Open and transparent sports science research: the role of journals to move the field forward

Harrison J. Hansford^{1,2} · Aidan G. Cashin^{1,2} · Michael A. Wewege^{1,2} · Michael C. Ferraro^{1,2} · James H. McAuley^{1,2} · Matthew D. Jones^{1,2} · the TOP Sport Science Collaborators

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Abbreviation

TOP Transparency and openness promotion

In recent years there has been a ‘crisis of confidence’ or ‘reproducibility crisis’ in many areas of science including psychology [1], neuroscience [2] and social science [3]. These issues stand to reduce confidence in the findings of science from those fields, potentially resulting in wasted research funding, resources and effort [4]. The field of sports science is not immune to these issues, with several appeals to improve research quality and move the field forward [5–7]. Research transparency and openness are essential to adequately appraise, replicate, and implement research findings into clinical practice and health policy. Greater transparency and openness in sports science research is needed to increase the confidence in research findings and aid reproducibility.

Sports science journals can support researchers to publish more transparent and open research [8, 9] by implementing practices such as requiring pre-registration [10], reporting guidelines [11] and sharing of data and code [12, 13]. Journal policies that actively support transparent and open research practices can improve the quality, reproducibility and replicability of the research they publish [14, 15]. For example, a change to editorial policy in the *Nature* life-science journals introducing a reporting checklist led to improved reporting of the risk of bias for in vivo research [15]. The Transparency and Openness Promotion (TOP)

Guidelines [16] provide an excellent overview of the key areas and practices journals should support to improve research transparency and openness.

To illustrate this issue, we appraised how well the policies of the leading 38 sports science journals support transparent and open research practices. These journals were evaluated using the TOP Factor (<https://osf.io/t2yu5/>)—a metric for evaluating the degree to which journal policies promote transparency and openness [17]. The TOP Factor is calculated as the sum of journal implementation of the eight modular standards within the TOP Guidelines and an additional standard related to the publication of replication studies. *Knee Surgery Sports Traumatology Arthroscopy*’s TOP Factor scores are provided in Fig. 1, alongside summary data from the top 38 sport science journals.

The mean TOP Factor score for the 38 leading sports science journals was $2.05 \pm 1.99/27$ showing a low level of engagement with transparency and openness standards. Compared to other sports science journals, *Knee Surgery Sports Traumatology Arthroscopy* showed greater engagement with transparency and openness standards with a total TOP Factor score of 7/27. The low TOP Factor scores seen across sports science journals highlight an important opportunity for journals to update their policies towards increased engagement with transparent and open practices to ultimately move the field forward.

There are several key areas where sports science journals can improve the transparency and openness of the research they publish. Sports science journals, including *Knee Surgery Sports Traumatology Arthroscopy*, scored poorly (median score 0/3) for TOP Factor items “data citation”, “code citation”, “data transparency”, “code transparency”, “research material transparency”, “analysis preregistration” and “replication” (Fig. 1). We encourage sports science journals to review their journal policies to better support these practices and help improve the quality and transparency of

✉ Harrison J. Hansford
h.hansford@unsw.edu.au

¹ Department of Exercise Physiology, Faculty of Medicine and Health, School of Health Sciences, UNSW Sydney, 61-63 Botany St, Randwick, NSW 2031, Australia

² Centre for Pain IMPACT, Neuroscience Research Australia, Sydney, Australia

Fig. 1 A panel of histograms detailing the 38 top sports science journals scores for each item of the TOP Factor. The dotted line indicates *Knee Surgery Sports Traumatology Arthroscopy's* (KSSTA) score for each item, with the colour of the line indicating the position relative to the median score of the top 38 sports science journals. Black indicates the score of KSSTA was equal to the median, and green indicates the score of KSSTA was above the median (better). For TOP

items 1–8, a score of: 0=not mentioned or ‘encouraged’ by the journal policy, 1=recommended by the journal policy, 2=required by the journal policy, 3=required and enforced by the journal policy. For item 9, a score of: 0=not mentioned by the journal policy, 1=journal states significance or novelty are not criteria for publication, 2=journal reviews replication studies blinded to results, 3=journal accepts registered reports

sports science research. For example, research material, code and data transparency are important for improving the ability to synthesise, verify and replicate research. Platforms such as the Open Science Framework (osf.io) [18], FigShare (figshare.com) [19] and Dryad (datadryad.org) [20] enable public sharing of research material, code and data; doing so may also increase trust in study findings [16].

“Study preregistration” was the only TOP Factor item on which some journals achieved a maximum (best) score. *Knee Surgery Sports Traumatology Arthroscopy* was one of these journals. Study preregistration is an important step in reducing the risk of selective reporting and outcome switching which can bias study findings, distort the evidence-base, and potentially lead to harm for patients [21–23]. Preregistration requires authors to prospectively specify the research

objectives, design, and methods before data is collected or becomes available. Critically, preregistration makes clearer the distinction between confirmatory research that is important for hypotheses testing, and unplanned, exploratory research that is important for generating hypotheses [10]. Specific, precise and exhaustive preregistration of research [24], along with transparent reporting of any deviations, allows peer reviewers and research end users to better assess the credibility of the research findings.

