groups and targeted outcomes (i.e. international/professional, national/interuniversity, regional/high school, recreational/grassroots/youth). Given that sport officials can be a smaller research population, particularly if targeting the international/professional level, and that understanding idiosyncratic journeys of some individuals is useful (e.g. a long-time volunteer; a particularly good recreational/grassroots level umpire), case study methodology and collaboration with local, regional, and national sporting organisations will be informative and should be used.

It will also be useful to work towards the identification of key data to capture, analyse, and share with the aim of building databases that can be used for longitudinal studies. These data sources can include factors such as salaries, competition and performance statistics, development milestones or training testing data, and volunteer demographics. A

structured approach to data collection and management will create a foundation for ongoing exploration and longitudinal analyses, aided by researchers, with potential minimum variables collected (e.g. see the minimum standard demographics for research samples). Some of these data might not only address training and development, but can specifically form the foundation for targeted research into specific areas such as AI assistance and real-time decision support (see Ma & Kabala, 2024).

As sport officials are often considered to be both athletes and administrators, athlete development models can serve as guides, but need adaptation and consideration for the particular transitions and factors in sport officiating. Using these models as frameworks for research on sport officiating development and training, and testing and challenging their applications and relevance will further develop the science of sport officiating. Models of development will help to identify key variables for exploration (e.g. the role of coaching, mentorship, funding, and sport science) or transitions in stages of development (from national to international/professional). Additional consideration is needed to explore how performance is measured in sport officiating across different types (e.g. interactor versus monitor) and levels of sport, including quantitative objective and subjective evaluations.

A final consideration is the need for ongoing programmes of work. The complexity of development and training means there is the need to include multiple sources of information and levels of exploration to provide a holistic understanding (e.g. lab-based training studies, on-field and transfer testing, longitudinal studies, case studies, and how a training intervention fits within a development curriculum, see Raab et al., 2023). A critical component is that we cannot focus all our efforts on understanding only the international/professional level of sport officiating. Given the importance of the role of sport officials to: (a) the development of athletes along their development pathway and (b) facilitating health through sport participation at all levels, understanding how to train and develop sport officials at all levels is essential. Understanding how to effectively train and develop sport officials, whilst also responding to the mentoring and support needs for these groups is, therefore, of paramount importance. Within a holistic approach to understanding training and development, researchers need to consider the factors that are influential not only for development overall but also for cohorts who have been historically underrepresented.

Conclusion

This statement has considered the areas we believe are critical for the development and evolution of sport officiating research. We focused on factors related to physiology, decision making, psychology, mental health, management, and training and development, whilst also considering the importance of standardising language and the collection of data and demographic information, particularly when working with marginalised or underrepresented populations. We have proposed future areas of research related to each of the subject areas, which we believe will help scholars develop new ideas and contribute to the growing sport officiating literature. There is much work to be done, as we have demonstrated, and there remain significant literature gaps, but this is an exciting and vibrant time for sport officiating research. We see this statement as a key building block for the continued growth in research during the coming years.

Disclosure statement

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