There is great opportunity among the top sports science journals to improve engagement with research transparency and openness. *Knee Surgery Sports Traumatology Arthroscopy* had one of the highest TOP Factor scores among the other top sports science journals and can further champion transparent and open research practices by requiring the

sharing of data and code (transparency), and requiring both study and analysis preregistration. Journals are key stakeholders in the publication of high-quality and reproducible research and can support transparent and open research practices by updating their policies. The Centre for Open Science (<https://cos.io/top/>) provides advice and resources to help guide this. Greater transparency and openness will improve the conduct and translation of sport science research to ultimately move the field forward.

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Declarations

Conflict of interest All authors declare they have no conflicts of interest.

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References

- Open Science Collaboration (2015) Estimating the reproducibility of psychological science. *Science* 349:4716
- Button KS, Ioannidis JP, Mokrysz C, Nosek BA, Flint J, Robinson ES et al (2013) Power failure: why small sample size undermines the reliability of neuroscience. *Nat Rev Neurosci* 14:365–376
- Camerer CF, Dreber A, Holzmeister F, Ho T-H, Huber J, Johannesson M et al (2018) Evaluating the replicability of social science experiments in Nature and Science between 2010 and 2015. *Nat Hum Behav* 2:637–644
- Ioannidis JPA (2005) Why most published research findings are false. *PLoS Med* 2:e124
- Bernards JR, Sato K, Haff GG, Bazyler CD (2017) Current research and statistical practices in sport science and a need for change. *Sports* 5:87
- Caldwell AR, Vigotsky AD, Tenan MS, Radel R, Mellor DT, Kreutzer A et al (2020) Moving sport and exercise science forward: a call for the adoption of more transparent research practices. *Sports Med* 50:449–459
- Halperin I, Vigotsky AD, Foster C, Pyne DB (2018) Strengthening the practice of exercise and sport-science research. *Int J Sports Physiol Perform* 13:127–134
- Ioannidis JP (2015) How to make more published research true. *Revista Cubana de Información en Ciencias de la Salud (ACI-MED)* 26:187–200
- Munafò MR, Nosek BA, Bishop DVM, Button KS, Chambers CD, Percie du Sert N et al (2017) A manifesto for reproducible science. *Nat Hum Behav* 1:0021
- Nosek BA, Ebersole CR, DeHaven AC, Mellor DT (2018) The pre-registration revolution. *Proc Natl Acad Sci USA* 115:2600–2606
- Simera I, Moher D, Hirst A, Hoey J, Schulz KF, Altman DG (2010) Transparent and accurate reporting increases reliability, utility, and impact of your research: reporting guidelines and the EQUATOR Network. *BMC Med* 8:1–6
- Herbert R, Elkins M (2017) Publishing code: an initiative to enhance transparency of data analyses reported in Journal of Physiotherapy. *J Physiother* 63:129–130
- Naudet F, Sakarovitch C, Janiaud P, Cristea I, Fanelli D, Moher D et al (2018) Data sharing and reanalysis of randomized controlled trials in leading biomedical journals with a full data sharing policy: survey of studies published in The BMJ and PLOS Medicine. *BMJ* 360:400
- Cashin AG, Bagg MK, Richards GC, Toomey E, McAuley JH, Lee H (2020) Limited engagement with transparent and open science standards in the policies of pain journals: a cross-sectional evaluation. *BMJ Evid Based Med* 26:313–319
- The NPQIP Collaborative Group (2019) Did a change in Nature journals' editorial policy for life sciences research improve reporting? *BMJ Open Sci* 3:00035
- Nosek BA, Alter G, Banks GC, Borsboom D, Bowman SD, Breckler SJ et al (2015) Promoting an open research culture. *Science* 348:1422–1425
- Mayo-Wilson E, Grant S, Supplee L, Kianersi S, Amin A, DeHaven A et al (2021) Evaluating implementation of the Transparency and Openness Promotion (TOP) guidelines: the TRUST process for rating journal policies, procedures, and practices. *Res Integr Peer Rev* 6:9
- Foster ED, Deardorff A (2017) Open Science Framework (OSF). *J Med Libr Assoc JMLA* 105:203–206
- Hahnel M. Figshare. 2012; <https://figshare.com/>. Accessed 2021.
- Greenberg J, White HC, Carrier S, Scherle R (2009) A metadata best practice for a scientific data repository. *J Libr Metadata* 9:194–212
- Chan A-W, Song F, Vickers A, Jefferson T, Dickersin K, Gøtzsche PC et al (2014) Increasing value and reducing waste: addressing inaccessible research. *Lancet* 383:257–266
- Hart B, Lundh A, Bero L (2012) Effect of reporting bias on meta-analyses of drug trials: reanalysis of meta-analyses. *BMJ* 344:7202
- Kirkham JJ, Dwan KM, Altman DG, Gamble C, Dodd S, Smyth R et al (2010) The impact of outcome reporting bias in randomised controlled trials on a cohort of systematic reviews. *BMJ* 340:365
- Wicherts JM, Veldkamp CL, Augusteijn HE, Bakker M, Van Aert R, Van Assen MA (2016) Degrees of freedom in planning, running, analyzing, and reporting psychological studies: a checklist to avoid p-hacking. *Front Psychol* 7:1832

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